

# Intel® Open Source HD Graphics Programmers' Reference Manual (PRM)

## **Volume 2d: Command Reference: Structures**

For the 2014-2015 Intel Atom™ Processors, Celeron™ Processors and Pentium™ Processors based on the "Cherry Trail/Braswell" Platform  
(Cherryview/Braswell graphics)

October 2015, Revision 1.1

## Creative Commons License

**You are free to Share** - to copy, distribute, display, and perform the work under the following conditions:

- **Attribution.** You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work).
- **No Derivative Works.** You may not alter, transform, or build upon this work.

## Notices and Disclaimers

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL® PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

A "Mission Critical Application" is any application in which failure of the Intel Product could result, directly or indirectly, in personal injury or death. SHOULD YOU PURCHASE OR USE INTEL'S PRODUCTS FOR ANY SUCH MISSION CRITICAL APPLICATION, YOU SHALL INDEMNIFY AND HOLD INTEL AND ITS SUBSIDIARIES, SUBCONTRACTORS AND AFFILIATES, AND THE DIRECTORS, OFFICERS, AND EMPLOYEES OF EACH, HARMLESS AGAINST ALL CLAIMS COSTS, DAMAGES, AND EXPENSES AND REASONABLE ATTORNEYS' FEES ARISING OUT OF, DIRECTLY OR INDIRECTLY, ANY CLAIM OF PRODUCT LIABILITY, PERSONAL INJURY, OR DEATH ARISING IN ANY WAY OUT OF SUCH MISSION CRITICAL APPLICATION, WHETHER OR NOT INTEL OR ITS SUBCONTRACTOR WAS NEGLIGENT IN THE DESIGN, MANUFACTURE, OR WARNING OF THE INTEL PRODUCT OR ANY OF ITS PARTS.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined". Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Implementations of the I2C bus/protocol may require licenses from various entities, including Philips Electronics N.V. and North American Philips Corporation.

Intel and the Intel logo are trademarks of Intel Corporation in the U.S. and other countries.

\* Other names and brands may be claimed as the property of others.

**Copyright © 2015, Intel Corporation. All rights reserved.**

## Table of Contents

|  |           |
|--|-----------|
| <b>3DSTATE_CONSTANT(Body)</b> .....  | <b>1</b>  |
| <b>A32 Buffer Base Address Message Header Control</b> .....                    | <b>4</b>  |
| <b>A64 Data Size Message Descriptor Control Field</b> .....                    | <b>5</b>  |
| <b>A64 Dual Oword Block Message Header</b> .....                               | <b>6</b>  |
| <b>A64 Hword Block Message Header</b> .....                                    | <b>7</b>  |
| <b>A64 Hword Data Blocks Message Descriptor Control Field</b> .....            | <b>8</b>  |
| <b>A64 Oword Block Message Header</b> .....                                    | <b>9</b>  |
| <b>A64 Oword Data Blocks Message Descriptor Control Field</b> .....            | <b>10</b> |
| <b>A64 Oword Dual Data Blocks Message Descriptor Control Field</b> .....       | <b>11</b> |
| <b>AddrSubRegNum</b> .....   | <b>12</b> |
| <b>Any Binding Table Index Message Descriptor Control Field</b> .....          | <b>13</b> |
| <b>Atomic Integer Binary Operation Message Descriptor Control Field</b> .....  | <b>14</b> |
| <b>Atomic Integer Trinary Operation Message Descriptor Control Field</b> ..... | <b>15</b> |
| <b>Atomic Integer Unary Operation Message Descriptor Control Field</b> .....   | <b>16</b> |
| <b>AVC CABAC</b> .....   | <b>17</b> |
| <b>AVC CAVLC</b> .....   | <b>19</b> |
| <b>AVS_Inline_DMEN</b> .....   | <b>21</b> |
| <b>BCS Hardware-Detected Error Bit Definitions</b> .....                       | <b>24</b> |
| <b>BINDING_TABLE_EDIT_ENTRY</b> .....  | <b>25</b> |
| <b>BINDING_TABLE_STATE</b> .....   | <b>26</b> |
| <b>Bit Definition for Interrupt Control Registers - Render</b> .....           | <b>27</b> |
| <b>BLEND_STATE</b> .....   | <b>29</b> |
| <b>BLEND_STATE_ENTRY</b> .....   | <b>31</b> |
| <b>Block Dimensions Message Header Control</b> .....                           | <b>35</b> |
| <b>Block Message Header</b> .....  | <b>36</b> |
| <b>BR00 - BLT Opcode and Control</b> .....                                     | <b>37</b> |
| <b>BR01 - Setup BLT Raster OP, Control, and Destination Offset</b> .....       | <b>41</b> |
| <b>BR05 - Setup Expansion Background Color</b> .....                           | <b>44</b> |
| <b>BR06 - Setup Expansion Foreground Color</b> .....                           | <b>45</b> |
| <b>BR07 - Setup Blit Color Pattern Address Lower Order Address bits</b> .....  | <b>46</b> |
| <b>BR09 - Destination Address Lower Order Address Bits</b> .....               | <b>47</b> |

**BR11 - BLT Source Pitch (Offset)..... 48**

**BR12 - Source Address Lower order Address bits ..... 49**

**BR13 - BLT Raster OP, Control, and Destination Pitch ..... 50**

**BR14 - Destination Width and Height..... 53**

**BR15 - Color Pattern Address Lower order Address bits..... 54**

**BR16 - Pattern Expansion Background and Solid Pattern Color ..... 55**

**BR17 - Pattern Expansion Foreground Color ..... 56**

**BR18 - Source Expansion Background and Destination Color ..... 57**

**BR19 - Source Expansion Foreground Color ..... 58**

**BR27 - Destination Address Higher Order Address..... 59**

**BR28 - Source Address Higher order Address..... 60**

**BR29 - Color Pattern Address Higher order Address ..... 61**

**BR30 - Setup Blit Color Pattern Address Higher Order Address ..... 62**

**Byte Masked Media Block Message Header ..... 63**

**Byte Masked Media Block Message Header Control ..... 65**

**CC\_VIEWPORT ..... 67**

**Channel Mask Message Descriptor Control Field ..... 68**

**Channel Mode Message Descriptor Control Field ..... 69**

**COLOR\_CALC\_STATE..... 70**

**COLOR\_PROCESSING\_STATE - ACE State ..... 72**

**COLOR\_PROCESSING\_STATE - CSC State ..... 78**

**COLOR\_PROCESSING\_STATE - PROCAMP State ..... 82**

**COLOR\_PROCESSING\_STATE - STD/STE State ..... 83**

**COLOR\_PROCESSING\_STATE - TCC State ..... 95**

**Color Calculator State Pointer Message Header Control ..... 100**

**Color Code Message Header Control..... 101**

**Context Descriptor Format..... 102**

**Context Status..... 106**

**Data Port 0 Message Types ..... 108**

**Data Port 1 Message Types ..... 109**

**Data Size Message Descriptor Control Field..... 111**

**DstRegNum..... 112**

**DstSubRegNum..... 113**

|  |     |
|--|-----|
| Dword Data Payload Register.....                               | 114 |
| Dword SIMD4x2 Atomic CMPWR Message Data Payload .....          | 116 |
| Dword SIMD4x2 Atomic Operation Message Data Payload.....       | 117 |
| Dword SIMD4x2 Data Payload .....                               | 118 |
| Dword SIMD8 Atomic Operation CMPWR Message Data Payload .....  | 120 |
| Dword SIMD8 Data Payload.....                                  | 121 |
| Dword SIMD16 Atomic Operation CMPWR Message Data Payload ..... | 122 |
| Dword SIMD16 Data Payload .....                                | 123 |
| DX9_CONSTANTB_ENTRY.....                                       | 124 |
| DX9_CONSTANTF_ENTRY .....                                      | 125 |
| DX9_CONSTANTI_ENTRY .....                                      | 126 |
| Encoder Statistics Format.....                                 | 127 |
| EU_INSTRUCTION_BASIC_ONE_SRC .....                             | 131 |
| EU_INSTRUCTION_BASIC_THREE_SRC .....                           | 132 |
| EU_INSTRUCTION_BASIC_TWO_SRC .....                             | 135 |
| EU_INSTRUCTION_BRANCH_CONDITIONAL .....                        | 136 |
| EU_INSTRUCTION_BRANCH_ONE_SRC.....                             | 138 |
| EU_INSTRUCTION_BRANCH_TWO_SRC.....                             | 139 |
| EU_INSTRUCTION_COMPACT_THREE_SRC.....                          | 140 |
| EU_INSTRUCTION_COMPACT_TWO_SRC .....                           | 143 |
| EU_INSTRUCTION_CONTROLS_A.....                                 | 148 |
| EU_INSTRUCTION_CONTROLS_B.....                                 | 151 |
| EU_INSTRUCTION_CONTROLS.....                                   | 153 |
| EU_INSTRUCTION_HEADER.....                                     | 154 |
| EU_INSTRUCTION_ILLEGAL .....                                   | 155 |
| EU_INSTRUCTION_MATH .....                                      | 156 |
| EU_INSTRUCTION_NOP.....  | 157 |
| EU_INSTRUCTION_OPERAND_CONTROLS .....                          | 158 |
| EU_INSTRUCTION_OPERAND_DST_ALIGN1.....                         | 160 |
| EU_INSTRUCTION_OPERAND_DST_ALIGN16.....                        | 162 |
| EU_INSTRUCTION_OPERAND_SEND_MSG .....                          | 164 |
| EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN1 .....                    | 165 |
| EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16.....                    | 166 |

**EU\_INSTRUCTION\_OPERAND\_SRC\_REG\_THREE\_SRC..... 168**

**EU\_INSTRUCTION\_SEND..... 169**

**EU\_INSTRUCTION\_SOURCES\_IMM32..... 171**

**EU\_INSTRUCTION\_SOURCES\_REG ..... 172**

**EU\_INSTRUCTION\_SOURCES\_REG\_IMM ..... 173**

**EU\_INSTRUCTION\_SOURCES\_REG\_REG..... 174**

**ExtMsgDescpt..... 176**

**ExtMsgDescptImmediate..... 178**

**FFTID Message Header Control ..... 180**

**Filter\_Coefficient ..... 181**

**Filter\_Coefficients ..... 182**

**FrameDeltaQp ..... 183**

**FrameDeltaQpRange ..... 184**

**FunctionControl ..... 185**

**GATHER\_CONSTANT\_ENTRY..... 186**

**Hardware-Detected Error Bit Definitions..... 187**

**Hardware Status Page Layout..... 188**

**Header Forbidden Message Descriptor Control Field..... 193**

**Header Present Message Descriptor Control Field..... 194**

**Header Required Message Descriptor Control Field..... 195**

**HEVC\_ARBITRATION\_PRIORITY..... 196**

**HW Generated BINDING\_TABLE\_STATE..... 197**

**Hword 1 Block Data Payload ..... 198**

**Hword 2 Block Data Payload ..... 199**

**Hword 4 Block Data Payload ..... 200**

**Hword 8 Block Data Payload ..... 201**

**Hword Channel Mode Message Header Control ..... 203**

**Hword Register Blocks Message Descriptor Control Field..... 204**

**Ignored Message Header..... 205**

**Inline Data Description for MFD\_AVC\_BSD\_Object ..... 206**

**Inline Data Description - VP8 PAK OBJECT ..... 214**

**INTERFACE\_DESCRIPTOR\_DATA..... 218**

**Invalidate After Read Message Descriptor Control Field ..... 224**

|   |     |
|---|-----|
| JPEG .....  | 225 |
| LOD Message Address Payload Control .....                                 | 226 |
| Lower Oword Block Data Payload.....                                       | 227 |
| MEDIA_SURFACE_STATE .....   | 228 |
| MEMORY_OBJECT_CONTROL_STATE .....   | 235 |
| MemoryAddressAttributes.....  | 236 |
| Merged Media Block Message Header.....                                    | 238 |
| Merged Media Block Message Header Control .....                           | 240 |
| Message Descriptor - Render Target Write .....                            | 243 |
| Message Descriptor - Sampling Engine .....                                | 245 |
| MFD_MPEG2_BSD_OBJECT Inline Data Description .....                        | 247 |
| MPEG2 .....   | 250 |
| MPEG4-2_Inline_DMEM .....   | 251 |
| MsgDescpt31 .....   | 257 |
| Normal Media Block Message Header .....                                   | 258 |
| Normal Media Block Message Header Control .....                           | 260 |
| oMask Message Data Payload Register .....                                 | 262 |
| OM Replicated SIMD16 Render Target Data Payload.....                      | 265 |
| OM S0A SIMD8 Render Target Data Payload.....                              | 266 |
| OM S0A SIMD16 Render Target Data Payload .....                            | 268 |
| OM SIMD8 Dual Source Render Target Data Payload .....                     | 270 |
| OM SIMD8 Render Target Data Payload.....                                  | 272 |
| OM SIMD16 Render Target Data Payload .....                                | 273 |
| Oword 1 Dual Block Data Payload .....                                     | 275 |
| Oword 2 Block Data Payload .....  | 276 |
| Oword 4 Block Data Payload .....  | 277 |
| Oword 4 Dual Block Data Payload .....                                     | 278 |
| Oword 8 Block Data Payload .....  | 280 |
| Oword A64 SIMD4x2 Atomic CMPWR16B Message Data Payload .....              | 281 |
| Oword A64 SIMD4x2 Atomic Operation Return Data Message Data Payload ..... | 282 |
| Oword A64 SIMD8 Atomic Operation CMPWR16B Message Data Payload.....       | 283 |
| Oword Data Blocks Message Descriptor Control Field .....                  | 285 |
| Oword Data Payload Register.....  | 286 |

**Oword Dual Data Blocks Message Descriptor Control Field.....287**

**PALETTE\_ENTRY .....288**

**Per Thread Scratch Space Message Header Control .....289**

**Pixel Masked Media Block Message Header .....290**

**Pixel Masked Media Block Message Header Control .....292**

**Pixel Sample Mask Message Header Control .....294**

**Pixel Sample Mask Render Target Message Header Control.....295**

**Power Clock State Format .....296**

**PPHWSP\_LAYOUT .....298**

**Qword A64 SIMD4x2 Atomic CMPWR Message Data Payload .....299**

**Qword Data Payload Register.....301**

**Qword SIMD4x2 Atomic CMPWR8B Message Data Payload.....302**

**Qword SIMD4x2 Atomic Operation Message Data Payload.....303**

**Qword SIMD8 Atomic Operation CMPWR8B Message Data Payload .....304**

**Qword SIMD8 Atomic Operation CMPWR Message Data Payload .....305**

**Qword SIMD8 Atomic Operation Return Data Message Data Payload.....306**

**Qword SIMD8 Data Payload .....307**

**Qword SIMD16 Atomic Operation CMPWR8B Message Data Payload.....308**

**Qword SIMD16 Atomic Operation Return Data Message Data Payload .....310**

**Qword SIMD16 Data Payload .....311**

**Read-Only Data Port Message Types .....312**

**Read Surface Info 32-Bit Address Payload .....313**

**Read Surface Info Data Payload .....314**

**RENDER\_SURFACE\_STATE.....316**

**Render Data Port Message Types .....342**

**Render Target Index Message Header Control.....343**

**Render Target Message Header .....344**

**Render Target Message Header Control .....346**

**Replicated Pixel Render Target Data Payload Register .....349**

**Replicated SIMD16 Render Target Data Payload .....350**

**Reversed SIMD Mode 2 Message Descriptor Control Field .....351**

**RoundingPrecisionTable\_3\_Bits .....352**

**S0A SIMD8 Render Target Data Payload .....353**



|  |            |
|--|------------|
| <b>S0A SIMD16 Render Target Data Payload .....</b>                 | <b>354</b> |
| <b>SAMPLER_BORDER_COLOR_STATE .....</b>                            | <b>356</b> |
| <b>SAMPLER_INDIRECT_STATE_BORDER_COLOR.....</b>                    | <b>358</b> |
| <b>SAMPLER_INDIRECT_STATE .....</b>                                | <b>361</b> |
| <b>SAMPLER_STATE_8x8_AVS_COEFFICIENTS .....</b>                    | <b>364</b> |
| <b>SAMPLER_STATE_8x8_AVS .....</b>                                 | <b>368</b> |
| <b>SAMPLER_STATE_8x8_CONVOLVE .....</b>                            | <b>380</b> |
| <b>SAMPLER_STATE_8x8_ERODE_DILATE_MINMAXFILTER.....</b>            | <b>385</b> |
| <b>SAMPLER_STATE .....</b>   | <b>386</b> |
| <b>SCISSOR_RECT .....</b>  | <b>398</b> |
| <b>Scratch Hword Block Message Header.....</b>                     | <b>400</b> |
| <b>SF_CLIP_VIEWPORT.....</b>                                       | <b>401</b> |
| <b>SF_OUTPUT_ATTRIBUTE_DETAIL .....</b>                            | <b>404</b> |
| <b>SFC_8x8_AVS_COEFFICIENTS.....</b>                               | <b>406</b> |
| <b>SIMD4x2 Typed Surface 32-Bit Address Payload .....</b>          | <b>409</b> |
| <b>SIMD4x2 Untyped BUFFER Surface 32-Bit Address Payload .....</b> | <b>411</b> |
| <b>SIMD4x2 Untyped BUFFER Surface 64-Bit Address Payload .....</b> | <b>412</b> |
| <b>SIMD4x2 Untyped STRBUF Surface 32-Bit Address Payload.....</b>  | <b>413</b> |
| <b>SIMD4x2 32-Bit Address Payload .....</b>                        | <b>414</b> |
| <b>SIMD8 Dual Source Render Target Data Payload.....</b>           | <b>415</b> |
| <b>SIMD8 LOD Message Address Payload Control .....</b>             | <b>417</b> |
| <b>SIMD8 Render Target Data Payload .....</b>                      | <b>419</b> |
| <b>SIMD8 Typed Surface 32-Bit Address Payload .....</b>            | <b>420</b> |
| <b>SIMD8 Untyped BUFFER Surface 32-Bit Address Payload .....</b>   | <b>421</b> |
| <b>SIMD8 Untyped BUFFER Surface 64-Bit Address Payload .....</b>   | <b>422</b> |
| <b>SIMD8 Untyped STRBUF Surface 32-Bit Address Payload .....</b>   | <b>423</b> |
| <b>SIMD16 Render Target Data Payload .....</b>                     | <b>424</b> |
| <b>SIMD16 Untyped BUFFER Surface 32-Bit Address Payload .....</b>  | <b>426</b> |
| <b>SIMD16 Untyped BUFFER Surface 64-Bit Address Payload .....</b>  | <b>427</b> |
| <b>SIMD16 Untyped STRBUF Surface 32-Bit Address Payload.....</b>   | <b>428</b> |
| <b>SIMD 32-Bit Address Payload Control.....</b>                    | <b>429</b> |
| <b>SIMD 64-Bit Address Payload Control.....</b>                    | <b>431</b> |
| <b>SIMD8 32-Bit Address Payload.....</b>                           | <b>432</b> |

**SIMD8 64-Bit Address Payload.....433**

**SIMD16 32-Bit Address Payload.....434**

**SIMD16 64-Bit Address Payload.....435**

**SIMD Mode 2 Message Descriptor Control Field.....436**

**SIMD Mode 3 Message Descriptor Control Field.....437**

**SLM Surface Pixel Mask Message Header .....438**

**Slot Group 2 Message Descriptor Control Field.....439**

**Slot Group 3 Message Descriptor Control Field.....440**

**Slot Group Select Render Cache Message Descriptor Control Field .....441**

**SO\_DECL .....442**

**SO\_DECL\_ENTRY .....444**

**SplitBaseAddress4KByteAligned .....445**

**SplitBaseAddress64ByteAligned .....446**

**SrcRegNum .....447**

**SrcSubRegNum .....448**

**Stateless Binding Table Index Message Descriptor Control Field.....449**

**Stateless Block Message Header .....450**

**Stateless Surface Message Header.....452**

**Stateless Surface Pixel Mask Message Header.....453**

**Subset Atomic Integer Trinary Operation Message Descriptor Control Field.....454**

**Subset Reversed SIMD Mode 2 Message Descriptor Control Field .....455**

**Subset SIMD Mode 2 Message Descriptor Control Field.....456**

**Subset SIMD Mode 3 Message Descriptor Control Field.....457**

**Subspan Render Target Message Header Control.....458**

**Surface Binding Table Index Message Descriptor Control Field .....459**

**Surface or Stateless Binding Table Index Message Descriptor Control Field.....460**

**Surface Pixel Mask Message Header .....461**

**SW Generated BINDING\_TABLE\_STATE.....462**

**SZ OM S0A SIMD8 Render Target Data Payload .....463**

**SZ OM S0A SIMD16 Render Target Data Payload.....465**

**SZ OM SIMD8 Dual Source Render Target Data Payload.....467**

**SZ OM SIMD8 Render Target Data Payload .....469**

**SZ OM SIMD16 Render Target Data Payload .....471**

|   |            |
|---|------------|
| <b>SZ S0A SIMD8 Render Target Data Payload</b> .....                        | <b>473</b> |
| <b>SZ S0A SIMD16 Render Target Data Payload</b> .....                       | <b>475</b> |
| <b>SZ SIMD8 Dual Source Render Target Data Payload</b> .....                | <b>478</b> |
| <b>SZ SIMD8 Render Target Data Payload</b> .....                            | <b>480</b> |
| <b>SZ SIMD16 Render Target Data Payload</b> .....                           | <b>481</b> |
| <b>Thread Spawn Message Descriptor</b> .....                                | <b>483</b> |
| <b>TileW SIMD8 Data Control Dword</b> .....                                 | <b>485</b> |
| <b>TileW SIMD8 Data Payload</b> .....                                       | <b>486</b> |
| <b>Transpose Message Header</b> .....                                       | <b>488</b> |
| <b>Untyped Write Channel Mask Message Descriptor Control Field</b> .....    | <b>489</b> |
| <b>Upper Oword Block Data Payload</b> .....                                 | <b>490</b> |
| <b>VC1</b> .....  | <b>491</b> |
| <b>VCS Hardware-Detected Error Bit Definitions</b> .....                    | <b>492</b> |
| <b>VEBOX_CAPTURE_PIPE_STATE</b> .....                                       | <b>493</b> |
| <b>VEBOX_Ch_Dir_Filter_Coefficient</b> .....                                | <b>496</b> |
| <b>VEBOX_DNDI_STATE</b> .....   | <b>498</b> |
| <b>VEBOX_Filter_Coefficient</b> .....                                       | <b>506</b> |
| <b>VEBOX_FORWARD_GAMMA_CORRECTION_STATE</b> .....                           | <b>507</b> |
| <b>VEBOX_GAMUT_STATE</b> .....  | <b>512</b> |
| <b>VEBOX_RGB_TO_GAMMA_CORRECTION</b> .....                                  | <b>529</b> |
| <b>VEBOX_STD_STE_STATE</b> .....  | <b>530</b> |
| <b>VEBOX TLB Control Register</b> .....                                     | <b>545</b> |
| <b>VEBOX_VERTEX_TABLE</b> .....   | <b>546</b> |
| <b>VECS Hardware-Detected Error Bit Definitions</b> .....                   | <b>549</b> |
| <b>VERTEX_BUFFER_STATE</b> .....  | <b>550</b> |
| <b>VERTEX_ELEMENT_STATE</b> .....   | <b>553</b> |
| <b>Vertical Line Stride Override Message Descriptor Control Field</b> ..... | <b>557</b> |
| <b>VFE_STATE_EX</b> .....   | <b>558</b> |
| <b>VP8 Encoder StreamOut Format</b> .....                                   | <b>561</b> |



## 3DSTATE\_CONSTANT(Body)

| 3DSTATE_CONSTANT(Body)  |  |   |          |     |         |                 |                   |   |   |  |  |          |
|---|--|---|----------|-----|---------|-----------------|-------------------|---|---|--|--|----------|
| Project:  | All  |   |          |     |         |                 |                   |   |   |  |  |          |
| Source:   | RenderCS   |   |          |     |         |                 |                   |   |   |  |  |          |
| Size (in bits):   | 320  |   |          |     |         |                 |                   |   |   |  |  |          |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |     |         |                 |                   |   |   |  |  |          |
| DWord   | Bit  | Description   |          |     |         |                 |                   |   |   |  |  |          |
| 0   | 31:16  | <b>Constant Buffer 1 Read Length</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16 read length</td> </tr> </table> <p>This field specifies the length of the constant data to be loaded from memory in 256-bit units.</p> <table border="1"> <thead> <tr> <th>Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 1.</li> <li>If disabled, the <b>Pointer to Constant Buffer 1</b> must be programmed to zero.</li> </ul> </td> <td></td> </tr> <tr> <td>if gather constant are enabled, this field must be non-zero if a there was a preceding corresponding 3DSTATE_GATHER_CONSTANT_*, otherwise this field must be zero.</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Project: | All | Format: | U16 read length | Programming Notes | Project   | <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 1.</li> <li>If disabled, the <b>Pointer to Constant Buffer 1</b> must be programmed to zero.</li> </ul> |  | if gather constant are enabled, this field must be non-zero if a there was a preceding corresponding 3DSTATE_GATHER_CONSTANT_*, otherwise this field must be zero. | CHV, BSW |
|   |  | Project:  | All      |     |         |                 |                   |   |   |  |  |          |
| Format:   | U16 read length  |   |          |     |         |                 |                   |   |   |  |  |          |
| Programming Notes   | Project  |   |          |     |         |                 |                   |   |   |  |  |          |
| <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 1.</li> <li>If disabled, the <b>Pointer to Constant Buffer 1</b> must be programmed to zero.</li> </ul> |  |   |          |     |         |                 |                   |   |   |  |  |          |
| if gather constant are enabled, this field must be non-zero if a there was a preceding corresponding 3DSTATE_GATHER_CONSTANT_*, otherwise this field must be zero.  | CHV, BSW   |   |          |     |         |                 |                   |   |   |  |  |          |
| 15:0  | 15:0   | <b>Constant Buffer 0 Read Length</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16 read length</td> </tr> </table> <p>This field specifies the length of the constant data to be loaded from memory in 256-bit units.</p> <table border="1"> <thead> <tr> <th>Programming Notes</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 0.</li> <li>If disabled, the <b>Pointer to Constant Buffer 0</b> must be programmed to zero.</li> </ul> </td> </tr> </tbody> </table>   | Project: | All | Format: | U16 read length | Programming Notes | <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 0.</li> <li>If disabled, the <b>Pointer to Constant Buffer 0</b> must be programmed to zero.</li> </ul> |   |  |  |          |
|   |  | Project:  | All      |     |         |                 |                   |   |   |  |  |          |
| Format:   | U16 read length  |   |          |     |         |                 |                   |   |   |  |  |          |
| Programming Notes   |  |   |          |     |         |                 |                   |   |   |  |  |          |
| <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 0.</li> <li>If disabled, the <b>Pointer to Constant Buffer 0</b> must be programmed to zero.</li> </ul> |  |   |          |     |         |                 |                   |   |   |  |  |          |
| 1   | 31:16  | <b>Constant Buffer 3 Read Length</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16 read length</td> </tr> </table> <p>This field specifies the length of the constant data to be loaded from memory in 256-bit units.</p> <table border="1"> <thead> <tr> <th>Programming Notes</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 3.</li> </ul> </td> </tr> </tbody> </table>   | Project: | All | Format: | U16 read length | Programming Notes | <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 3.</li> </ul>   |   |  |  |          |
|   |  | Project:  | All      |     |         |                 |                   |   |   |  |  |          |
| Format:   | U16 read length  |   |          |     |         |                 |                   |   |   |  |  |          |
| Programming Notes   |  |   |          |     |         |                 |                   |   |   |  |  |          |
| <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 3.</li> </ul>   |  |   |          |     |         |                 |                   |   |   |  |  |          |

| <b>3DSTATE_CONSTANT(Body)</b>   |  |          |          |         |                                     |             |         |   |             |
|---|--|----------|----------|---------|-------------------------------------|-------------|---------|---|-------------|
|   | <ul style="list-style-type: none"> <li>If disabled, the <b>Pointer to Constant Buffer 3</b> must be programmed to zero.</li> </ul>   |          |          |         |                                     |             |         |   |             |
|   | <p><b>15:0 Constant Buffer 2 Read Length</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16 read length</td> </tr> </table> <p>This field specifies the length of the constant data to be loaded from memory in 256-bit units.</p> <p style="text-align: center;"><b>Programming Notes</b></p> <ul style="list-style-type: none"> <li>The sum of all four read length fields must be less than or equal to the size of 64</li> <li>Setting the value of the register to zero will disable buffer 2.</li> <li>If disabled, the <b>Pointer to Constant Buffer 2</b> must be programmed to zero.</li> </ul>   | Project: | All      | Format: | U16 read length                     |             |         |   |             |
| Project:  | All  |          |          |         |                                     |             |         |   |             |
| Format:   | U16 read length  |          |          |         |                                     |             |         |   |             |
| 2.3<br><b>Project:</b><br>CHV,<br>BSW   | <p><b>63:5 Pointer To Constant Buffer 0</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>GraphicsAddress[63:5]ConstantBuffer</td> </tr> </table> <table border="1"> <thead> <tr> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>When CONSTANT_BUFFER Address Offset Disable in INSTPM register is set, the value of this field is the virtual address of the location of the push constant buffer. GraphicsAddress [63:48] are ignored by the HW and assumed to be in correct canonical form [63:48] == [47]. When CONSTANT_BUFFER Address Offset Disable in INSTPM register is cleared, the value of this field is the offset into the Dynamic State Base Address. Only [47:5] of the field are added to the base address to generate the virtual address to be fetched from memory.</td> <td>CHV,<br/>BSW</td> </tr> </tbody> </table> | Project: | CHV, BSW | Format: | GraphicsAddress[63:5]ConstantBuffer | Description | Project | When CONSTANT_BUFFER Address Offset Disable in INSTPM register is set, the value of this field is the virtual address of the location of the push constant buffer. GraphicsAddress [63:48] are ignored by the HW and assumed to be in correct canonical form [63:48] == [47]. When CONSTANT_BUFFER Address Offset Disable in INSTPM register is cleared, the value of this field is the offset into the Dynamic State Base Address. Only [47:5] of the field are added to the base address to generate the virtual address to be fetched from memory. | CHV,<br>BSW |
| Project:  | CHV, BSW   |          |          |         |                                     |             |         |   |             |
| Format:   | GraphicsAddress[63:5]ConstantBuffer  |          |          |         |                                     |             |         |   |             |
| Description   | Project  |          |          |         |                                     |             |         |   |             |
| When CONSTANT_BUFFER Address Offset Disable in INSTPM register is set, the value of this field is the virtual address of the location of the push constant buffer. GraphicsAddress [63:48] are ignored by the HW and assumed to be in correct canonical form [63:48] == [47]. When CONSTANT_BUFFER Address Offset Disable in INSTPM register is cleared, the value of this field is the offset into the Dynamic State Base Address. Only [47:5] of the field are added to the base address to generate the virtual address to be fetched from memory. | CHV,<br>BSW  |          |          |         |                                     |             |         |   |             |
|   | <p><b>4:0 Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project: | CHV, BSW | Format: | MBZ                                 |             |         |   |             |
| Project:  | CHV, BSW   |          |          |         |                                     |             |         |   |             |
| Format:   | MBZ  |          |          |         |                                     |             |         |   |             |
| 4.5<br><b>Project:</b><br>CHV,<br>BSW   | <p><b>63:5 Pointer To Constant Buffer 1</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>GraphicsAddress[63:5]ConstantBuffer</td> </tr> </table> <p>This field points to the location of Constant Buffer 1.</p> <p>If gather constants are enabled This field is an offset of constant Buffer1 from the Gather Pool BASE ADDRESS.</p> <p>If gather constants is disabled, the value of this field is the virtual address of the location of the push constant buffer. GraphicsAddress [63:48] are ignored by the HW and assumed to be in correct canonical form [63:48] == [47].</p> <p style="text-align: center;"><b>Programming Notes</b></p> <p>Constant buffers must be allocated in linear (not tiled) graphics memory.</p>   | Project: | CHV, BSW | Format: | GraphicsAddress[63:5]ConstantBuffer |             |         |   |             |
| Project:  | CHV, BSW   |          |          |         |                                     |             |         |   |             |
| Format:   | GraphicsAddress[63:5]ConstantBuffer  |          |          |         |                                     |             |         |   |             |
|   | <p><b>4:0 Reserved</b></p>   |          |          |         |                                     |             |         |   |             |

| <b>3DSTATE_CONSTANT(Body)</b>  |   |          |          |         |                                     |                   |  |
|--|---|----------|----------|---------|-------------------------------------|-------------------|--|
|  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project: | All      | Format: | MBZ                                 |                   |  |
| Project:   | All   |          |          |         |                                     |                   |  |
| Format:  | MBZ   |          |          |         |                                     |                   |  |
| <b>6..7</b><br><b>Project:</b><br>CHV,<br>BSW  | <b>63:5</b> <b>Pointer To Constant Buffer 2</b> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>GraphicsAddress[63:5]ConstantBuffer</td> </tr> </table> <p>The value of this field is the virtual address of the location of the push constant buffer 2. GraphicsAddress [63:48] are ignored by the HW and assumed to be in correct canonical form [63:48] == [47].</p> <table border="1" style="background-color: #e6f2ff;"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> </table> <p>Constant buffers must be allocated in linear (not tiled) graphics memory.</p> | Project: | CHV, BSW | Format: | GraphicsAddress[63:5]ConstantBuffer | Programming Notes |  |
|  | Project:  | CHV, BSW |          |         |                                     |                   |  |
| Format:  | GraphicsAddress[63:5]ConstantBuffer   |          |          |         |                                     |                   |  |
| Programming Notes  |   |          |          |         |                                     |                   |  |
| <b>4:0</b> <b>Reserved</b> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> | Project:  | CHV, BSW | Format:  | MBZ     |                                     |                   |  |
| Project:   | CHV, BSW  |          |          |         |                                     |                   |  |
| Format:  | MBZ   |          |          |         |                                     |                   |  |
| <b>8..9</b><br><b>Project:</b><br>CHV,<br>BSW  | <b>63:5</b> <b>Pointer To Constant Buffer 3</b> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>GraphicsAddress[63:5]ConstantBuffer</td> </tr> </table> <p>The value of this field is the virtual address of the location of the push constant buffer 3. GraphicsAddress [63:48] are ignored by the HW and assumed to be in correct canonical form [63:48] == [47].</p> <table border="1" style="background-color: #e6f2ff;"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> </table> <p>Constant buffers must be allocated in linear (not tiled) graphics memory.</p> | Project: | CHV, BSW | Format: | GraphicsAddress[63:5]ConstantBuffer | Programming Notes |  |
|  | Project:  | CHV, BSW |          |         |                                     |                   |  |
| Format:  | GraphicsAddress[63:5]ConstantBuffer   |          |          |         |                                     |                   |  |
| Programming Notes  |   |          |          |         |                                     |                   |  |
| <b>4:0</b> <b>Reserved</b> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> | Project:  | CHV, BSW | Format:  | MBZ     |                                     |                   |  |
| Project:   | CHV, BSW  |          |          |         |                                     |                   |  |
| Format:  | MBZ   |          |          |         |                                     |                   |  |

## A32 Buffer Base Address Message Header Control

| <b>MHC_A32_BBA - A32 Buffer Base Address Message Header Control</b> |                          |  |          |     |         |                          |
|---|--------------------------|--|----------|-----|---------|--------------------------|
| Project:  | CHV, BSW                 |  |          |     |         |                          |
| Source:   | PRM                      |  |          |     |         |                          |
| Size (in bits):   | 32                       |  |          |     |         |                          |
| Default Value:  | 0x00000000               |  |          |     |         |                          |
| DWord   | Bit                      | Description  |          |     |         |                          |
| 0   | 31:0                     | <p><b>Buffer Base Address Offset</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>GeneralStateOffset[31:0]</td> </tr> </table> <p>Specifies the base address offset page [31:10] for A32 stateless messages.</p> | Project: | All | Format: | GeneralStateOffset[31:0] |
| Project:  | All                      |  |          |     |         |                          |
| Format:   | GeneralStateOffset[31:0] |  |          |     |         |                          |



## A64 Data Size Message Descriptor Control Field

| <b>MDC_A64_DS - A64 Data Size Message Descriptor Control Field</b> |            |  |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
|--|------------|--|-------------|------|-------------|---------|-----|-----|----------------------------|-----|-----|-----|-----------------------------|-----|-----|-----|-----------------------------|-----|-----|-----|-----------------------------|-----|--|
| Project:   | CHV, BSW   |  |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
| Source:  | PRM        |  |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
| Size (in bits):  | 2          |  |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
| Default Value:   | 0x00000000 |  |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
| DWord  | Bit        | Description  |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
| 0  | 1:0        | <b>Data Size</b>   |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
|  |            | Project:   | All         |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
|  |            | Format:  | Enumeration |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
|  |            | Specifies the number of data elements to be read or written  |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
|  |            | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h</td> <td>DE1</td> <td>1 data element (B, DW, QW)</td> <td>All</td> </tr> <tr> <td>01h</td> <td>DE2</td> <td>2 data elements (B, DW, QW)</td> <td>All</td> </tr> <tr> <td>02h</td> <td>DE4</td> <td>4 data elements (B, DW, QW)</td> <td>All</td> </tr> <tr> <td>03h</td> <td>DE8</td> <td>8 data elements (B, DW, QW)</td> <td>All</td> </tr> </tbody> </table> | Value       | Name | Description | Project | 00h | DE1 | 1 data element (B, DW, QW) | All | 01h | DE2 | 2 data elements (B, DW, QW) | All | 02h | DE4 | 4 data elements (B, DW, QW) | All | 03h | DE8 | 8 data elements (B, DW, QW) | All |  |
| Value  | Name       | Description  | Project     |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
| 00h  | DE1        | 1 data element (B, DW, QW)   | All         |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
| 01h  | DE2        | 2 data elements (B, DW, QW)  | All         |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
| 02h  | DE4        | 4 data elements (B, DW, QW)  | All         |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
| 03h  | DE8        | 8 data elements (B, DW, QW)  | All         |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
|  |            | <b>Restriction</b>   |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |
|  |            | The number of elements is constrained by SIMD Mode and Data Width. The max data payload limit is 256B: 2 elements SIMD16 QW, 4 elements SIMD16 DW, or 4 elements SIMD8 QW.   |             |      |             |         |     |     |                            |     |     |     |                             |     |     |     |                             |     |     |     |                             |     |  |

## A64 Dual Oword Block Message Header

| <b>MH_A64_OWDB - A64 Dual Oword Block Message Header</b>  |       |  |
|---|-------|--|
| Project: CHV, BSW   |       |  |
| Source: DataPort 1  |       |  |
| Size (in bits): 256   |       |  |
| Default Value: 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |       |  |
| DWord   | Bit   | Description  |
| 0-1   | 63:0  | <b>BlockOffset0</b>  |
|   |       | Project: All   |
|   |       | Format: U64  |
|   |       | Specifies the U64 byte offset of Oword Block 0.  |
|   |       | <b>Programming Notes</b>   |
|   |       | If the BlockOffset is not in the 48-bit canonical address range, the access is Out-of-Bounds.  |
|   |       | <b>Restriction</b>   |
|   |       | The byte offset must be aligned to the message's data type. Dwords have [1:0] = 0, Qwords have [2:0] = 0, and Hwords have [4:0] = 0. |
| 2-3   | 63:0  | <b>BlockOffset1</b>  |
|   |       | Project: All   |
|   |       | Format: U64  |
|   |       | Specifies the U64 byte offset of Oword Block 1.  |
|   |       | <b>Programming Notes</b>   |
|   |       | If the BlockOffset is not in the 48-bit canonical address range, the access is Out-of-Bounds.  |
|   |       | <b>Restriction</b>   |
|   |       | The byte offset must be aligned to the message's data type. Dwords have [1:0] = 0, Qwords have [2:0] = 0, and Hwords have [4:0] = 0. |
| 4-7   | 127:0 | <b>Reserved</b>  |
|   |       | Project: All   |
|   |       | Format: Ignore   |
|   |       | Ignored  |

## A64 Hword Block Message Header

| <b>MH_A64_HWB - A64 Hword Block Message Header</b> |  |  |
|--|--|--|
| Project:   | CHV, BSW   |  |
| Source:  | DataPort 1   |  |
| Size (in bits):                                    | 256  |  |
| Default Value:                                     | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord  | Bit  | Description  |
| 0-1  | 63:0   | <b>BlockOffset</b>   |
|  |  | Format: U64  |
|  |  | Specifies the U64 byte offset of Oword block.  |
|  |  | <b>Programming Notes</b>   |
|  |  | If the BlockOffset is not in the 48-bit canonical address range, the access is Out-of-Bounds.  |
|  |  | <b>Restriction</b>   |
|  |  | The byte offset must be aligned to the message's data type. Dwords have [1:0] = 0, Qwords have [2:0] = 0, and Hwords have [4:0] = 0. |
| 2-4  | 95:0   | <b>Reserved</b>  |
|  |  | Format: Ignore   |
|  |  | Ignored  |
| 5  | 31:0   | <b>Hword Channel Mode</b>  |
|  |  | Project: CHV, BSW  |
|  |  | Format: MHC_A64_CMODE [CHV, BSW]   |
|  |  | Specifies the Hword Channel Mode   |
| 6-7  | 63:0   | <b>Reserved</b>  |
|  |  | Format: Ignore   |
|  |  | Ignored  |

## A64 Hword Data Blocks Message Descriptor Control Field

| <b>MDC_A64_DB_HW - A64 Hword Data Blocks Message Descriptor Control Field</b> |                      |   |         |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
|---|----------------------|---|---------|----------|-----|---------|-------------|-------|------|-------------|---------|-----|----------------------|---------------|-----|-----|-----|----------------|-----|-----|-----|----------------|-----|-----|-----|----------------|-----|--------|----------|---------|-----|
| Project:  | CHV, BSW             |   |         |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| Source:   | PRM                  |   |         |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| Size (in bits):   | 3                    |   |         |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| Default Value:  | 0x00000001           |   |         |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| DWord   | Bit                  | Description   |         |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| 0   | 2:0                  | <b>Data Blocks</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enumeration</td> </tr> </table> <p>Specifies the number of Hwords to be read or written</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>01h</td> <td>HW1 <b>[Default]</b></td> <td>1 Hword block</td> <td>All</td> </tr> <tr> <td>02h</td> <td>HW2</td> <td>2 Hword blocks</td> <td>All</td> </tr> <tr> <td>03h</td> <td>HW4</td> <td>4 Hword blocks</td> <td>All</td> </tr> <tr> <td>04h</td> <td>HW8</td> <td>8 Hword blocks</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </tbody> </table> |         | Project: | All | Format: | Enumeration | Value | Name | Description | Project | 01h | HW1 <b>[Default]</b> | 1 Hword block | All | 02h | HW2 | 2 Hword blocks | All | 03h | HW4 | 4 Hword blocks | All | 04h | HW8 | 8 Hword blocks | All | Others | Reserved | Ignored | All |
| Project:  | All                  |   |         |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| Format:   | Enumeration          |   |         |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| Value   | Name                 | Description   | Project |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| 01h   | HW1 <b>[Default]</b> | 1 Hword block   | All     |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| 02h   | HW2                  | 2 Hword blocks  | All     |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| 03h   | HW4                  | 4 Hword blocks  | All     |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| 04h   | HW8                  | 8 Hword blocks  | All     |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |
| Others  | Reserved             | Ignored   | All     |          |     |         |             |       |      |             |         |     |                      |               |     |     |     |                |     |     |     |                |     |     |     |                |     |        |          |         |     |

## A64 Oword Block Message Header

| <b>MH_A64_OWB - A64 Oword Block Message Header</b>  |       |  |
|---|-------|--|
| Project: CHV, BSW   |       |  |
| Source: DataPort 1  |       |  |
| Size (in bits): 256   |       |  |
| Default Value: 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |       |  |
| DWord   | Bit   | Description  |
| 0-1   | 63:0  | <b>BlockOffset</b>   |
|   |       | Project: All   |
|   |       | Format: U64  |
|   |       | Specifies the U64 byte offset of Oword block.  |
|   |       | <b>Programming Notes</b>   |
|   |       | If the BlockOffset is not in the 48-bit canonical address range, the access is Out-of-Bounds.  |
|   |       | <b>Restriction</b>   |
|   |       | The byte offset must be aligned to the message's data type. Dwords have [1:0] = 0, Qwords have [2:0] = 0, and Hwords have [4:0] = 0. |
| 2-7   | 191:0 | <b>Reserved</b>  |
|   |       | Project: All   |
|   |       | Format: Ignore   |
|   |       | Ignored  |

## A64 Oword Data Blocks Message Descriptor Control Field

| MDC_A64_DB_OW - A64 Oword Data Blocks Message Descriptor Control Field |            |   |         |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
|--|------------|---|---------|------|-------------|---------|-----|------|---|-----|-----|------|--|-----|-----|-----|----------|-----|-----|-----|----------|-----|-----|-----|----------|-----|--------|----------|---------|-----|--|
| Project:   | CHV, BSW   |   |         |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| Source:  | PRM        |   |         |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| Size (in bits):  | 3          |   |         |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| Default Value:   | 0x00000000 |   |         |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| DWord  | Bit        | Description   |         |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| 0  | 2:0        | <b>Data Blocks</b><br>Project: All<br>Format: Enumeration<br>Specifies the number of Oword blocks to be read or written   |         |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
|  |            | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h</td> <td>OW1L</td> <td>1 Oword, read into or written from the low 128 bits of the destination register</td> <td>All</td> </tr> <tr> <td>01h</td> <td>OW1U</td> <td>1 Oword, read into or written from the high 128 bits of the destination register</td> <td>All</td> </tr> <tr> <td>02h</td> <td>OW2</td> <td>2 Owords</td> <td>All</td> </tr> <tr> <td>03h</td> <td>OW4</td> <td>4 Owords</td> <td>All</td> </tr> <tr> <td>04h</td> <td>OW8</td> <td>8 Owords</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </tbody> </table> | Value   | Name | Description | Project | 00h | OW1L | 1 Oword, read into or written from the low 128 bits of the destination register | All | 01h | OW1U | 1 Oword, read into or written from the high 128 bits of the destination register | All | 02h | OW2 | 2 Owords | All | 03h | OW4 | 4 Owords | All | 04h | OW8 | 8 Owords | All | Others | Reserved | Ignored | All |  |
| Value  | Name       | Description   | Project |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| 00h  | OW1L       | 1 Oword, read into or written from the low 128 bits of the destination register   | All     |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| 01h  | OW1U       | 1 Oword, read into or written from the high 128 bits of the destination register  | All     |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| 02h  | OW2        | 2 Owords  | All     |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| 03h  | OW4        | 4 Owords  | All     |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| 04h  | OW8        | 8 Owords  | All     |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |
| Others   | Reserved   | Ignored   | All     |      |             |         |     |      |   |     |     |      |  |     |     |     |          |     |     |     |          |     |     |     |          |     |        |          |         |     |  |

## A64 Oword Dual Data Blocks Message Descriptor Control Field

| <b>MDC_A64_DB_OWD - A64 Oword Dual Data Blocks Message Descriptor Control Field</b> |                       |   |         |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
|---|-----------------------|---|---------|----------|-----|---------|-------------|-------|------|-------------|---------|-----|-----------------------|----------------------------|-----|-----|------|-----------------------------|-----|--------|----------|---------|-----|
| Project:  | CHV, BSW              |   |         |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| Source:   | PRM                   |   |         |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| Size (in bits):   | 3                     |   |         |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| Default Value:  | 0x00000001            |   |         |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| DWord   | Bit                   | Description   |         |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| 0   | 2:0                   | <b>Data Blocks</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enumeration</td> </tr> </table> Specifies the number of Oword blocks to be read or written<br><table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>01h</td> <td>OWD1 <b>[Default]</b></td> <td>1 Hword register, 2 Owords</td> <td>All</td> </tr> <tr> <td>03h</td> <td>OWD4</td> <td>4 Hword registers, 8 Owords</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </tbody> </table> |         | Project: | All | Format: | Enumeration | Value | Name | Description | Project | 01h | OWD1 <b>[Default]</b> | 1 Hword register, 2 Owords | All | 03h | OWD4 | 4 Hword registers, 8 Owords | All | Others | Reserved | Ignored | All |
| Project:  | All                   |   |         |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| Format:   | Enumeration           |   |         |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| Value   | Name                  | Description   | Project |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| 01h   | OWD1 <b>[Default]</b> | 1 Hword register, 2 Owords  | All     |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| 03h   | OWD4                  | 4 Hword registers, 8 Owords   | All     |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |
| Others  | Reserved              | Ignored   | All     |          |     |         |             |       |      |             |         |     |                       |                            |     |     |      |                             |     |        |          |         |     |

## AddrSubRegNum

| <b>AddrSubRegNum</b>   |                            |   |          |          |       |      |      |                            |
|--|----------------------------|---|----------|----------|-------|------|------|----------------------------|
| Project:   | CHV, BSW                   |   |          |          |       |      |      |                            |
| Source:  | Eulsa                      |   |          |          |       |      |      |                            |
| Size (in bits):  | 4                          |   |          |          |       |      |      |                            |
| Default Value:   | 0x00000000                 |   |          |          |       |      |      |                            |
| <p>Address Subregister Number This field provides the subregister number for the address register. The address register contains 8 sub-registers. The size of each subregister is one word. The address register contains the register address of the operand, when the operand is in register-indirect addressing mode. This field applies to the destination operand and the source operands. It is ignored (or not present in the instruction word) for an immediate source operand. This field is present if the operand is in register-indirect addressing mode; it is not present if the operand is directly addressed. An address subregister used for indirect addressing is often called an index register.</p> |                            |   |          |          |       |      |      |                            |
| DWord  | Bit                        | Description   |          |          |       |      |      |                            |
| 0  | 3:0                        | <p><b>Address Subregister Number</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> <tr> <td style="text-align: center;">0-15</td> <td>Address Subregister Number</td> </tr> </table> | Project: | CHV, BSW | Value | Name | 0-15 | Address Subregister Number |
| Project:   | CHV, BSW                   |   |          |          |       |      |      |                            |
| Value  | Name                       |   |          |          |       |      |      |                            |
| 0-15   | Address Subregister Number |   |          |          |       |      |      |                            |



## Any Binding Table Index Message Descriptor Control Field

| MDC_BTS_SLM_A32 - Any Binding Table Index Message Descriptor Control Field |            |  |          |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
|--|------------|--|----------|------|-------------|---------|----------|-----|---------------------------------------|-----|----------|----------|-------------------------|-----|------|----------|-------------------------|----------|------|-----|-------------------------|-----|------|---------|---|-----|------|------------|--|-----|--|
| Project:   | CHV, BSW   |  |          |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| Source:  | PRM        |  |          |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| Size (in bits):  | 8          |  |          |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| Default Value:   | 0x00000000 |  |          |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| DWord  | Bit        | Description  |          |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| 0  | 7:0        | <b>Binding Table Index</b><br>Project: All<br>Format: Enumeration<br>Specifies the surface for the message, which can be Surface State Model, SLM or Stateless.  |          |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
|  |            | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h-0EFh</td> <td>BTS</td> <td>Index of Binding Table State Surfaces</td> <td>All</td> </tr> <tr> <td>F0h-0FBh</td> <td>Reserved</td> <td>Reserved for future use</td> <td>All</td> </tr> <tr> <td>0FCh</td> <td>Reserved</td> <td>Reserved for future use</td> <td>CHV, BSW</td> </tr> <tr> <td>0FEh</td> <td>SLM</td> <td>Specifies an SLM access</td> <td>All</td> </tr> <tr> <td>0FFh</td> <td>A32_A64</td> <td>Specifies a A32 or A64 Stateless access that is locally coherent (coherent within a thread group)</td> <td>All</td> </tr> <tr> <td>0FDh</td> <td>A32_A64_NC</td> <td>Specifies a A32 or A64 Stateless access that is non-coherent (coherent within a thread).</td> <td>All</td> </tr> </tbody> </table> | Value    | Name | Description | Project | 00h-0EFh | BTS | Index of Binding Table State Surfaces | All | F0h-0FBh | Reserved | Reserved for future use | All | 0FCh | Reserved | Reserved for future use | CHV, BSW | 0FEh | SLM | Specifies an SLM access | All | 0FFh | A32_A64 | Specifies a A32 or A64 Stateless access that is locally coherent (coherent within a thread group) | All | 0FDh | A32_A64_NC | Specifies a A32 or A64 Stateless access that is non-coherent (coherent within a thread). | All |  |
| Value  | Name       | Description  | Project  |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| 00h-0EFh   | BTS        | Index of Binding Table State Surfaces  | All      |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| F0h-0FBh   | Reserved   | Reserved for future use  | All      |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| 0FCh   | Reserved   | Reserved for future use  | CHV, BSW |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| 0FEh   | SLM        | Specifies an SLM access  | All      |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| 0FFh   | A32_A64    | Specifies a A32 or A64 Stateless access that is locally coherent (coherent within a thread group)  | All      |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
| 0FDh   | A32_A64_NC | Specifies a A32 or A64 Stateless access that is non-coherent (coherent within a thread).   | All      |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |
|  |            | <b>Restriction</b><br>When using A32_A64_NC, SW must ensure that 2 threads do not both access the same cache line (64B)  |          |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |     |                         |     |      |         |   |     |      |            |  |     |  |

## Atomic Integer Binary Operation Message Descriptor Control Field

| <b>MDC_AOP2 - Atomic Integer Binary Operation Message Descriptor Control Field</b> |                          |   |         |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
|--|--------------------------|---|---------|------|-------------|---------|-----|--------------------------|----------------------------|-----|-----|--------|--------------------------|-----|-----|---------|--------------------------|-----|-----|---------|----------------|-----|-----|---------|--------------------------|-----|-----|---------|--------------------------|-----|-----|------------|--------------------------|-----|-----|----------|-------------------------------|-----|-----|----------|-------------------------------|-----|-----|----------|-------------------------------|-----|-----|----------|-------------------------------|-----|--------|----------|---------|-----|--|
| Project:   | CHV, BSW                 |   |         |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| Source:  | PRM                      |   |         |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| Size (in bits):  | 4                        |   |         |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| Default Value:   | 0x00000001               |   |         |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| DWord  | Bit                      | Description   |         |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 0  | 3:0                      | <b>Atomic Integer Operation Type</b><br>Project: All<br>Format: Enumeration<br>Specifies the atomic integer binary operation to be performed  |         |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
|  |                          | <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>01h</td> <td>AOP_AND <b>[Default]</b></td> <td>new_dst = old_dst AND src0</td> <td>All</td> </tr> <tr> <td>02h</td> <td>AOP_OR</td> <td>new_dst = old_dst   src0</td> <td>All</td> </tr> <tr> <td>03h</td> <td>AOP_XOR</td> <td>new_dst = old_dst ^ src0</td> <td>All</td> </tr> <tr> <td>04h</td> <td>AOP_MOV</td> <td>new_dst = src0</td> <td>All</td> </tr> <tr> <td>07h</td> <td>AOP_ADD</td> <td>new_dst = old_dst + src0</td> <td>All</td> </tr> <tr> <td>08h</td> <td>AOP_SUB</td> <td>new_dst = old_dst - src0</td> <td>All</td> </tr> <tr> <td>09h</td> <td>AOP_REVSUB</td> <td>new_dst = src0 - old_dst</td> <td>All</td> </tr> <tr> <td>0Ah</td> <td>AOP_IMAX</td> <td>new_dst = imax(old_dst, src0)</td> <td>All</td> </tr> <tr> <td>0Bh</td> <td>AOP_IMIN</td> <td>new_dst = imin(old_dst, src0)</td> <td>All</td> </tr> <tr> <td>0Ch</td> <td>AOP_UMAX</td> <td>new_dst = umax(old_dst, src0)</td> <td>All</td> </tr> <tr> <td>0Dh</td> <td>AOP_UMIN</td> <td>new_dst = umin(old_dst, src0)</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </tbody> </table> | Value   | Name | Description | Project | 01h | AOP_AND <b>[Default]</b> | new_dst = old_dst AND src0 | All | 02h | AOP_OR | new_dst = old_dst   src0 | All | 03h | AOP_XOR | new_dst = old_dst ^ src0 | All | 04h | AOP_MOV | new_dst = src0 | All | 07h | AOP_ADD | new_dst = old_dst + src0 | All | 08h | AOP_SUB | new_dst = old_dst - src0 | All | 09h | AOP_REVSUB | new_dst = src0 - old_dst | All | 0Ah | AOP_IMAX | new_dst = imax(old_dst, src0) | All | 0Bh | AOP_IMIN | new_dst = imin(old_dst, src0) | All | 0Ch | AOP_UMAX | new_dst = umax(old_dst, src0) | All | 0Dh | AOP_UMIN | new_dst = umin(old_dst, src0) | All | Others | Reserved | Ignored | All |  |
| Value  | Name                     | Description   | Project |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 01h  | AOP_AND <b>[Default]</b> | new_dst = old_dst AND src0  | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 02h  | AOP_OR                   | new_dst = old_dst   src0  | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 03h  | AOP_XOR                  | new_dst = old_dst ^ src0  | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 04h  | AOP_MOV                  | new_dst = src0  | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 07h  | AOP_ADD                  | new_dst = old_dst + src0  | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 08h  | AOP_SUB                  | new_dst = old_dst - src0  | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 09h  | AOP_REVSUB               | new_dst = src0 - old_dst  | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 0Ah  | AOP_IMAX                 | new_dst = imax(old_dst, src0)   | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 0Bh  | AOP_IMIN                 | new_dst = imin(old_dst, src0)   | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 0Ch  | AOP_UMAX                 | new_dst = umax(old_dst, src0)   | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| 0Dh  | AOP_UMIN                 | new_dst = umin(old_dst, src0)   | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
| Others   | Reserved                 | Ignored   | All     |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
|  |                          | <b>Programming Notes</b>  |         |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |
|  |                          | When Return Data Control is set, old_dst is returned.   |         |      |             |         |     |                          |                            |     |     |        |                          |     |     |         |                          |     |     |         |                |     |     |         |                          |     |     |         |                          |     |     |            |                          |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |     |          |                               |     |        |          |         |     |  |

## Atomic Integer Ternary Operation Message Descriptor Control Field

| <b>MDC_AOP3 - Atomic Integer Ternary Operation Message Descriptor Control Field</b> |                               |  |         |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
|---|-------------------------------|--|---------|----------|-----|---------|-------------|-------|------|-------------|---------|-----|--------------|--|-----|-----|-------------------------------|--|-----|--------|----------|---------|-----|
| Project:  | CHV, BSW                      |  |         |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| Source:   | PRM                           |  |         |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| Size (in bits):   | 4                             |  |         |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| Default Value:  | 0x0000000E                    |  |         |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| DWord   | Bit                           | Description  |         |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| 0   | 3:0                           | <b>Atomic Integer Operation Type</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enumeration</td> </tr> </table> <p>Specifies the atomic integer ternary operation to be performed</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">00h</td> <td>AOP_CMPWR_2W</td> <td>new_dst = (src0_2W == old_dst_2W) ? src1_2W : old_dst_2W</td> <td style="text-align: center;">All</td> </tr> <tr> <td style="text-align: center;">0Eh</td> <td>AOP_CMPWR<br/><b>[Default]</b></td> <td>new_dst = (src0 == old_dst) ? src1 : old_dst</td> <td style="text-align: center;">All</td> </tr> <tr> <td style="text-align: center;">Others</td> <td>Reserved</td> <td>Ignored</td> <td style="text-align: center;">All</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>When Return Data Control is set, old_dst is returned.</p> |         | Project: | All | Format: | Enumeration | Value | Name | Description | Project | 00h | AOP_CMPWR_2W | new_dst = (src0_2W == old_dst_2W) ? src1_2W : old_dst_2W | All | 0Eh | AOP_CMPWR<br><b>[Default]</b> | new_dst = (src0 == old_dst) ? src1 : old_dst | All | Others | Reserved | Ignored | All |
| Project:  | All                           |  |         |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| Format:   | Enumeration                   |  |         |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| Value   | Name                          | Description  | Project |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| 00h   | AOP_CMPWR_2W                  | new_dst = (src0_2W == old_dst_2W) ? src1_2W : old_dst_2W   | All     |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| 0Eh   | AOP_CMPWR<br><b>[Default]</b> | new_dst = (src0 == old_dst) ? src1 : old_dst   | All     |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |
| Others  | Reserved                      | Ignored  | All     |          |     |         |             |       |      |             |         |     |              |  |     |     |                               |  |     |        |          |         |     |

## Atomic Integer Unary Operation Message Descriptor Control Field

| <b>MDC_AOP1 - Atomic Integer Unary Operation Message Descriptor Control Field</b> |                          |   |         |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
|---|--------------------------|---|---------|------|-------------|---------|-----|--------------------------|-----------------------|-----|-----|---------|-----------------------|-----|-----|------------|-----------------------|-----|--------|----------|---------|-----|--|
| Project:  | CHV, BSW                 |   |         |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
| Source:   | PRM                      |   |         |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
| Size (in bits):   | 4                        |   |         |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
| Default Value:  | 0x00000005               |   |         |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
| DWord   | Bit                      | Description   |         |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
| 0   | 3:0                      | <b>Atomic Integer Operation Type</b><br>Project: All<br>Format: Enumeration<br>Specifies the atomic integer unary operation to be performed   |         |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
|   |                          | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>05h</td> <td>AOP_INC <b>[Default]</b></td> <td>new_dst = old_dst + 1</td> <td>All</td> </tr> <tr> <td>06h</td> <td>AOP_DEC</td> <td>new_dst = old_dst - 1</td> <td>All</td> </tr> <tr> <td>0Fh</td> <td>AOP_PREDEC</td> <td>new_dst = old_dst - 1</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </tbody> </table> | Value   | Name | Description | Project | 05h | AOP_INC <b>[Default]</b> | new_dst = old_dst + 1 | All | 06h | AOP_DEC | new_dst = old_dst - 1 | All | 0Fh | AOP_PREDEC | new_dst = old_dst - 1 | All | Others | Reserved | Ignored | All |  |
| Value   | Name                     | Description   | Project |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
| 05h   | AOP_INC <b>[Default]</b> | new_dst = old_dst + 1   | All     |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
| 06h   | AOP_DEC                  | new_dst = old_dst - 1   | All     |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
| 0Fh   | AOP_PREDEC               | new_dst = old_dst - 1   | All     |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
| Others  | Reserved                 | Ignored   | All     |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |
|   |                          | <b>Programming Notes</b><br>When Return Data Control is set, new_dst is returned by AOP_PREDEC and otherwise old_dst is returned.   |         |      |             |         |     |                          |                       |     |     |         |                       |     |     |            |                       |     |        |          |         |     |  |

## AVC CABAC

| AVC CABAC       |   |  |
|-----------------|---|--|
| Project:        | CHV, BSW  |  |
| Source:         | VideoCS   |  |
| Size (in bits): | 16  |  |
| Default Value:  | 0x00000000  |  |
| DWord           | Bit   | Description  |
| 0               | 15  | <b>Reserved</b><br>Format: MBZ   |
|                 | 14  | <b>Coefficient level out-of-bound Error</b><br>This flag indicates the coded coefficient level SEs in the bit-stream is out-of-bound.  |
|                 | 13  | <b>Reserved</b><br>Format: MBZ   |
|                 | 12  | <b>Reserved</b><br>Format: MBZ   |
|                 | 11  | <b>Temporal Direction Motion Vector Out-of-Bound Error</b><br>This flag indicates motion vectors calculated from Temporal Direct Motion Vector is larger than the allowed range specified by the AVC spec. |
|                 | 10  | <b>Reserved</b><br>MBZ   |
|                 | 9   | <b>Motion Vector Delta SE Out-of-Bound Error</b><br>This flag indicates inconsistent Motion Vector Delta SEs coded in the bit-stream.  |
|                 | 8   | <b>Reference Index SE Out-of-Bound Error</b><br>This flag indicates inconsistent Reference Index SEs coded in the bit-stream.  |
|                 | 7   | <b>MacroBlock QpDelta Error</b><br>This flag indicates out-of-bound MB QP delta SEs coded in the bit-stream.   |
|                 | 6   | <b>Motion Vector Delta SE Error</b><br>This flag indicates out-of-bound motion vector delta SEs coded in the bit-stream.   |
|                 | 5   | <b>Reference Index SE Error</b><br>This flag indicates out-of-bound Refidx SEs coded in the bit-stream.  |
|                 | 4   | <b>Residual Error</b><br>This flag indicates out-of-bound absolute coefficient level SEs coded in the bit-stream.  |
|                 | 3   | <b>Slice end Error</b><br>This flag indicates a pre-matured slice_end SE or inconsistent slice end on the last MB of a slice.  |
| 2               | <b>Chroma Intra prediction Mode Error</b><br>This flag indicates inconsistent Chroma Intra prediction mode SEs coded in the bit-stream. |  |
| 1               | <b>Luma Intra prediction Mode Error</b><br>This flag indicates inconsistent luma Intra prediction mode SE coded in the bit-stream.      |  |

## AVC CABAC

|  |   |  |
|--|---|--|
|  | 0 | <b>MB Concealment Flag</b><br>Each pulse from this flag indicates one MB is concealed by hardware. |
|--|---|--|

## AVC CAVLC

| AVC CAVLC       |   |  |
|-----------------|---|--|
| Project:        | CHV, BSW  |  |
| Source:         | VideoCS   |  |
| Size (in bits): | 16  |  |
| Default Value:  | 0x00000000  |  |
| DWord           | Bit   | Description  |
| 0               | 15  | <b>Total Zero out-of-bound Error</b><br>This flag indicates the Total zero SE count exceed the max number of coeffs allowed in an intra16x16 AC block.   |
|                 | 14  | <b>Coefficient level out-of-bound Error</b><br>This flag indicates the coded coefficient level SEs in the bit-stream is out-of-bound.  |
|                 | 13  | <b>RunBefore out-of-bound Error</b><br>This flag indicates the coded RunBefore SE value is larger than the remaining zero block count.   |
|                 | 12  | <b>Total coefficient Out-of-bound Error</b><br>This flag indicates the coded total coeff SE count exceed the max number of coeffs allowed in an intra16x16 AC block.                                       |
|                 | 11  | <b>Temporal Direction Motion Vector Out-of-Bound Error</b><br>This flag indicates motion vectors calculated from Temporal Direct Motion Vector is larger than the allowed range specified by the AVC spec. |
|                 | 10  | <b>Reserved</b><br>Reserved  |
|                 | 9   | <b>Motion Vector Delta SE Out-of-Bound Error</b><br>This flag indicates inconsistent Motion Vector Delta SEs coded in the bit-stream.  |
|                 | 8   | <b>Reference Index SE Out-of-Bound Error</b><br>This flag indicates inconsistent Reference Index SEs coded in the bit-stream.  |
|                 | 7   | <b>RunBefore/TotalZero Error</b><br>This flag indicates one or more inconsistent RunBefore or TotalZero SEs coded in the bit-stream.   |
|                 | 6   | <b>Exponential Golomb Error</b><br>This flag indicates hardware detects more than 18 leadzero for skip and more than 19 for other SEs from the Exponential Golomb Logic                                    |
|                 | 5   | <b>Total Coeff SE Error</b><br>This flag indicates one or more inconsistent total coeff SEs coded in the bit-stream.   |
|                 | 4   | <b>Macroblock Coded Block Pattern Error</b><br>This flag indicates inconsistent CBP SEs coded in the bit-stream.   |
|                 | 3   | <b>Mbtype/submbtype Error</b><br>This flag indicates inconsistent MBtype/SubMBtype SEs coded in the bit-stream.  |
| 2               | <b>Chroma Intra prediction Mode Error</b><br>This flag indicates inconsistent Chroma Intra prediction mode SEs coded in the bit-stream. |  |
| 1               | <b>Luma Intra prediction Mode Error</b>   |  |

## AVC CAVLC

|  |   |  |
|--|---|--|
|  |   | This flag indicates inconsistent luma Intra prediction mode SE coded in the bit-stream.            |
|  | 0 | <b>MB Concealment Flag</b><br>Each pulse from this flag indicates one MB is concealed by hardware. |



## AVS\_Inline\_DMEM

| <b>AVS_Inline_DMEM</b> |  |   |
|------------------------|--|---|
| Project:               | CHV, BSW   |   |
| Source:                | PRM  |   |
| Size (in bits):        | 768  |   |
| Default Value:         | 0x00000000, 0x00000000 |   |
| DWord                  | Bit  | Description   |
| 0                      | 31:3   | <b>Reserved</b><br>Format: MBZ  |
|                        | 2:0  | <b>hw_used_bits</b><br>Index into the first valid bit of the starting byte of the first macroblock of the frame |
| 1                      | 31:14  | <b>Reserved</b><br>Format: MBZ  |
|                        | 13:0   | <b>hw_width</b><br>AVS SE: horizontal_size  |
| 2                      | 31:14  | <b>Reserved</b><br>Format: MBZ  |
|                        | 13:0   | <b>hw_height</b><br>AVS SE: vertical_size   |
| 3                      | 31:0   | <b>hw_MbMax</b><br>In the VideoSequenceHeader of the AVS standard specification: MbWidth*MbHeight               |
| 4                      | 31:2   | <b>Reserved</b><br>Format: MBZ  |
|                        | 1:0  | <b>hw_chroma_format</b><br>AVS SE: chroma_format  |
| 5                      | 31:2   | <b>Reserved</b><br>Format: MBZ  |
|                        | 1:0  | <b>hw_picture_coding_type</b><br>AVS SE: picture_coding_type  |
| 6                      | 31:8   | <b>Reserved</b><br>Format: MBZ  |
|                        | 7:0  | <b>hw_picture_distance</b><br>AVS SE: picture_distance  |
| 7                      | 31:1   | <b>Reserved</b><br>Format: MBZ  |

| <b>AVS Inline_DMEM</b> |      |  |
|------------------------|------|--|
|                        | 0    | <b>hw_picture_structure</b><br>AVS SE: picture_structure           |
| 8                      | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 9                      | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 10                     | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 11                     | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 12                     | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 13                     | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 14                     | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 15                     | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 16                     | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 17                     | 31:0 | <b>Reserved</b><br>Format: MBZ                                     |
| 18                     | 31:1 | <b>Reserved</b><br>Format: MBZ                                     |
|                        | 0    | <b>hw_fixed_picture_qp</b><br>AVS SE: fixed_picture_qp             |
| 19                     | 31:6 | <b>Reserved</b><br>Format: MBZ                                     |
|                        | 5:0  | <b>hw_picture_qp</b><br>AVS SE: picture_qp                         |
| 20                     | 31:1 | <b>Reserved</b><br>Format: MBZ                                     |
|                        | 0    | <b>hw_picture_reference_flag</b><br>AVS SE: picture_reference_flag |
| 21                     | 31:1 | <b>Reserved</b><br>Format: MBZ                                     |

| <b>AVS_Inline_DMEM</b> |   |   |         |     |
|------------------------|---|---|---------|-----|
|                        | 0   | <b>hw_skip_mode_flag</b><br>AVS SE: skip_mode_flag  |         |     |
| 22                     | 31:1  | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">MBZ</td> </tr> </table> | Format: | MBZ |
|                        | Format:   | MBZ   |         |     |
| 0                      | <b>hw_loop_filter_diable</b><br>AVS SE: loop_filter_disable |   |         |     |
| 23                     | 31:0  | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">MBZ</td> </tr> </table> | Format: | MBZ |
|                        | Format:   | MBZ   |         |     |

## BCS Hardware-Detected Error Bit Definitions

| BCS Hardware-Detected Error Bit Definitions   |   |  |      |             |   |  |                            |
|---|---|--|------|-------------|---|--|----------------------------|
| Project:  | CHV, BSW  |  |      |             |   |  |                            |
| Source:   | BlitterCS   |  |      |             |   |  |                            |
| Size (in bits):   | 16  |  |      |             |   |  |                            |
| Default Value:  | 0x00000000  |  |      |             |   |  |                            |
| DWord   | Bit   | Description  |      |             |   |  |                            |
| 0   | 15:3  | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>  |      | MBZ         |   |  |                            |
|   |   | MBZ  |      |             |   |  |                            |
|   | 2   | <b>Command Privilege Violation Error</b><br>Project: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>CHV, BSW</td></tr></table><br>This bit is set if a command classified as privileged is parsed in a non-privileged batch buffer. The command will be converted to a NOOP and parsing will continue. |      | CHV, BSW    |   |  |                            |
|   |   | CHV, BSW   |      |             |   |  |                            |
| 1   | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>   |  | MBZ  |             |   |  |                            |
|   | MBZ   |  |      |             |   |  |                            |
| 0   | <b>Instruction Error</b><br>This bit is set when the Renderer Instruction Parser detects an error while parsing an instruction. Instruction errors include: <ul style="list-style-type: none"> <li>Client ID value (Bits 31:29 of the Header) is not supported (only MI, 2D and 3D are supported).</li> <li>Defeatured MI Instruction Opcodes:</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 15%;">Name</th> <th style="width: 70%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td> </td> <td>Instruction Error detected</td> </tr> </tbody> </table> | Value  | Name | Description | 1 |  | Instruction Error detected |
| Value   | Name  | Description  |      |             |   |  |                            |
| 1   |   | Instruction Error detected   |      |             |   |  |                            |
| <b>Programming Notes</b>  |   |  |      |             |   |  |                            |
| This error indications cannot be cleared except by reset (i.e., it is a fatal error). |   |  |      |             |   |  |                            |

## BINDING\_TABLE\_EDIT\_ENTRY

| BINDING_TABLE_EDIT_ENTRY |  |  |   |     |
|--------------------------|--|--|---|-----|
| Project:                 | CHV, BSW   |  |   |     |
| Source:                  | RenderCS   |  |   |     |
| Size (in bits):          | 32   |  |   |     |
| Default Value:           | 0x00000000   |  |   |     |
| DWord                    | Bit  | Description  |   |     |
| 0                        | 31:24  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:   | MBZ |
|                          | Format:  | MBZ  |   |     |
|                          | 23:16  | <p><b>Binding Table Index</b></p> <table border="1"> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>This field specifies the index of binding table entry that will be updated.</p> | Format:   | U8  |
| Format:                  | U8   |  |   |     |
| 15:0                     | <p><b>Surface State Pointer</b></p> <table border="1"> <tr> <td>Format:</td> <td>SurfaceStateOffset[21:6]RENDER_SURFACE_STATE [CHV, BSW]</td> </tr> </table> <p>Surface State Pointer. This address points to a surface state block. This pointer is relative to the Surface State Base Address.</p> | Format:  | SurfaceStateOffset[21:6]RENDER_SURFACE_STATE [CHV, BSW] |     |
| Format:                  | SurfaceStateOffset[21:6]RENDER_SURFACE_STATE [CHV, BSW]  |  |   |     |

## BINDING\_TABLE\_STATE

| BINDING_TABLE_STATE   |                          |  |          |          |
|---|--------------------------|--|----------|----------|
| Project:  | CHV, BSW                 |  |          |          |
| Source:   | PRM                      |  |          |          |
| Size (in bits):   | 32                       |  |          |          |
| Default Value:  | 0x00000000               |  |          |          |
| <p>The binding table binds surfaces to logical resource indices used by shaders and other compute engine kernels. It is stored as an array of up to 256 elements, each of which contains one dword as defined here. The start of each element is spaced one dword apart. The first element of the binding table is aligned to a 32-byte boundary.</p> |                          |  |          |          |
| DWord   | Bit                      | Description  |          |          |
| 0   | 31:6                     | <b>Surface State Pointer</b>   |          |          |
|   |                          | <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>SurfaceStateOffset[31:6]</td> </tr> </table> <p>This 64-byte aligned address points to a surface state block. This pointer is relative to the <b>Surface State Base Address</b>.</p> | Project: | CHV, BSW |
| Project:  | CHV, BSW                 |  |          |          |
| Format:   | SurfaceStateOffset[31:6] |  |          |          |
|   | 5:0                      | <b>Reserved</b>  |          |          |
|   |                          | <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project: | CHV, BSW |
| Project:  | CHV, BSW                 |  |          |          |
| Format:   | MBZ                      |  |          |          |

## Bit Definition for Interrupt Control Registers - Render

| Bit Definition for Interrupt Control Registers - Render  |   |   |  |         |  |
|--|---|---|--|---------|--|
| Project:   | CHV, BSW  |   |  |         |  |
| Source:  | RenderCS  |   |  |         |  |
| Size (in bits):  | 32  |   |  |         |  |
| Default Value:   | 0x00000000  |   |  |         |  |
| DWord  | Bit   | Description   |  |         |  |
| 0  | 31:16   | <b>Reserved</b>   |  |         |  |
|  |   | Project:  | CHV, BSW   |         |  |
|  |   | Format:   | MBZ  |         |  |
|  |   |   | Reserved for other command streamers - cannot be allocated by main command streamer.   |         |  |
|  | 15:12   | <b>Reserved</b>   |  |         |  |
|  |   | Project:  | CHV, BSW   |         |  |
|  |   | Format:   | MBZ  |         |  |
|  | 11  | <b>Wait on Semaphore</b>  |  |         |  |
|  |   | Project:  | CHV, BSW   |         |  |
|  |   |   | Exec-List Scheduling: Set when MI_SEMAPHORE_WAIT command is un-successful and when "Inhibit Synchronous Context Switch" is set. Scheduler can use this interrupt to preempt the context waiting on semaphore wait. |         |  |
| 10   | <b>L3 Counter Save Interrupt</b>  |   |  |         |  |
|  | Project:  | CHV, BSW  |  |         |  |
| 9  | <b>Reserved</b>   |   |  |         |  |
|  | Project:  | CHV, BSW  |  |         |  |
|  | Format:   | MBZ   |  |         |  |
| 8  | <b>Context Switch Interrupt</b>   |   |  |         |  |
|  | Project:  | CHV, BSW  |  |         |  |
|  |   | Set when a context switch has just occurred. Execlist Enable bit needs to be set for this interrupt to occur. |  |         |  |
| 7  | <b>Page Fault</b>   |   |  |         |  |
|  | Project:  | All   |  |         |  |
|  | <table border="1"> <thead> <tr> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>This interrupt is for handling Legacy Page Fault interface for all Command Streamers (BCS, RCS, VCS, VECS). When Fault Repair Mode is enabled, Interrupt mask register value is not looked at to generate interrupt due to page fault. Please refer to vol1c</td> <td>CHV, BSW</td> </tr> </tbody> </table> |   | Description  | Project | This interrupt is for handling Legacy Page Fault interface for all Command Streamers (BCS, RCS, VCS, VECS). When Fault Repair Mode is enabled, Interrupt mask register value is not looked at to generate interrupt due to page fault. Please refer to vol1c |
| Description  | Project   |   |  |         |  |
| This interrupt is for handling Legacy Page Fault interface for all Command Streamers (BCS, RCS, VCS, VECS). When Fault Repair Mode is enabled, Interrupt mask register value is not looked at to generate interrupt due to page fault. Please refer to vol1c | CHV, BSW  |   |  |         |  |

## Bit Definition for Interrupt Control Registers - Render

|   |   |   |  |
|---|---|---|--|
|   |   | "Page Fault Support" section for more details.  |  |
| 6 | <b>Timeout Counter Expired</b>              | Set when the render pipe timeout counter (0x02190) has reached the timeout threshold value (0x0217c).   |  |
| 5 | <b>L3 Parity Error (Slice0)</b>             | When this bit is set, L3 cache controller is indicating that it has encountered a parity error while checking the data.   |  |
|   | Project:                                    | CHV, BSW  |  |
| 4 | <b>PIPE_CONTROL Notify Interrupt</b>        | The Pipe Control packet (Fences) specified in 3D pipeline document may optionally generate an Interrupt. The Store QW associated with a fence is completed ahead of the interrupt.  |  |
| 3 | <b>Render Command Parser Master Error</b>   | When this status bit is set, it indicates that the hardware has detected an error. It is set by the device upon an error condition and cleared by a CPU write of a one to the appropriate bit contained in the Error ID register followed by a write of a one to this bit in the IIR. Further information on the source of the error comes from the "Error Status Register" which along with the "Error Mask Register" determine which error conditions will cause the error status bit to be set and the interrupt to occur.<br><b>Page Table Error:</b> Indicates a page table error.<br><b>Instruction Parser Error:</b> The Render Instruction Parser encounters an error while parsing an instruction. |  |
| 2 | <b>Reserved</b>                             |   |  |
|   | Project:                                    | CHV, BSW  |  |
|   | Format:                                     | MBZ   |  |
| 1 | <b>Reserved</b>                             |   |  |
| 0 | <b>Render Command Parser User Interrupt</b> | This status bit is set when an MI_USER_INTERRUPT instruction is executed on the Render Command Parser. Note that instruction execution is not halted and proceeds normally. A mechanism such as an MI_STORE_DATA instruction is required to associate a particular meaning to a user interrupt.   |  |



## BLEND\_STATE

| BLEND_STATE   |  |  |         |        |
|---|--|--|---------|--------|
| Project:  | CHV, BSW   |  |         |        |
| Source:   | PRM  |  |         |        |
| Size (in bits):   | 544  |  |         |        |
| Default Value:  | 0x00000000, 0x00000000 |  |         |        |
| <p>The blend state is stored as a structure containing a common DWORD that applies to all RTs and an array of up to 8 elements, each of which contains the two DWords for each. The start of each element is spaced 2 DWords apart. The blend state is aligned to a 64-byte boundary, which is pointed to by a field in 3DSTATE_BLEND_STATE_POINTERS. The 3-bit Render Target Index field in the Render Target Write data port message header is used to select which of the 8 elements from BLEND_STATE that is used on the current message.</p> |  |  |         |        |
| DWord   | Bit  | Description  |         |        |
| 0   | 31   | <p><b>Alpha To Coverage Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>If set, Source0 Alpha is converted to a temporary 1/2/4-bit coverage mask and the mask bit corresponding to the sample# ANDed with the sample mask bit. If set, sample coverage is computed based on src0 alpha value. Value of 0 disables all samples and value of 1 enables all samples for that pixel. The same coverage needs to apply to all the RTs in MRT case. Further, any value of src0 alpha between 0 and 1 monotonically increases the number of enabled pixels. The field is applied to all the RTs in MRT case.</p> | Format: | Enable |
|   | Format:  | Enable   |         |        |
|   | 30   | <p><b>Independent Alpha Blend Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>When enabled, the other fields in this instruction control the combination of the alpha components in the Color Buffer Blend stage. When disabled, the alpha components are combined in the same fashion as the color components. The field is applied to all the RTs in MRT case.</p>   | Format: | Enable |
|   | Format:  | Enable   |         |        |
| 29  | <p><b>Alpha To One Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>If set, Source0 Alpha is set to 1.0f after (possibly) being used to generate the AlphaToCoverage coverage mask. If Dual Source Blending is enabled, this bit must be disabled. The field is applied to all the RTs in MRT case.</p>                                   | Format:  | Enable  |        |
| Format:   | Enable   |  |         |        |
| 28  | <p><b>Alpha To Coverage Dither Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>If set, sample coverage is computed based on src0 alpha value and it modulates the sample coverage based on screen coordinates. Value of 0 disables all samples and value of 1 enables all</p>  | Format:  | Enable  |        |
| Format:   | Enable   |  |         |        |

| <b>BLEND_STATE</b>       |   |         |                              |                          |
|--------------------------|---|---------|------------------------------|--------------------------|
|                          | <p>samples for that pixel. The same coverage needs to apply to all the RTs in MRT case. Further, any value of src0 alpha between 0 and 1 monotonically increases the number of enabled pixels. If AlphaToCoverage is disabled, AlphaToCoverage Dither does not have any impact. The field is applied to all the RTs in MRT case.</p>  |         |                              |                          |
| 27                       | <p><b>Alpha Test Enable</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>Enable</td> </tr> </table> <p>Enables the AlphaTest function of the Pixel Processing pipeline. The field is applied to all the RTs in MRT case.</p> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <tr> <td style="text-align: center;"><b>Programming Notes</b></td> </tr> </table> <p>Alpha Test can only be enabled if Pixel Shader outputs a float alpha value. Alpha Test is applied independently on each render target by comparing that render target's alpha value against the alpha reference value. If the alpha test fails, the corresponding pixel write will be suppressed only for that render target. The depth/stencil update will occur if alpha test passes for any render target.</p> | Format: | Enable                       | <b>Programming Notes</b> |
| Format:                  | Enable  |         |                              |                          |
| <b>Programming Notes</b> |   |         |                              |                          |
| 26:24                    | <p><b>Alpha Test Function</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 35%;">Format:</td> <td>3D_Compare_Function</td> </tr> </table> <p>This field specifies the comparison function used in the AlphaTest function. The field is applied to all the RTs in MRT case.</p>  | Format: | 3D_Compare_Function          |                          |
| Format:                  | 3D_Compare_Function   |         |                              |                          |
| 23                       | <p><b>Color Dither Enable</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>Enable</td> </tr> </table> <p>Enables dithering of colors (including any alpha component) before they are written to the Color Buffer. The field is applied to all the RTs in MRT case.</p> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <tr> <td style="text-align: center;"><b>Programming Notes</b></td> </tr> </table> <p>For YUV render target formats, this field must be programmed to 0.</p>  | Format: | Enable                       | <b>Programming Notes</b> |
| Format:                  | Enable  |         |                              |                          |
| <b>Programming Notes</b> |   |         |                              |                          |
| 22:21                    | <p><b>X Dither Offset</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U2</td> </tr> </table> <p>Specifies offset to apply to pixel X coordinate LSBs when accessing dither table. The field is applied to all the RTs in MRT case.</p>  | Format: | U2                           |                          |
| Format:                  | U2  |         |                              |                          |
| 20:19                    | <p><b>Y Dither Offset</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U2</td> </tr> </table> <p>Specifies offset to apply to pixel Y coordinate LSBs when accessing dither table. The field is applied to all the RTs in MRT case.</p>  | Format: | U2                           |                          |
| Format:                  | U2  |         |                              |                          |
| 18:0                     | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>MBZ</td> </tr> </table>  | Format: | MBZ                          |                          |
| Format:                  | MBZ   |         |                              |                          |
| 1..16                    | <p>63:0 <b>Entry</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>BLEND_STATE_ENTRY [CHV, BSW]</td> </tr> </table>   | Format: | BLEND_STATE_ENTRY [CHV, BSW] |                          |
| Format:                  | BLEND_STATE_ENTRY [CHV, BSW]  |         |                              |                          |

## BLEND\_STATE\_ENTRY

| BLEND_STATE_ENTRY  |                        |  |          |   |             |   |          |   |   |         |  |
|--|------------------------|--|----------|---|-------------|---|----------|---|---|---------|--|
| Project:   | CHV, BSW               |  |          |   |             |   |          |   |   |         |  |
| Source:  | PRM                    |  |          |   |             |   |          |   |   |         |  |
| Size (in bits):  | 64                     |  |          |   |             |   |          |   |   |         |  |
| Default Value:   | 0x00000000, 0x00000000 |  |          |   |             |   |          |   |   |         |  |
| DWord  | Bit                    | Description  |          |   |             |   |          |   |   |         |  |
| 0  | 63                     | <b>Logic Op Enable</b><br>Format: Enable<br>Enables the LogicOp function of the Pixel Processing pipeline.   |          |   |             |   |          |   |   |         |  |
|  |                        | <b>Programming Notes</b><br>Enabling LogicOp and Color Buffer Blending at the same time is UNDEFINED   |          |   |             |   |          |   |   |         |  |
|  |                        | <b>Logic Op Function</b><br>Format: 3D_Logic_Op_Function<br>This field specifies the function to be performed (when enabled) in the Logic Op stage of the Pixel Processing pipeline. Note that the encoding of this field is one less than the corresponding "R2_" ROP code defined in WINGDI.H, and is a rather contorted mapping of the OpenGL LogicOp encodings. However, this field was defined such that, when the 4 bits are replicated to 8 bits, they coincide with the ROP codes used in the Blter. Note: if the Logic Op Function does not depend on "D", the dest buffer is not read. |          |   |             |   |          |   |   |         |  |
|  |                        | <b>Reserved</b><br>Format: MBZ   |          |   |             |   |          |   |   |         |  |
| 36   |                        | <b>Pre-Blend Source Only Clamp Enable</b><br>This field specifies whether the source(s) are clamped prior to blending, regardless of whether blending is enabled. If DISABLED, no clamping is performed prior to blending. If ENABLED, only source0 and source 1, if dual source is enabled, are clamped prior to the blend to the range specified by Color Clamp Range.   |          |   |             |   |          |   |   |         |  |
|  |                        | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Disabled</td> <td>No clamping is performed prior to blending.</td> </tr> <tr> <td>1</td> <td>Enabled</td> <td>Only Source(s) are clamped prior to blend function. Other inputs to blend must not be clamped.</td> </tr> </tbody> </table>   | Value    | Name  | Description | 0 | Disabled | No clamping is performed prior to blending. | 1 | Enabled | Only Source(s) are clamped prior to blend function. Other inputs to blend must not be clamped. |
|  |                        | Value  | Name     | Description                                 |             |   |          |   |   |         |  |
|  |                        | 0  | Disabled | No clamping is performed prior to blending. |             |   |          |   |   |         |  |
| 1  | Enabled                | Only Source(s) are clamped prior to blend function. Other inputs to blend must not be clamped.   |          |   |             |   |          |   |   |         |  |
| <b>Programming Notes</b><br>See table in Pre-Blending Color Clamp subsection for programming restrictions as a function of RT format. This field is ignored (treated as DISABLED) for UINT and SINT RT surface formats. Blending is not supported for those RT surface formats. <b>When this bit is enabled Pre-Blend Color Clamp Enable RT[0] must be disabled.</b> |                        |  |          |   |             |   |          |   |   |         |  |
| 35:34  |                        | <b>Color Clamp Range</b>   |          |   |             |   |          |   |   |         |  |

| <b>BLEND_STATE_ENTRY</b> |  |   |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
|--------------------------|--|---|---------|--------|-------------|------|------------------|-------------------|----------|---|--------------------|---------|--|---|---|----------|----------|
|                          | <p>Specifies the clamped range used in Pre-Blend and Post-Blend Color Clamp functions if one or both of those functions are enabled. Note that this range selection is shared between those functions. This field is ignored if both of the Color Clamp Enables are disabled</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>COLORCLAMP_UNORM</td> <td>Clamp Range [0,1]</td> </tr> <tr> <td>1</td> <td>COLORCLAMP_SNORM</td> <td>Clamp Range [-1,1]</td> </tr> <tr> <td>2</td> <td>COLORCLAMP_RTFORMAT</td> <td>Clamp to the range of the RT surface format (Note: The Alpha component is clamped to FLOAT16 for R11G11B10_FLOAT format).</td> </tr> <tr> <td>3</td> <td>Reserved</td> <td>Reserved</td> </tr> </tbody> </table>   |   | Value   | Name   | Description | 0    | COLORCLAMP_UNORM | Clamp Range [0,1] | 1        | COLORCLAMP_SNORM                            | Clamp Range [-1,1] | 2       | COLORCLAMP_RTFORMAT  | Clamp to the range of the RT surface format (Note: The Alpha component is clamped to FLOAT16 for R11G11B10_FLOAT format). | 3 | Reserved | Reserved |
| Value                    | Name   | Description   |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| 0                        | COLORCLAMP_UNORM   | Clamp Range [0,1]   |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| 1                        | COLORCLAMP_SNORM   | Clamp Range [-1,1]  |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| 2                        | COLORCLAMP_RTFORMAT  | Clamp to the range of the RT surface format (Note: The Alpha component is clamped to FLOAT16 for R11G11B10_FLOAT format). |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| 3                        | Reserved   | Reserved  |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| 33                       | <p><b>Pre-Blend Color Clamp Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>This field specifies whether the source, destination and constant color channels are clamped prior to blending, regardless of whether blending is enabled. If DISABLED, no clamping is performed prior to blending. If ENABLED, all inputs to the blend function are clamped prior to the blend to the range specified by Color Clamp Range.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Disabled</td> <td>No clamping is performed prior to blending.</td> </tr> <tr> <td>1</td> <td>Enabled</td> <td>All inputs to the blend function are clamped prior to the blend to the range specified by Color Clamp Range.</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>See table in Pre-Blending Color Clamp subsection for programming restrictions as a function of RT format. This field is ignored (treated as DISABLED) for UINT and SINT RT surface formats. Blending is not supported for those RT surface formats. The device will automatically clamp source color channels to the respective RT surface range.</p> |   | Format: | Enable | Value       | Name | Description      | 0                 | Disabled | No clamping is performed prior to blending. | 1                  | Enabled | All inputs to the blend function are clamped prior to the blend to the range specified by Color Clamp Range. |   |   |          |          |
| Format:                  | Enable   |   |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| Value                    | Name   | Description   |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| 0                        | Disabled   | No clamping is performed prior to blending.   |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| 1                        | Enabled  | All inputs to the blend function are clamped prior to the blend to the range specified by Color Clamp Range.              |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| 32                       | <p><b>Post-Blend Color Clamp Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>If blending is enabled, this field specifies whether the blending output channels are first clamped to the range specified by Color Clamp Range. Regardless of whether this clamping is enabled, the blending output channels will be clamped to the RT surface format just prior to being written.</p> <p style="text-align: center;"><b>Programming Notes</b></p> <p>See table in Pre-Blending Color Clamp subsection for programming restrictions as a function of RT format. This field is ignored (treated as DISABLED) for UINT and SINT RT surface formats. Blending is not supported for those RT surface formats. The device will automatically clamp source color channels to the respective RT surface range. <b>When this bit is enabled Pre-Blend Source Only Clamp Enable RT[0] must be disabled.</b></p>   |   | Format: | Enable |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| Format:                  | Enable   |   |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| 31                       | <p><b>Color Buffer Blend Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>Enables the ColorBufferBlending (nee "alpha blending") function of the Pixel Processing Pipeline</p>  |   | Format: | Enable |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |
| Format:                  | Enable   |   |         |        |             |      |                  |                   |          |   |                    |         |  |   |   |          |          |

| <b>BLEND_STATE_ENTRY</b>   |   |                          |                                |  |  |
|--|---|--------------------------|--------------------------------|--|--|
|  | <p>for this render target.</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td colspan="2"><b>Programming Notes</b></td> </tr> <tr> <td colspan="2">Enabling LogicOp and ColorBufferBlending at the same time is UNDEFINED</td> </tr> </table>   | <b>Programming Notes</b> |                                | Enabling LogicOp and ColorBufferBlending at the same time is UNDEFINED |  |
| <b>Programming Notes</b>   |   |                          |                                |  |  |
| Enabling LogicOp and ColorBufferBlending at the same time is UNDEFINED |   |                          |                                |  |  |
| 30:26  | <p><b>Source Blend Factor</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Format:</td> <td>3D_Color_Buffer_Blend_Factor</td> </tr> </table> <p>Controls the "source factor" in the ColorBufferBlending function. Refer to Source Alpha Blend Factor for encodings.</p>   | Format:                  | 3D_Color_Buffer_Blend_Factor   |  |  |
| Format:  | 3D_Color_Buffer_Blend_Factor  |                          |                                |  |  |
| 25:21  | <p><b>Destination Blend Factor</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Format:</td> <td>3D_Color_Buffer_Blend_Factor</td> </tr> </table> <p>Controls the "destination factor" in the ColorBufferBlending function. Refer to Source Alpha Blend Factor for encodings.</p>   | Format:                  | 3D_Color_Buffer_Blend_Factor   |  |  |
| Format:  | 3D_Color_Buffer_Blend_Factor  |                          |                                |  |  |
| 20:18  | <p><b>Color Blend Function</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Format:</td> <td>3D_Color_Buffer_Blend_Function</td> </tr> </table> <p>This field specifies the function used to combine the color components in the ColorBufferBlending function of the Pixel Processing Pipeline. If Independent Alpha Blend Enable is disabled, this field will also control the blending of the alpha components in the ColorBufferBlending function.</p> | Format:                  | 3D_Color_Buffer_Blend_Function |  |  |
| Format:  | 3D_Color_Buffer_Blend_Function  |                          |                                |  |  |
| 17:13  | <p><b>Source Alpha Blend Factor</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Format:</td> <td>3D_Color_Buffer_Blend_Factor</td> </tr> </table> <p>Controls the "source factor" in alpha Color Buffer Blending stage. Note: For the source/destination alpha blend factors, the encodings indicating "COLOR" are the same as the encodings indicating "ALPHA", as the alpha component of the color is selected.</p>                                    | Format:                  | 3D_Color_Buffer_Blend_Factor   |  |  |
| Format:  | 3D_Color_Buffer_Blend_Factor  |                          |                                |  |  |
| 12:8   | <p><b>Destination Alpha Blend Factor</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Format:</td> <td>3D_Color_Buffer_Blend_Factor</td> </tr> </table> <p>Controls the "destination factor" in alpha Color Buffer Blending stage. Refer to Source Alpha Blend Factor for encodings.</p>  | Format:                  | 3D_Color_Buffer_Blend_Factor   |  |  |
| Format:  | 3D_Color_Buffer_Blend_Factor  |                          |                                |  |  |
| 7:5  | <p><b>Alpha Blend Function</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Format:</td> <td>3D_Color_Buffer_Blend_Function</td> </tr> </table> <p>This field specifies the function used to combine the alpha components in the Color Buffer blend stage of the Pixel Pipeline when the IndependentAlphaBlend state is enabled.</p>  | Format:                  | 3D_Color_Buffer_Blend_Function |  |  |
| Format:  | 3D_Color_Buffer_Blend_Function  |                          |                                |  |  |
| 4  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td>MBZ</td> </tr> </table>  | Format:                  | MBZ                            |  |  |
| Format:  | MBZ   |                          |                                |  |  |
| 3  | <p><b>Write Disable Alpha</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>Disable</td> </tr> </table> <p>This field controls the writing of the alpha component into the Render Target.</p>   | Format:                  | Disable                        |  |  |
| Format:  | Disable   |                          |                                |  |  |

| <b>BLEND_STATE_ENTRY</b> |  |   |      |             |    |         |                                    |    |          |   |  |
|--------------------------|--|---|------|-------------|----|---------|------------------------------------|----|----------|---|--|
|                          | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>Enabled</td> <td>Alpha component can be overwritten</td> </tr> <tr> <td>1b</td> <td>Disabled</td> <td>Writes to the color buffer will not modify Alpha.</td> </tr> </tbody> </table> | Value   | Name | Description | 0b | Enabled | Alpha component can be overwritten | 1b | Disabled | Writes to the color buffer will not modify Alpha. |  |
| Value                    | Name   | Description                                       |      |             |    |         |                                    |    |          |   |  |
| 0b                       | Enabled  | Alpha component can be overwritten                |      |             |    |         |                                    |    |          |   |  |
| 1b                       | Disabled   | Writes to the color buffer will not modify Alpha. |      |             |    |         |                                    |    |          |   |  |
|                          | <b>Programming Notes</b>   |   |      |             |    |         |                                    |    |          |   |  |
|                          | For YUV surfaces, this field must be set to 0B (enabled).  |   |      |             |    |         |                                    |    |          |   |  |
| 2                        | <b>Write Disable Red</b>   |   |      |             |    |         |                                    |    |          |   |  |
|                          | Format:  | Disable   |      |             |    |         |                                    |    |          |   |  |
|                          | This field controls the writing of the red component into the Render Target.   |   |      |             |    |         |                                    |    |          |   |  |
|                          | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>Enabled</td> <td>Red component can be overwritten</td> </tr> <tr> <td>1b</td> <td>Disabled</td> <td>Writes to the color buffer will not modify Red.</td> </tr> </tbody> </table>     | Value   | Name | Description | 0b | Enabled | Red component can be overwritten   | 1b | Disabled | Writes to the color buffer will not modify Red.   |  |
| Value                    | Name   | Description                                       |      |             |    |         |                                    |    |          |   |  |
| 0b                       | Enabled  | Red component can be overwritten                  |      |             |    |         |                                    |    |          |   |  |
| 1b                       | Disabled   | Writes to the color buffer will not modify Red.   |      |             |    |         |                                    |    |          |   |  |
|                          | <b>Programming Notes</b>   |   |      |             |    |         |                                    |    |          |   |  |
|                          | For YUV surfaces, this field must be set to 0B (enabled).  |   |      |             |    |         |                                    |    |          |   |  |
| 1                        | <b>Write Disable Green</b>   |   |      |             |    |         |                                    |    |          |   |  |
|                          | Format:  | Disable   |      |             |    |         |                                    |    |          |   |  |
|                          | This field controls the writing of the green component into the Render Target.   |   |      |             |    |         |                                    |    |          |   |  |
|                          | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>Enabled</td> <td>Green component can be overwritten</td> </tr> <tr> <td>1b</td> <td>Disabled</td> <td>Writes to the color buffer will not modify Green.</td> </tr> </tbody> </table> | Value   | Name | Description | 0b | Enabled | Green component can be overwritten | 1b | Disabled | Writes to the color buffer will not modify Green. |  |
| Value                    | Name   | Description                                       |      |             |    |         |                                    |    |          |   |  |
| 0b                       | Enabled  | Green component can be overwritten                |      |             |    |         |                                    |    |          |   |  |
| 1b                       | Disabled   | Writes to the color buffer will not modify Green. |      |             |    |         |                                    |    |          |   |  |
|                          | <b>Programming Notes</b>   |   |      |             |    |         |                                    |    |          |   |  |
|                          | For YUV surfaces, this field must be set to 0B (enabled).  |   |      |             |    |         |                                    |    |          |   |  |
| 0                        | <b>Write Disable Blue</b>  |   |      |             |    |         |                                    |    |          |   |  |
|                          | Format:  | Disable   |      |             |    |         |                                    |    |          |   |  |
|                          | This field controls the writing of the Blue component into the Render Target.  |   |      |             |    |         |                                    |    |          |   |  |
|                          | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>Enabled</td> <td>Blue component can be overwritten</td> </tr> <tr> <td>1b</td> <td>Disabled</td> <td>Writes to the color buffer will not modify Blue.</td> </tr> </tbody> </table>   | Value   | Name | Description | 0b | Enabled | Blue component can be overwritten  | 1b | Disabled | Writes to the color buffer will not modify Blue.  |  |
| Value                    | Name   | Description                                       |      |             |    |         |                                    |    |          |   |  |
| 0b                       | Enabled  | Blue component can be overwritten                 |      |             |    |         |                                    |    |          |   |  |
| 1b                       | Disabled   | Writes to the color buffer will not modify Blue.  |      |             |    |         |                                    |    |          |   |  |
|                          | <b>Programming Notes</b>   |   |      |             |    |         |                                    |    |          |   |  |
|                          | For YUV surfaces, this field must be set to 0B (enabled).  |   |      |             |    |         |                                    |    |          |   |  |

## Block Dimensions Message Header Control

| MHC_BDIM - Block Dimensions Message Header Control |  |   |                        |                       |         |
|--|--|---|------------------------|-----------------------|---------|
| Project:   |  | CHV, BSW  |                        |                       |         |
| Source:  |  | PRM   |                        |                       |         |
| Size (in bits):                                    |  | 32  |                        |                       |         |
| Default Value:                                     |  | 0x00000000  |                        |                       |         |
| DWord  | Bit  | Description   |                        |                       |         |
| 0  | 31:22  | <b>Reserved</b>   |                        |                       |         |
|  |  | Project:  | All                    |                       |         |
|  |  | Format:   | Ignore                 |                       |         |
|  |  | Ignored   |                        |                       |         |
|  | 21:20  | <b>Block Height</b>   |                        |                       |         |
|  |  | Project:  | All                    |                       |         |
|  |  | Format:   | Enumeration            |                       |         |
|  |  | Height in rows of block being accessed. Range = [0,3] representing 1 to 8 rows. |                        |                       |         |
|  |  | Value   | Name                   | Description           | Project |
|  |  | 0h  | H1                     | Block height = 1 row  | All     |
|  |  | 1h  | H2                     | Block height = 2 rows | All     |
|  |  | 2h  | H4                     | Block height = 4 rows | All     |
| 03h  | H8   | Block height = 8 rows   | All                    |                       |         |
| 19:2   | <b>Reserved</b>  |   |                        |                       |         |
|  | Project:   | All   |                        |                       |         |
|  | Format:  | Ignore  |                        |                       |         |
|  | Ignored  |   |                        |                       |         |
| 1:0  | <b>Block Width</b>   |   |                        |                       |         |
|  | Project:   | All   |                        |                       |         |
|  | Format:  | Enumeration   |                        |                       |         |
|  | Width in Dwords of block being accessed. Range = [0,3] representing 1 to 8 Dwords. |   |                        |                       |         |
|  | Value  | Name  | Description            | Project               |         |
|  | 0h   | W1  | Block width = 1 Dword  | All                   |         |
|  | 1h   | W2  | Block width = 2 Dwords | All                   |         |
|  | 2h   | W4  | Block width = 4 Dwords | All                   |         |
| 03h  | W8   | Block width = 8 Dwords  | All                    |                       |         |

## Block Message Header

| <b>MH_BTS_GO - Block Message Header</b> |   |   |
|---|---|---|
| Project:                                | CHV, BSW  |   |
| Source:                                 | DataPort 0  |   |
| Size (in bits):                         | 256   |   |
| Default Value:                          | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |   |
| DWord                                   | Bit   | Description   |
| 0-1                                     | 63:0  | <b>Reserved</b>   |
|   |   | Project: All  |
|   |   | Format: Ignore  |
|   |   | Ignored   |
| 2                                       | 31:0  | <b>Global Offset</b>  |
|   |   | Project: All  |
|   |   | Format: U32   |
|   |   | Specifies the global element index into the buffer, in units of Owords, Dwords, or Bytes (depending on the message).        |
|   |   | <b>Programming Notes</b>  |
|   |   | The Global Offset for Oword Unaligned Block operations is specified as a Dword-aligned byte offset (offset bits [1:0] = 0). |
|   |   | If the address offset calculated with the Global Offset is greater than the Surface Size, then the access is Out-of-Bounds. |
| 3-7                                     | 159:0   | <b>Reserved</b>   |
|   |   | Project: All  |
|   |   | Format: Ignore  |
|   |   | Ignored   |



## BR00 - BLT Opcode and Control

| BR00 - BLT Opcode and Control |  |   |                |      |                        |                       |                     |      |                   |
|-------------------------------|--|---|----------------|------|------------------------|-----------------------|---------------------|------|-------------------|
| Project:                      | CHV, BSW   |   |                |      |                        |                       |                     |      |                   |
| Source:                       | BlitterCS  |   |                |      |                        |                       |                     |      |                   |
| Size (in bits):               | 32   |   |                |      |                        |                       |                     |      |                   |
| Default Value:                | 0x00000000   |   |                |      |                        |                       |                     |      |                   |
| DWord                         | Bit  | Description   |                |      |                        |                       |                     |      |                   |
| 0                             | 31   | <p><b>BLT Engine Busy</b></p> <p>This bit indicates whether the BLT Engine is busy (1) or idle (0). This bit is replicated in the SETUP BLT Opcode and Control register.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Idle <b>[Default]</b></td> </tr> <tr> <td>1</td> <td>Busy</td> </tr> </tbody> </table> | Value          | Name | 0                      | Idle <b>[Default]</b> | 1                   | Busy |                   |
|                               | Value  | Name  |                |      |                        |                       |                     |      |                   |
|                               | 0  | Idle <b>[Default]</b>   |                |      |                        |                       |                     |      |                   |
|                               | 1  | Busy  |                |      |                        |                       |                     |      |                   |
|                               | 30   | <p><b>Setup Instruction Instruction</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> </table> <p>The current instruction performs clipping (1).</p>   | Default Value: | 0    |                        |                       |                     |      |                   |
| Default Value:                | 0  |   |                |      |                        |                       |                     |      |                   |
| 29                            | <p><b>Setup Monochrome Pattern</b></p> <p>This bit is decoded from the Setup instruction opcode to identify whether a color (0) or monochrome (1) pattern is used with the SCANLINE_BLT instruction.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Color <b>[Default]</b></td> </tr> <tr> <td>1</td> <td>Monochrome</td> </tr> </tbody> </table>   | Value   | Name           | 0    | Color <b>[Default]</b> | 1                     | Monochrome          |      |                   |
| Value                         | Name   |   |                |      |                        |                       |                     |      |                   |
| 0                             | Color <b>[Default]</b>   |   |                |      |                        |                       |                     |      |                   |
| 1                             | Monochrome   |   |                |      |                        |                       |                     |      |                   |
| 28:22                         | <p><b>Instruction Target (Opcode)</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0000000b</td> </tr> </table> <p>This is the contents of the Instruction Target field from the last BLT instruction. This field is used by the BLT Engine state machine to identify the BLT instruction it is to perform. The opcode specifies whether the source and pattern operands are color or monochrome.</p> | Default Value:  | 0000000b       |      |                        |                       |                     |      |                   |
| Default Value:                | 0000000b   |   |                |      |                        |                       |                     |      |                   |
| 21:20                         | <p><b>32bpp Byte Mask</b></p> <p>This field is only used for 32bpp.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td><b>[Default]</b></td> </tr> <tr> <td>1xb</td> <td>Write Alpha Channel</td> </tr> <tr> <td>x1b</td> <td>Write RGB Channel</td> </tr> </tbody> </table>  | Value   | Name           | 00b  | <b>[Default]</b>       | 1xb                   | Write Alpha Channel | x1b  | Write RGB Channel |
| Value                         | Name   |   |                |      |                        |                       |                     |      |                   |
| 00b                           | <b>[Default]</b>   |   |                |      |                        |                       |                     |      |                   |
| 1xb                           | Write Alpha Channel  |   |                |      |                        |                       |                     |      |                   |
| x1b                           | Write RGB Channel  |   |                |      |                        |                       |                     |      |                   |
| 19:17                         | <p><b>Monochrome Source Start</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>000b</td> </tr> </table> <p>This field indicates the starting monochrome pixel bit position within a byte per scan line of the</p>   | Default Value:  | 000b           |      |                        |                       |                     |      |                   |
| Default Value:                | 000b   |   |                |      |                        |                       |                     |      |                   |

| <b>BR00 - BLT Opcode and Control</b> |  |   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
|--------------------------------------|--|---|----------------|------|-------------|----------------------|--|--|------|----------------------------------|--|------|--|--|
|                                      |  | source operand. The monochrome source is word aligned which means that at the end of the scan line all bits should be discarded until the next word boundary.   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 16                                   | <b>Bit/Byte Packed</b><br>Byte packed is for the NT driver.  | <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>Bit <b>[Default]</b></td> </tr> <tr> <td>1b</td> <td>Byte</td> </tr> </tbody> </table>   | Value          | Name | 0b          | Bit <b>[Default]</b> | 1b   | Byte   |      |                                  |  |      |  |  |
| Value                                | Name   |   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 0b                                   | Bit <b>[Default]</b>   |   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 1b                                   | Byte   |   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 15                                   | <b>Src Tiling Enable</b>   | <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>Tiling Disabled (Linear) <b>[Default]</b></td> <td></td> </tr> <tr> <td>1b</td> <td>Tiling enabled: Tile-X or Tile-Y</td> <td>CHV, BSW</td> </tr> </tbody> </table>   | Value          | Name | Project     | 0b                   | Tiling Disabled (Linear) <b>[Default]</b>      |  | 1b   | Tiling enabled: Tile-X or Tile-Y | CHV, BSW   |      |  |  |
| Value                                | Name   | Project   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 0b                                   | Tiling Disabled (Linear) <b>[Default]</b>  |   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 1b                                   | Tiling enabled: Tile-X or Tile-Y   | CHV, BSW  |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 14:12                                | <b>Horizontal Pattern Seed</b>   | <table border="1"> <tbody> <tr> <td>Default Value:</td> <td>0b</td> </tr> </tbody> </table> <p>This field indicates the pattern pixel position which corresponds to X = 0.</p>  | Default Value: | 0b   |             |                      |  |  |      |                                  |  |      |  |  |
| Default Value:                       | 0b   |   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 11                                   | <b>Dest Tiling Enable</b><br>When set to '1', this means that Blitter is executing in Tiled mode. If '0' it means that Blitter is in Linear mode. Pre-Dev Blitter never executes in Tiled-Y mode, DevGT+ Blitter supports both Tile-X and Tile-Y modes. On reset, this bit will be '0'. This definition applies to only X, Y Blits.                        | <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>Tiling Disabled (Linear blit) <b>[Default]</b></td> <td></td> </tr> <tr> <td>1b</td> <td>Tiling enabled: Tile-X or Tile-Y</td> <td>CHV, BSW</td> </tr> </tbody> </table>  | Value          | Name | Project     | 0b                   | Tiling Disabled (Linear blit) <b>[Default]</b> |  | 1b   | Tiling enabled: Tile-X or Tile-Y | CHV, BSW   |      |  |  |
| Value                                | Name   | Project   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 0b                                   | Tiling Disabled (Linear blit) <b>[Default]</b>   |   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 1b                                   | Tiling enabled: Tile-X or Tile-Y   | CHV, BSW  |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 10:8                                 | <b>Transparency Range Mode</b><br>These bits control whether or not the byte(s) at the destination corresponding to a given pixel will be conditionally written, and what those conditions are. This feature can make it possible to perform various masking functions in order to selectively write or preserve graphics data already at the destination. | <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td>xx0b</td> <td><b>[Default]</b></td> <td>No color transparency mode enabled. This causes normal operation with regard to writing data to the destination.</td> </tr> <tr> <td>001b</td> <td></td> <td>[Source color transparency] The Transparency Color Low: (Pixel Greater or Equal) (source background register) and the Transparency Color High: (Pixel Less or Equal) (source foreground register) are compared to the source pixels. The range comparisons are done on each component (R, G, B) and then logically ANDed. If the source pixel components are not within the range defined by the Transparency Color registers, then the byte(s) at the destination corresponding to the current pixel are written with the result of the bit-wise operation.</td> </tr> <tr> <td>011b</td> <td></td> <td>[Source and Alpha color transparency] The Transparency Color Low: (Pixel Greater or Equal) (source background register) and the Transparency Color</td> </tr> </tbody> </table> | Value          | Name | Description | xx0b                 | <b>[Default]</b>                               | No color transparency mode enabled. This causes normal operation with regard to writing data to the destination. | 001b |                                  | [Source color transparency] The Transparency Color Low: (Pixel Greater or Equal) (source background register) and the Transparency Color High: (Pixel Less or Equal) (source foreground register) are compared to the source pixels. The range comparisons are done on each component (R, G, B) and then logically ANDed. If the source pixel components are not within the range defined by the Transparency Color registers, then the byte(s) at the destination corresponding to the current pixel are written with the result of the bit-wise operation. | 011b |  | [Source and Alpha color transparency] The Transparency Color Low: (Pixel Greater or Equal) (source background register) and the Transparency Color |
| Value                                | Name   | Description   |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| xx0b                                 | <b>[Default]</b>   | No color transparency mode enabled. This causes normal operation with regard to writing data to the destination.  |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 001b                                 |  | [Source color transparency] The Transparency Color Low: (Pixel Greater or Equal) (source background register) and the Transparency Color High: (Pixel Less or Equal) (source foreground register) are compared to the source pixels. The range comparisons are done on each component (R, G, B) and then logically ANDed. If the source pixel components are not within the range defined by the Transparency Color registers, then the byte(s) at the destination corresponding to the current pixel are written with the result of the bit-wise operation.  |                |      |             |                      |  |  |      |                                  |  |      |  |  |
| 011b                                 |  | [Source and Alpha color transparency] The Transparency Color Low: (Pixel Greater or Equal) (source background register) and the Transparency Color  |                |      |             |                      |  |  |      |                                  |  |      |  |  |

| <b>BR00 - BLT Opcode and Control</b> |  |  |
|--------------------------------------|--|--|
|                                      |  | High: (Pixel Less or Equal) (source foreground register) are compared to the source pixels. The range comparisons are done on each component (A, R, G, B) and then logically ANDed. If the source pixel components are not within the range defined by the Transparency Color registers, then the byte(s) at the destination corresponding to the current pixel are written with the result of the bit-wise operation."  |
|                                      | 101b   | [Destination and Alpha color transparency] The Transparency Color Low: (Pixel Greater or Equal) (source background register) and the Transparency Color High: (Pixel Less or Equal) (source foreground register) are compared to the destination pixels. The range comparisons are done on each component (A, R, G, B) and then logically ANDed. If the destination pixels are within the range, then the byte(s) at the destination corresponding to the current pixel are written with the result of the bit-wise operation. |
|                                      | 111b   | [Destination color transparency] The Transparency Color Low: (Pixel Greater or Equal) (source background register) and the Transparency Color High: (Pixel Less or Equal) (source foreground register) are compared to the destination pixels. The range comparisons are done on each component (R, G, B) and then logically ANDed. If the destination pixels are within the range, then the byte(s) at the destination corresponding to the current pixel are written with the result of the bit-wise operation.              |
| 7:5                                  | <b>Pattern Vertical Seed</b>   |  |
|                                      | Default Value:   | 000b   |
|                                      | This field specifies the pattern scan line which corresponds to Y=0.   |  |
| 4                                    | <b>Destination Read Modify Write</b>   |  |
|                                      | Default Value:   | 0b   |
|                                      | This bit is decoded from the last instruction's opcode field and Destination Transparency Mode to identify whether a Destination read is needed. |  |
| 3                                    | <b>Color Source</b>  |  |
|                                      | Default Value:   | 0b   |
|                                      | This bit is decoded from the last instructions opcode field to identify whether a color (1) source is used.                                      |  |
| 2                                    | <b>Monochrome Source</b>   |  |
|                                      | Default Value:   | 0b   |
|                                      | This bit is decoded from the last instructions opcode field to identify whether a monochrome (1) source is used.                                 |  |
| 1                                    | <b>Color Pattern</b>   |  |
|                                      | Default Value:   | 0b   |
|                                      | This bit is decoded from the last instructions opcode field to identify whether a color (1) pattern  |  |

| <b>BR00 - BLT Opcode and Control</b> |   |                |    |
|--------------------------------------|---|----------------|----|
|                                      | is used.  |                |    |
| 0                                    | <p><b>Monochrome Pattern</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: center;">0b</td> </tr> </table> <p>This bit is decoded from the last instructions opcode field to identify whether a monochrome (1) pattern is used.</p> | Default Value: | 0b |
| Default Value:                       | 0b  |                |    |

## BR01 - Setup BLT Raster OP, Control, and Destination Offset

| BR01 - Setup BLT Raster OP, Control, and Destination Offset |            |  |             |  |             |           |           |  |    |  |  |
|---|------------|--|-------------|--|-------------|-----------|-----------|--|----|--|--|
| Project:  | CHV, BSW   |  |             |  |             |           |           |  |    |  |  |
| Source:   | BlitterCS  |  |             |  |             |           |           |  |    |  |  |
| Size (in bits):   | 32         |  |             |  |             |           |           |  |    |  |  |
| Default Value:  | 0x00000000 |  |             |  |             |           |           |  |    |  |  |
| DWord   | Bit        | Description  |             |  |             |           |           |  |    |  |  |
| 0   | 31         | <p><b>Solid Pattern Select</b></p> <p>This bit applies only when the pattern data is monochrome. This bit determines whether or not the BLT Engine actually performs read operations from the frame buffer in order to load the pattern data. Use of this feature to prevent these read operations can increase BLT Engine performance, if use of the pattern data is indeed not necessary. The BLT Engine is configured to accept either monochrome or color pattern data via the opcode field.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>[Default]</td> <td>This causes normal operation with regard to the use of the pattern data. The BLT Engine proceeds with the process of reading the pattern data, and the pattern data is used as the pattern operand for all bit-wise operations.</td> </tr> <tr> <td>1b</td> <td></td> <td>The BLT Engine forgoes the process of reading the pattern data, the presumption is made that all of the bits of the pattern data are set to 0, and the pattern operand for all bit-wise operations is forced to the background color specified in the Color Expansion Background Color Register.</td> </tr> </tbody> </table>  | Value       | Name   | Description | 0b        | [Default] | This causes normal operation with regard to the use of the pattern data. The BLT Engine proceeds with the process of reading the pattern data, and the pattern data is used as the pattern operand for all bit-wise operations.  | 1b |  | The BLT Engine forgoes the process of reading the pattern data, the presumption is made that all of the bits of the pattern data are set to 0, and the pattern operand for all bit-wise operations is forced to the background color specified in the Color Expansion Background Color Register. |
|   |            | Value  | Name        | Description  |             |           |           |  |    |  |  |
|   |            | 0b   | [Default]   | This causes normal operation with regard to the use of the pattern data. The BLT Engine proceeds with the process of reading the pattern data, and the pattern data is used as the pattern operand for all bit-wise operations.  |             |           |           |  |    |  |  |
|   |            | 1b   |             | The BLT Engine forgoes the process of reading the pattern data, the presumption is made that all of the bits of the pattern data are set to 0, and the pattern operand for all bit-wise operations is forced to the background color specified in the Color Expansion Background Color Register. |             |           |           |  |    |  |  |
|   | 30         | <p><b>Clipping Enabled</b></p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>[Default]</td> </tr> <tr> <td>1b</td> <td></td> </tr> </tbody> </table>  | Value       | Name   | 0b          | [Default] | 1b        |  |    |  |  |
|   |            | Value  | Name        |  |             |           |           |  |    |  |  |
|   |            | 0b   | [Default]   |  |             |           |           |  |    |  |  |
|   | 1b         |  |             |  |             |           |           |  |    |  |  |
|   | 29         | <p><b>Monochrome Source Transparency Mode</b></p> <p>This bit applies only when the source data is in monochrome. This bit determines whether or not the byte(s) at the destination corresponding to the pixel to which a given bit of the source data also corresponds will actually be written if that source data bit has the value of 0. This feature can make it possible to use the source as a transparency mask. The BLT Engine is configured to accepted either monochrome or color source data via the opcode field.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td>[Default]</td> <td>This causes normal operation with regard to the use of the source data. Wherever a bit in the source data has the value of 0, the color specified in the background color register is used as the source operand in the bit-wise operation for the pixel corresponding to the source data bit, and the bytes at the destination corresponding to that pixel are written with the result.</td> </tr> <tr> <td>1b</td> <td></td> <td>Wherever a bit in the source data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the source data bit also corresponds are simply not written, and the data at those byte(s) at the</td> </tr> </tbody> </table> | Value       | Name   | Description | 0b        | [Default] | This causes normal operation with regard to the use of the source data. Wherever a bit in the source data has the value of 0, the color specified in the background color register is used as the source operand in the bit-wise operation for the pixel corresponding to the source data bit, and the bytes at the destination corresponding to that pixel are written with the result. | 1b |  | Wherever a bit in the source data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the source data bit also corresponds are simply not written, and the data at those byte(s) at the   |
|   | Value      | Name   | Description |  |             |           |           |  |    |  |  |
| 0b  | [Default]  | This causes normal operation with regard to the use of the source data. Wherever a bit in the source data has the value of 0, the color specified in the background color register is used as the source operand in the bit-wise operation for the pixel corresponding to the source data bit, and the bytes at the destination corresponding to that pixel are written with the result.   |             |  |             |           |           |  |    |  |  |
| 1b  |            | Wherever a bit in the source data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the source data bit also corresponds are simply not written, and the data at those byte(s) at the   |             |  |             |           |           |  |    |  |  |

## BR01 - Setup BLT Raster OP, Control, and Destination Offset

|       |   | destination are allowed to remain unchanged.   |       |      |             |                                    |                  |  |     |                              |   |                    |
|-------|---|--|-------|------|-------------|------------------------------------|------------------|--|-----|------------------------------|---|--------------------|
| 28    | <p><b>Monochrome Pattern Transparency Mode</b></p> <p>This bit applies only when the pattern data is monochrome. This bit determines whether or not the byte(s) at the destination corresponding to the pixel to which a given bit of the pattern data also corresponds will actually be written if that pattern data bit has the value of 1. This feature can make it possible to use the pattern as a transparency mask. The BLT Engine is configured to accepted either monochrome or color pattern data via the opcode field.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0b</td> <td><b>[Default]</b></td> <td>This causes normal operation with regard to the use of the pattern data. Wherever a bit in the pattern data has the value of 0, the color specified in the background color register is used as the pattern operand in the bit-wise operation for the pixel corresponding to the pattern data bit, and the bytes at the destination corresponding to that pixel are written with the result.</td> </tr> <tr> <td>1b</td> <td></td> <td>Wherever a bit in the pattern data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the pattern data bit also corresponds are simply not written, and the data at those byte(s) at the destination are allowed to remain unchanged.</td> </tr> </tbody> </table> |  | Value | Name | Description | 0b                                 | <b>[Default]</b> | This causes normal operation with regard to the use of the pattern data. Wherever a bit in the pattern data has the value of 0, the color specified in the background color register is used as the pattern operand in the bit-wise operation for the pixel corresponding to the pattern data bit, and the bytes at the destination corresponding to that pixel are written with the result. | 1b  |                              | Wherever a bit in the pattern data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the pattern data bit also corresponds are simply not written, and the data at those byte(s) at the destination are allowed to remain unchanged. |                    |
| Value | Name  | Description  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 0b    | <b>[Default]</b>  | This causes normal operation with regard to the use of the pattern data. Wherever a bit in the pattern data has the value of 0, the color specified in the background color register is used as the pattern operand in the bit-wise operation for the pixel corresponding to the pattern data bit, and the bytes at the destination corresponding to that pixel are written with the result. |       |      |             |                                    |                  |  |     |                              |   |                    |
| 1b    |   | Wherever a bit in the pattern data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the pattern data bit also corresponds are simply not written, and the data at those byte(s) at the destination are allowed to remain unchanged.  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 27:26 | <p><b>32bpp Byte Mask</b></p> <p>This bit applies only when the pattern data is monochrome. This bit determines whether or not the byte(s) at the destination corresponding to the pixel to which a given bit of the pattern data also corresponds will actually be written if that pattern data bit has the value of 1. This feature can make it possible to use the pattern as a transparency mask. The BLT Engine is configured to accepted either monochrome or color pattern data via the opcode field.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td><b>[Default]</b></td> </tr> <tr> <td>1xb</td> <td>Write Alpha Channel</td> </tr> <tr> <td>x1b</td> <td>Write RGB Channel</td> </tr> </tbody> </table>  |  | Value | Name | 00b         | <b>[Default]</b>                   | 1xb              | Write Alpha Channel  | x1b | Write RGB Channel            |   |                    |
| Value | Name  |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 00b   | <b>[Default]</b>  |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 1xb   | Write Alpha Channel   |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| x1b   | Write RGB Channel   |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 25:24 | <p><b>Color Depth</b></p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td>8 Bit Color Depth <b>[Default]</b></td> </tr> <tr> <td>01b</td> <td>16 Bit Color Depth</td> </tr> <tr> <td>10b</td> <td>Alternate 16 Bit Color Depth</td> </tr> <tr> <td>11b</td> <td>32 Bit Color Depth</td> </tr> </tbody> </table>   |  | Value | Name | 00b         | 8 Bit Color Depth <b>[Default]</b> | 01b              | 16 Bit Color Depth   | 10b | Alternate 16 Bit Color Depth | 11b   | 32 Bit Color Depth |
| Value | Name  |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 00b   | 8 Bit Color Depth <b>[Default]</b>  |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 01b   | 16 Bit Color Depth  |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 10b   | Alternate 16 Bit Color Depth  |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 11b   | 32 Bit Color Depth  |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 23:16 | <p><b>Raster Operation Select</b></p> <p>These 8 bits are used to select which one of 256 possible raster operations is to be performed by the BLT Engine.</p>  |  |       |      |             |                                    |                  |  |     |                              |   |                    |
| 15:0  | <p><b>Destination Pitch (Offset)</b></p> <p>For non-XY Blits, the signed 16bit field allows for specifying upto + 32Kbytes signed pitches in bytes (same as before). For X, Y Blits with tiled-X surfaces, the pitch for Destination will be 512Byte aligned and should be programmable upto + 128Kbytes. For X, Y Blits with tiled-Y surfaces, the pitch for Destination will be 128Byte aligned and should be programmable upto +</p>   |  |       |      |             |                                    |                  |  |     |                              |   |                    |

**BR01 - Setup BLT Raster OP, Control, and Destination Offset**

|  |  |
|--|--|
|  | <p>128Kbytes. In this case, this 16bit signed pitch field is used to specify upto + 32KWords. For X, Y blits with nontiled surfaces (linear surfaces), this 16bit field can be programmed to byte specification of upto + 32Kbytes (same as before). These 16 bits store the signed memory address offset value by which the destination address originally specified in the Destination Address Register is incremented or decremented as each scan line's worth of destination data is written into the frame buffer by the BLT Engine, so that the destination address will point to the next memory address to which the next scan line's worth of destination data is to be written. If the intended destination of a BLT operation is within on-screen frame buffer memory, this offset is normally set so that each subsequent scan line's worth of destination data lines up vertically with the destination data in the scan line, above. However, if the intended destination of a BLT operation is within off-screen memory, this offset can be set so that each subsequent scan line's worth of destination data is stored at a location immediately after the location where the destination data for the last scan line ended, in order to create a single contiguous block of bytes of destination data at the destination.</p> |
|--|--|

## BR05 - Setup Expansion Background Color

| BR05 - Setup Expansion Background Color |            |  |
|---|------------|--|
| Project:                                | CHV, BSW   |  |
| Source:                                 | BlitterCS  |  |
| Size (in bits):                         | 32         |  |
| Default Value:                          | 0x00000000 |  |
| DWord                                   | Bit        | Description  |
| 0                                       | 31:0       | <p><b>Setup Expansion Background Color Bits</b></p> <p>These bits provide the one, two, or four bytes worth of color data that select the background color to be used in the color expansion of monochrome pattern or source data for either the SCANLINE_BLT or TEXT_BLT instructions. BR05 is also used as the solid pattern for the PIXEL_BLT instruction. Whether one, two, or three bytes worth of color data is needed depends upon the color depth to which the BLT Engine has been set. For a color depth of 32bpp, 16bpp and 8bpp, bits [31:0], [15:0] and [7:0], respectively, are used.</p> |



## BR06 - Setup Expansion Foreground Color

| BR06 - Setup Expansion Foreground Color |            |  |
|---|------------|--|
| Project:                                | CHV, BSW   |  |
| Source:                                 | BlitterCS  |  |
| Size (in bits):                         | 32         |  |
| Default Value:                          | 0x00000000 |  |
| DWord                                   | Bit        | Description  |
| 0                                       | 31:0       | <p><b>Setup Expansion Foreground Color Bits</b></p> <p>These bits provide the one, two, or four bytes worth of color data that select the foreground color to be used in the color expansion of monochrome pattern or source data for either the SCANLINE_BLT or TEXT_BLT instructions. Whether one, two, or three bytes worth of color data is needed depends upon the color depth to which the BLT Engine has been set. For a color depth of 32bpp, 16bpp and 8bpp, bits [31:0], [15:0] and [7:0], respectively, are used.</p> |

## BR07 - Setup Blit Color Pattern Address Lower Order Address bits

| BR07 - Setup Blit Color Pattern Address Lower Order Address bits |   |  |         |                       |
|--|---|--|---------|-----------------------|
| Project:   | CHV, BSW  |  |         |                       |
| Source:  | BlitterCS   |  |         |                       |
| Size (in bits):  | 32  |  |         |                       |
| Default Value:   | 0x00000000  |  |         |                       |
| DWord  | Bit   | Description  |         |                       |
| 0  | 31:6  | <p><b>Setup Blit Color Pattern Address</b></p> <table border="1"> <tr> <td>Format:</td> <td>GraphicsAddress[31:6]</td> </tr> </table> <p>Lower 32bits of the 48bit addressing.<br/>           These 26 bits specify the starting address of the (8X8) pixel color <b>pattern from the SETUP_BLT instruction</b>. This register works identically to the Pattern Address register (BR15), but this version is <b>only used with the SCANLINE_BLT instruction execution</b> (the actual programming for this, is done in XY_SETUP_BLT command). The pattern data must be located in linear memory.<br/>           The pattern data must be located on a pattern-size boundary. The pattern is always of 8x8 pixels, and therefore, its size is dependent upon its pixel depth. The pixel depth may be 8, 16, or 32 bits per pixel if the pattern is in color (the pixel depth of a color pattern must match the pixel depth to which the graphics system has been set). Monochrome patterns require 8 bytes and is supplied through the instruction. Color patterns of 8, 16, and 32 bits per pixel color depth must start on 64-byte, 128-byte and 256-byte boundaries, respectively.<br/>           The Pattern Base Address programmed, must always be Cache Line (64byte) aligned.</p> | Format: | GraphicsAddress[31:6] |
|  | Format:   | GraphicsAddress[31:6]  |         |                       |
| 5:0  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> | Format:  | MBZ     |                       |
| Format:  | MBZ   |  |         |                       |

## BR09 - Destination Address Lower Order Address Bits

| BR09 - Destination Address Lower Order Address Bits |                       |  |         |                       |
|---|-----------------------|--|---------|-----------------------|
| Project:  | CHV, BSW              |  |         |                       |
| Source:   | BlitterCS             |  |         |                       |
| Size (in bits):                                     | 32                    |  |         |                       |
| Default Value:                                      | 0x00000000            |  |         |                       |
| DWord   | Bit                   | Description  |         |                       |
| 0   | 31:0                  | <p><b>Destination Address Bits</b></p> <table border="1"> <tr> <td>Format:</td> <td>GraphicsAddress[31:0]</td> </tr> </table> <p>When tiling is enabled for XY-blits, this base address should be limited to 4KB. when tiling is disabled for XY-blits, this base address should be CL (64byte) aligned. These lower 32bits of the 48bit address, which specify the starting pixel address of the destination data. This register is also the working destination address register for the lower 32bits of the address, and changes as the BLT Engine performs the accesses. Used as the scan line address (Destination Y Address and Destination Y1 Address) for BLT instructions: PIXEL_BLT, SCANLINE_BLT, and TEXT_BLT. In this case the address points to the first pixel in a scan line and is compared with the ClipRect Y1 and Y2 address registers to determine whether the scan line should be written or not. The Destination Y1 address is the top scan line to be written for text. Note that for non-XY blits (COLOR_BLT, SRC_COPY_BLT), this address points to the first byte to be written. Note: Some instructions affect only one scan line (requiring only one coordinate); other instructions affect multiple scan lines and need both coordinates.</p> | Format: | GraphicsAddress[31:0] |
| Format:   | GraphicsAddress[31:0] |  |         |                       |

## BR11 - BLT Source Pitch (Offset)

| BR11 - BLT Source Pitch (Offset) |            |  |
|----------------------------------|------------|--|
| Project:                         | CHV, BSW   |  |
| Source:                          | BlitterCS  |  |
| Size (in bits):                  | 32         |  |
| Default Value:                   | 0x00000000 |  |
| DWord                            | Bit        | Description  |
| 0                                | 31:16      | <b>Reserved</b>  |
|                                  | 15:0       | <p><b>Source Pitch (Offset)</b></p> <p>For non-XY Blits with color source operand (SRC_COPY_BLT), the signed 16bit field allows for specifying upto + 32Kbytes signed pitch in bytes (same as before). For X, Y Blits with tiled-X surfaces, the pitch for Color Source will be 512Byte aligned and should be programmable upto + 128Kbytes. For X, Y Blits with tiled-Y surfaces, the pitch for Color Source will be 128Byte aligned and should be programmable upto + 128Kbytes. In this case, this 16bit signed pitch field is used to specify upto + 32KDWords. For X, Y blits with nontiled color source surfaces (linear surfaces), this 16bit field can be programmed to byte specification of upto + 32Kbytes (same as before). When the color source data is located within the frame buffer or AGP aperture, these signed 16 bits store the memory address offset (pitch) value by which the source address originally specified in the Source Address Register is incremented or decremented as each scan line's worth of source data is read from the frame buffer by the BLT Engine, so that the source address will point to the next memory address from which the next scan line's worth of source data is to be read. Note that if the intended source of a BLT operation is within on-screen frame buffer memory, this offset is normally set to accommodate the fact that each subsequent scan line's worth of source data lines up vertically with the source data in the scan line, above. However, if the intended source of a BLT operation is within off-screen memory, this offset can be set to accommodate a situation in which the source data exists as a single contiguous block of bytes where in each subsequent scan line's worth of source data is stored at a location immediately after the location where the source data for the last scan line ended.</p> |

## BR12 - Source Address Lower order Address bits

| BR12 - Source Address Lower order Address bits |                       |  |         |                       |
|--|-----------------------|--|---------|-----------------------|
| Project:                                       | CHV, BSW              |  |         |                       |
| Source:  | BlitterCS             |  |         |                       |
| Size (in bits):                                | 32                    |  |         |                       |
| Default Value:                                 | 0x00000000            |  |         |                       |
| DWord  | Bit                   | Description  |         |                       |
| 0  | 31:0                  | <p><b>Source Address Bits</b></p> <table border="1"> <tr> <td>Format:</td> <td>GraphicsAddress[31:0]</td> </tr> </table> <p>Lower 32bits of the 48bit addressing.<br/>                     When tiling is enabled for XY-blits with Color source surfaces, this base address should be limited to 4KB. When tiling is disabled for XY-blits, this base address should be CL (64byte) aligned.<br/>                     Note that for non-XY blit with Color Source (SRC_COPY_BLT), this address points to the first byte to be read.<br/>                     These lower 32bits of the 48bit address, specify the starting pixel address of the color source data. The lower 3 bits are used to indicate the position of the first valid byte within the first Quadword of the source data.<br/>                     If this Source happens to be a Monosource surface, then this Monosource Base Address programmed, must always be Cache Line (64byte) aligned.</p> | Format: | GraphicsAddress[31:0] |
| Format:  | GraphicsAddress[31:0] |  |         |                       |

## BR13 - BLT Raster OP, Control, and Destination Pitch

| BR13 - BLT Raster OP, Control, and Destination Pitch |   |  |           |  |             |   |           |  |   |  |  |
|--|---|--|-----------|--|-------------|---|-----------|--|---|--|--|
| Project:   | CHV, BSW  |  |           |  |             |   |           |  |   |  |  |
| Source:  | BlitterCS   |  |           |  |             |   |           |  |   |  |  |
| Size (in bits):                                      | 32  |  |           |  |             |   |           |  |   |  |  |
| Default Value:                                       | 0x00000000  |  |           |  |             |   |           |  |   |  |  |
| DWord  | Bit   | Description  |           |  |             |   |           |  |   |  |  |
| 0  | 31  | <p><b>Solid Pattern Select</b></p> <p>This bit applies only when the pattern data is monochrome. This bit determines whether or not the BLT Engine actually performs read operations from the frame buffer in order to load the pattern data. Use of this feature to prevent these read operations can increase BLT Engine performance, if use of the pattern data is indeed not necessary. The BLT Engine is configured to accept either monochrome or color pattern data via the opcode field.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>[Default]</td> <td>This causes normal operation with regard to the use of the pattern data. The BLT Engine proceeds with the process of reading the pattern data, and the pattern data is used as the pattern operand for all bit-wise operations.</td> </tr> <tr> <td>1</td> <td></td> <td>The BLT Engine forgoes the process of reading the pattern data, the presumption is made that all of the bits of the pattern data are set to 0, and the pattern operand for all bit-wise operations is forced to the background color specified in the Color Expansion Background Color Register.</td> </tr> </tbody> </table>  | Value     | Name   | Description | 0 | [Default] | This causes normal operation with regard to the use of the pattern data. The BLT Engine proceeds with the process of reading the pattern data, and the pattern data is used as the pattern operand for all bit-wise operations.  | 1 |  | The BLT Engine forgoes the process of reading the pattern data, the presumption is made that all of the bits of the pattern data are set to 0, and the pattern operand for all bit-wise operations is forced to the background color specified in the Color Expansion Background Color Register. |
|  |   | Value  | Name      | Description  |             |   |           |  |   |  |  |
|  |   | 0  | [Default] | This causes normal operation with regard to the use of the pattern data. The BLT Engine proceeds with the process of reading the pattern data, and the pattern data is used as the pattern operand for all bit-wise operations.  |             |   |           |  |   |  |  |
|  |   | 1  |           | The BLT Engine forgoes the process of reading the pattern data, the presumption is made that all of the bits of the pattern data are set to 0, and the pattern operand for all bit-wise operations is forced to the background color specified in the Color Expansion Background Color Register.   |             |   |           |  |   |  |  |
| 30   | <p><b>Clipping Enabled</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> </table>  | Default Value:   | 0         |  |             |   |           |  |   |  |  |
| Default Value:                                       | 0   |  |           |  |             |   |           |  |   |  |  |
| 29   |   | <p><b>Monochrome Source Transparency Mode</b></p> <p>This bit applies only when the source data is in monochrome. This bit determines whether or not the byte(s) at the destination corresponding to the pixel to which a given bit of the source data also corresponds will actually be written if that source data bit has the value of 0. This feature can make it possible to use the source as a transparency mask. The BLT Engine is configured to accepted either monochrome or color source data via the opcode field.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>[Default]</td> <td>This causes normal operation with regard to the use of the source data. Wherever a bit in the source data has the value of 0, the color specified in the background color register is used as the source operand in the bit-wise operation for the pixel corresponding to the source data bit, and the bytes at the destination corresponding to that pixel are written with the result.</td> </tr> <tr> <td>1</td> <td></td> <td>Where a bit in the source data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the source data bit also corresponds are simply not written, and the data at those byte(s) at the destination are allowed to remain unchanged.</td> </tr> </tbody> </table> | Value     | Name   | Description | 0 | [Default] | This causes normal operation with regard to the use of the source data. Wherever a bit in the source data has the value of 0, the color specified in the background color register is used as the source operand in the bit-wise operation for the pixel corresponding to the source data bit, and the bytes at the destination corresponding to that pixel are written with the result. | 1 |  | Where a bit in the source data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the source data bit also corresponds are simply not written, and the data at those byte(s) at the destination are allowed to remain unchanged.                             |
|  |   | Value  | Name      | Description  |             |   |           |  |   |  |  |
|  |   | 0  | [Default] | This causes normal operation with regard to the use of the source data. Wherever a bit in the source data has the value of 0, the color specified in the background color register is used as the source operand in the bit-wise operation for the pixel corresponding to the source data bit, and the bytes at the destination corresponding to that pixel are written with the result. |             |   |           |  |   |  |  |
| 1  |   | Where a bit in the source data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the source data bit also corresponds are simply not written, and the data at those byte(s) at the destination are allowed to remain unchanged.   |           |  |             |   |           |  |   |  |  |
| 28   | <p><b>Monochrome Pattern Transparency Mode</b></p> <p>This bit applies only when the pattern data is monochrome. This bit determines whether or not</p> |  |           |  |             |   |           |  |   |  |  |

## BR13 - BLT Raster OP, Control, and Destination Pitch

|                |  | <p>the byte(s) at the destination corresponding to the pixel to which a given bit of the pattern data also corresponds will actually be written if that pattern data bit has the value of 1. This feature can make it possible to use the pattern as a transparency mask. The BLT Engine is configured to accepted either monochrome or color pattern data via the opcode in the Opcode and Control register.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Value</th> <th style="width: 10%;">Name</th> <th style="width: 80%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;"><b>[Default]</b></td> <td>This causes normal operation with regard to the use of the pattern data. Where a bit in the pattern data has the value of 0, the color specified in the background color register is used as the pattern operand in the bit-wise operation for the pixel corresponding to the pattern data bit, and the bytes at the destination corresponding to that pixel are written with the result.</td> </tr> <tr> <td style="text-align: center;">1</td> <td></td> <td>Wherever a bit in the pattern data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the pattern data bit also corresponds are simply not written, and the data at those byte(s) at the destination are allowed to remain unchanged.</td> </tr> </tbody> </table> | Value     | Name | Description                        | 0   | <b>[Default]</b>    | This causes normal operation with regard to the use of the pattern data. Where a bit in the pattern data has the value of 0, the color specified in the background color register is used as the pattern operand in the bit-wise operation for the pixel corresponding to the pattern data bit, and the bytes at the destination corresponding to that pixel are written with the result. | 1                  |     | Wherever a bit in the pattern data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the pattern data bit also corresponds are simply not written, and the data at those byte(s) at the destination are allowed to remain unchanged. |
|----------------|--|--|-----------|------|------------------------------------|-----|---------------------|---|--------------------|-----|---|
| Value          | Name   | Description  |           |      |                                    |     |                     |   |                    |     |   |
| 0              | <b>[Default]</b>   | This causes normal operation with regard to the use of the pattern data. Where a bit in the pattern data has the value of 0, the color specified in the background color register is used as the pattern operand in the bit-wise operation for the pixel corresponding to the pattern data bit, and the bytes at the destination corresponding to that pixel are written with the result.  |           |      |                                    |     |                     |   |                    |     |   |
| 1              |  | Wherever a bit in the pattern data has the value of 0, the byte(s) at the destination corresponding to the pixel to which the pattern data bit also corresponds are simply not written, and the data at those byte(s) at the destination are allowed to remain unchanged.  |           |      |                                    |     |                     |   |                    |     |   |
| 27:26          | <p><b>32bpp Byte Mask</b><br/>This field is only used for 32bpp.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Value</th> <th style="width: 70%;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">00b</td> <td style="text-align: center;"><b>[Default]</b></td> </tr> <tr> <td style="text-align: center;">1xb</td> <td>Write Alpha Channel</td> </tr> <tr> <td style="text-align: center;">x1b</td> <td>Write RGB Channel</td> </tr> </tbody> </table>   | Value  | Name      | 00b  | <b>[Default]</b>                   | 1xb | Write Alpha Channel | x1b   | Write RGB Channel  |     |   |
| Value          | Name   |  |           |      |                                    |     |                     |   |                    |     |   |
| 00b            | <b>[Default]</b>   |  |           |      |                                    |     |                     |   |                    |     |   |
| 1xb            | Write Alpha Channel  |  |           |      |                                    |     |                     |   |                    |     |   |
| x1b            | Write RGB Channel  |  |           |      |                                    |     |                     |   |                    |     |   |
| 25:24          | <p><b>Color Depth</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Value</th> <th style="width: 70%;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">00b</td> <td>8 Bit Color Depth <b>[Default]</b></td> </tr> <tr> <td style="text-align: center;">01b</td> <td>16 Bit Color Depth</td> </tr> <tr> <td style="text-align: center;">10b</td> <td>24 Bit Color Depth</td> </tr> <tr> <td style="text-align: center;">11b</td> <td>Reserved</td> </tr> </tbody> </table>  | Value  | Name      | 00b  | 8 Bit Color Depth <b>[Default]</b> | 01b | 16 Bit Color Depth  | 10b   | 24 Bit Color Depth | 11b | Reserved  |
| Value          | Name   |  |           |      |                                    |     |                     |   |                    |     |   |
| 00b            | 8 Bit Color Depth <b>[Default]</b>   |  |           |      |                                    |     |                     |   |                    |     |   |
| 01b            | 16 Bit Color Depth   |  |           |      |                                    |     |                     |   |                    |     |   |
| 10b            | 24 Bit Color Depth   |  |           |      |                                    |     |                     |   |                    |     |   |
| 11b            | Reserved   |  |           |      |                                    |     |                     |   |                    |     |   |
| 23:16          | <p><b>Raster Operation Select</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Default Value:</td> <td style="text-align: center;">00000000b</td> </tr> </table> <p>These 8 bits are used to select which one of 256 possible raster operations is to be performed by the BLT Engine.</p>   | Default Value:   | 00000000b |      |                                    |     |                     |   |                    |     |   |
| Default Value: | 00000000b  |  |           |      |                                    |     |                     |   |                    |     |   |
| 15:0           | <p><b>Destination Pitch(Offset)</b></p> <p>These 16 bits store the signed memory address offset value by which the destination address originally specified in the Destination Address Register is incremented or decremented as each scan line's worth of destination data is written into the frame buffer by the BLT Engine, so that the destination address will point to the next memory address to which the next scan line's worth of destination data is to be written. If the intended destination of a BLT operation is within on-screen frame buffer memory, this offset is normally set so that each subsequent scan line's worth of destination data lines up vertically with the destination data in the scan line, above. However, if the intended destination of a BLT operation is within off-screen memory, this offset can be set</p> |  |           |      |                                    |     |                     |   |                    |     |   |

## BR13 - BLT Raster OP, Control, and Destination Pitch

|  |  |   |
|--|--|---|
|  |  | so that each subsequent scan line's worth of destination data is stored at a location immediately after the location where the destination data for the last scan line ended, in order to create a single contiguous block of bytes of destination data at the destination. |
|--|--|---|



## BR14 - Destination Width and Height

| <b>BR14 - Destination Width and Height</b>  |            |   |
|---|------------|---|
| Project:  | CHV, BSW   |   |
| Source:   | BlitterCS  |   |
| Size (in bits):   | 32         |   |
| Default Value:  | 0x00000000 |   |
| <p>BR14 contains the values for the height and width of the data to be BLT. If these values are not correct, such that the BLT Engine is either expecting data it does not receive or receives data it did not expect, the system can hang.</p> |            |   |
| DWord   | Bit        | Description   |
| 0   | 31:29      | <b>Reserved</b>   |
|   | 28:16      | <b>Destination Height</b><br>These 13 bits specify the height of the destination data in terms of the number of scan lines. This is a working register.   |
|   | 15:13      | <b>Reserved</b>   |
|   | 12:0       | <b>Destination Byte Width</b><br>These 13 bits specify the width of the destination data in terms of the number of bytes per scan line. The number of pixels per scan line into which this value translates depends upon the color depth to which the graphics system has been set. |

## BR15 - Color Pattern Address Lower order Address bits

| BR15 - Color Pattern Address Lower order Address bits |   |  |         |                       |
|---|---|--|---------|-----------------------|
| Project:  | CHV, BSW  |  |         |                       |
| Source:   | BlitterCS   |  |         |                       |
| Size (in bits):                                       | 32  |  |         |                       |
| Default Value:  | 0x00000000  |  |         |                       |
| DWord   | Bit   | Description  |         |                       |
| 0   | 31:6  | <p><b>Color Pattern Address</b></p> <table border="1"> <tr> <td>Format:</td> <td>GraphicsAddress[31:6]</td> </tr> </table> <p>Lower 32bits of the 48bit addressing.<br/>           There is no change to the Color Pattern address specification due to Non-Power-of-2 change. It remains the same as before. The pattern data must be located in linear memory.<br/>           These 26 bits specify the starting address of the (8X8) pixel color pattern.<br/>           The pattern data must be located on a pattern-size boundary. The pattern is always of 8x8 pixels, and therefore, its size is dependent upon its pixel depth. The pixel depth may be 8, 16, or 32 bits per pixel if the pattern is in color (the pixel depth of a color pattern must match the pixel depth to which the graphics system has been set). Monochrome patterns require 8 bytes and are applied through the instruction. Color patterns of 8, 16, and 32 bits per pixel color depth must start on 64-byte, 128-byte and 256-byte boundaries, respectively.<br/>           The Pattern Base Address programmed, must always be Cache Line (64byte) aligned.</p> | Format: | GraphicsAddress[31:6] |
|   | Format:   | GraphicsAddress[31:6]  |         |                       |
| 5:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> | Format:  | MBZ     |                       |
| Format:   | MBZ   |  |         |                       |

## BR16 - Pattern Expansion Background and Solid Pattern Color

| BR16 - Pattern Expansion Background and Solid Pattern Color |            |  |
|---|------------|--|
| Project:  | CHV, BSW   |  |
| Source:   | BlitterCS  |  |
| Size (in bits):   | 32         |  |
| Default Value:  | 0x00000000 |  |
| DWord   | Bit        | Description  |
| 0   | 31:0       | <p><b>Pattern Expansion Background Color Bits</b></p> <p>These bits provide the one, two, or four bytes worth of color data that select the background color to be used in the color expansion of monochrome pattern data during BLT operations. Whether one, two, or four bytes worth of color data is needed depends upon the color depth to which the BLT Engine has been set. For a color depth of 32bpp, 16bpp and 8bpp, bits [31:0], [15:0] and [7:0], respectively, are used.</p> |

## BR17 - Pattern Expansion Foreground Color

| BR17 - Pattern Expansion Foreground Color |            |  |
|---|------------|--|
| Project:                                  | CHV, BSW   |  |
| Source:                                   | BlitterCS  |  |
| Size (in bits):                           | 32         |  |
| Default Value:                            | 0x00000000 |  |
| DWord                                     | Bit        | Description  |
| 0   | 31:0       | <p><b>Pattern Expansion Background Color Bits</b></p> <p>These bits provide the one, two, or four bytes worth of color data that select the foreground color to be used in the color expansion of monochrome pattern data during BLT operations. Whether one, two, or four bytes worth of color data is needed depends upon the color depth to which the BLT Engine has been set. For a color depth of 32bpp, 16bpp and 8bpp, bits [31:0], [15:0] and [7:0], respectively, are used.</p> |

## BR18 - Source Expansion Background and Destination Color

| BR18 - Source Expansion Background and Destination Color |            |   |
|--|------------|---|
| Project:   | CHV, BSW   |   |
| Source:  | BlitterCS  |   |
| Size (in bits):  | 32         |   |
| Default Value:   | 0x00000000 |   |
| DWord  | Bit        | Description   |
| 0  | 31:0       | <p><b>Source Expansion Background Color Bits</b></p> <p>These bits provide the one, two, or four bytes worth of color data that select the background color to be used in the color expansion of monochrome source data during BLT operations. This register is also used to support destination transparency mode and Solid color fill. Whether one, two, three, or four bytes worth of color data is needed depends upon the color depth to which the BLT Engine has been set. For a color depth of 32bpp, 16bpp and 8bpp, bits [31:0], [15:0] and [7:0], respectively, are used.</p> |

## BR19 - Source Expansion Foreground Color

| BR19 - Source Expansion Foreground Color |            |  |
|--|------------|--|
| Project:                                 | CHV, BSW   |  |
| Source:                                  | BlitterCS  |  |
| Size (in bits):                          | 32         |  |
| Default Value:                           | 0x00000000 |  |
| DWord                                    | Bit        | Description  |
| 0  | 31:0       | <p><b>Pattern/Source Expansion Foreground Color Bits</b></p> <p>These bits provide the one, two, or four bytes worth of color data that select the foreground color to be used in the color expansion of monochrome source data during BLT operations. Whether one, two, or four bytes worth of color data is needed depends upon the color depth to which the BLT Engine has been set. For a color depth of 32bpp, 16bpp and 8bpp, bits [31:0], [15:0] and [7:0], respectively, are used.</p> |

## BR27 - Destination Address Higher Order Address

| BR27 - Destination Address Higher Order Address |  |   |                        |     |
|---|--|---|------------------------|-----|
| Project:  | CHV, BSW   |   |                        |     |
| Source:   | BlitterCS  |   |                        |     |
| Size (in bits):                                 | 32   |   |                        |     |
| Default Value:                                  | 0x00000000   |   |                        |     |
| DWord   | Bit  | Description   |                        |     |
| 0   | 31:16  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> | Format:                | MBZ |
|   | Format:  | MBZ   |                        |     |
| 15:0  | <p><b>Destination Address Upper DWORD</b></p> <table border="1"> <tr> <td>Format:</td> <td>GraphicsAddress[47:32]</td> </tr> </table> <p>When tiling is enabled for XY-blits, this base address should be limited to 4KB. Otherwise for XY blits, there is no restriction and it is same as before. These upper 16bits of the 48bit address, along with BR09 register, will specify the starting pixel address of the destination data. This register is also the working destination address register for the upper 16bits of the destination address, and changes as the BLT Engine performs the accesses. Used as the scan line address (Destination Y Address and Destination Y1 Address) for BLT instructions: PIXEL_BLT, SCANLINE_BLT, and TEXT_BLT. In this case the address points to the first pixel in a scan line and is compared with the ClipRect Y1 and Y2 address registers to determine whether the scan line should be written or not. The Destination Y1 address is the top scan line to be written for text. Note that for non-XY blits (COLOR_BLT, SRC_COPY_BLT), this 16bits of the 48bit address, along with BR09 register, points to the first byte to be written. This register is always the last register written for a BLT drawing instruction. Writing BR27 starts the BLT engine execution. Note: Some instructions affect only one scan line (requiring only one coordinate); other instructions affect multiple scan lines and need both coordinates.</p> | Format:   | GraphicsAddress[47:32] |     |
| Format:   | GraphicsAddress[47:32]   |   |                        |     |

## BR28 - Source Address Higher order Address

| BR28 - Source Address Higher order Address |  |   |                        |     |
|--|--|---|------------------------|-----|
| Project:                                   | CHV, BSW   |   |                        |     |
| Source:                                    | BlitterCS  |   |                        |     |
| Size (in bits):                            | 32   |   |                        |     |
| Default Value:                             | 0x00000000   |   |                        |     |
| DWord                                      | Bit  | Description   |                        |     |
| 0  | 31:16  | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table> |                        | MBZ |
|  |  | MBZ   |                        |     |
| 15:0                                       | <b>Source Address Upper DWORD</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>GraphicsAddress[47:32]</td></tr></table><br>These upper 16bits of the 48bit address, specify the starting pixel address of the color or mono source data. When tiling is enabled for XY-blits with Color source surfaces, this base address should be limited to 4KB. Otherwise for XY blits, there is no restriction and it is same as before, including for monosource and text blits. Note that for non-XY blit with Color Source (SRC_COPY_BLT), this address points to the first byte to be read. |   | GraphicsAddress[47:32] |     |
|  | GraphicsAddress[47:32]   |   |                        |     |



## BR29 - Color Pattern Address Higher order Address

| BR29 - Color Pattern Address Higher order Address |            |  |
|---|------------|--|
| Project:  | CHV, BSW   |  |
| Source:   | BlitterCS  |  |
| Size (in bits):                                   | 32         |  |
| Default Value:                                    | 0x00000000 |  |
| DWord   | Bit        | Description  |
| 0   | 31:16      | <b>Reserved</b><br>Format: <span style="border: 1px solid black; padding: 2px;">MBZ</span>   |
|   | 15:0       | <b>Color Pattern Address Upper DWORD</b><br>Format: <span style="border: 1px solid black; padding: 2px;">GraphicsAddress[47:32]</span><br>These upper 16bits of the 48bit address,specify the starting address of the (8X8) pixel pattern. |

## BR30 - Setup Blit Color Pattern Address Higher Order Address

| BR30 - Setup Blit Color Pattern Address Higher Order Address |            |   |
|--|------------|---|
| Project:   | CHV, BSW   |   |
| Source:  | BlitterCS  |   |
| Size (in bits):  | 32         |   |
| Default Value:   | 0x00000000 |   |
| DWord  | Bit        | Description   |
| 0  | 31:16      | <b>Reserved</b><br>Format: <span style="border: 1px solid black; padding: 2px;">MBZ</span>  |
|  | 15:0       | <b>Setup Blit Color Pattern Address Upper DWORD</b><br>Format: <span style="border: 1px solid black; padding: 2px;">GraphicsAddress[47:32]</span><br>These upper 16bits of the 48bit address,specify the starting address of the (8X8) pixel pattern. |

## Byte Masked Media Block Message Header

| <b>MH_MBBM - Byte Masked Media Block Message Header</b> |  |   |
|---|--|---|
| Project:  | CHV, BSW   |   |
| Source:   | DataPort 1   |   |
| Size (in bits):   | 256  |   |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |
| DWord   | Bit  | Description   |
| 0   | 31:0   | <b>X Offset</b>   |
|   |  | Project: All  |
|   |  | Format: S31   |
|   |  | X offset (in bytes) of the upper left corner of the block into the surface.                             |
|   |  | <b>Programming Notes</b>  |
|   |  | Must be DWord aligned (Bits 1:0 MBZ) for the write form of the message.                                 |
| 1   | 31:0   | <b>Y Offset</b>   |
|   |  | Project: All  |
|   |  | Format: S31   |
|   |  | Y offset (in rows) of the upper left corner of the block into the surface.                              |
| 2   | 31:0   | <b>Media Block Message Control</b>  |
|   |  | Project: All  |
|   |  | Format: MHC_MBBM_CONTROL [CHV, BSW]   |
|   |  | Specifies the Byte Masked message subtype and its additional input parameters.                          |
| 3   | 31:0   | <b>Byte Mask</b>  |
|   |  | Project: All  |
|   |  | Format: U32   |
|   |  | Specifies the Byte Mask for writes when Message Mode field is BYTE_MASK.                                |
|   |  | <b>Programming Notes</b>  |
|   |  | The Byte mask applies horizontally to each row of output: bit 0 for byte 0, through bit 31 for byte 31. |
| 4   | 31:0   | <b>FFTID</b>  |
|   |  | Project: All  |
|   |  | Format: MHC_FFTID [CHV, BSW]  |
|   |  | Fixed Function Thread ID  |
| 5-7   | 95:0   | <b>Reserved</b>   |

## MH\_MBBM - Byte Masked Media Block Message Header

|  |          |        |
|--|----------|--------|
|  | Project: | All    |
|  | Format:  | Ignore |
|  | Ignored  |        |

## Byte Masked Media Block Message Header Control

| MHC_MBBM_CONTROL - Byte Masked Media Block Message Header Control                             |                     |   |             |             |   |         |     |           |   |     |        |          |
|---|---------------------|---|-------------|-------------|---|---------|-----|-----------|---|-----|--------|----------|
| Project:  | CHV, BSW            |   |             |             |   |         |     |           |   |     |        |          |
| Source:   | PRM                 |   |             |             |   |         |     |           |   |     |        |          |
| Size (in bits):   | 32                  |   |             |             |   |         |     |           |   |     |        |          |
| Default Value:  | 0x00000000          |   |             |             |   |         |     |           |   |     |        |          |
| DWord   | Bit                 | Description   |             |             |   |         |     |           |   |     |        |          |
| 0   | 31:30               | <b>Message Mode</b>   |             |             |   |         |     |           |   |     |        |          |
|   |                     | Project:  | All         |             |   |         |     |           |   |     |        |          |
|   |                     | Format:   | Enumeration |             |   |         |     |           |   |     |        |          |
|   |                     | Specifies the Media Block Write Message subtype is Byte Masked.   |             |             |   |         |     |           |   |     |        |          |
|   |                     | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>02h</td> <td>BYTE_MASK</td> <td>The Block Height and Block Width fields are specified in this Dword. The Byte Mask qualifies which bytes are written.</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Reserved.</td> <td>All</td> </tr> </tbody> </table> | Value       | Name        | Description   | Project | 02h | BYTE_MASK | The Block Height and Block Width fields are specified in this Dword. The Byte Mask qualifies which bytes are written. | All | Others | Reserved |
| Value   | Name                | Description   | Project     |             |   |         |     |           |   |     |        |          |
| 02h   | BYTE_MASK           | The Block Height and Block Width fields are specified in this Dword. The Byte Mask qualifies which bytes are written.   | All         |             |   |         |     |           |   |     |        |          |
| Others  | Reserved            | Reserved.   | All         |             |   |         |     |           |   |     |        |          |
| 29  | Reserved            | Project:  | All         |             |   |         |     |           |   |     |        |          |
|   |                     | Format:   | Ignore      |             |   |         |     |           |   |     |        |          |
|   |                     | Ignored   |             |             |   |         |     |           |   |     |        |          |
| 28:24   | Sub-Register Offset | Project:  | All         |             |   |         |     |           |   |     |        |          |
|   |                     | Format:   | U5          |             |   |         |     |           |   |     |        |          |
|   |                     | This field is ignored (reserved) for Media Block Write message.   |             |             |   |         |     |           |   |     |        |          |
| 23:22   | Reserved            | Project:  | All         |             |   |         |     |           |   |     |        |          |
|   |                     | Format:   | Ignore      |             |   |         |     |           |   |     |        |          |
|   |                     | Ignored   |             |             |   |         |     |           |   |     |        |          |
| 21:16   | Block Height        | Project:  | All         |             |   |         |     |           |   |     |        |          |
|   |                     | Format:   | U6          |             |   |         |     |           |   |     |        |          |
|   |                     | Height in rows of block being accessed. Range = [0,63] representing 1 to 64 rows  |             |             |   |         |     |           |   |     |        |          |
|   |                     | <table border="1"> <thead> <tr> <th>Restriction</th> </tr> </thead> <tbody> <tr> <td>If Block Width (bytes), then Maximum Block Height (rows) is constrained by (# Dwords width) *</td> </tr> </tbody> </table>   |             | Restriction | If Block Width (bytes), then Maximum Block Height (rows) is constrained by (# Dwords width) * |         |     |           |   |     |        |          |
| Restriction   |                     |   |             |             |   |         |     |           |   |     |        |          |
| If Block Width (bytes), then Maximum Block Height (rows) is constrained by (# Dwords width) * |                     |   |             |             |   |         |     |           |   |     |        |          |

## MHC\_MBBM\_CONTROL - Byte Masked Media Block Message Header Control

|       |  |        |
|-------|--|--------|
|       | (# rows) <= 64 Dwords.   |        |
| 15:10 | <b>Reserved</b>  |        |
|       | Project:   | All    |
|       | Format:  | Ignore |
|       | Ignored  |        |
| 9:8   | <b>Register Pitch Control</b>  |        |
|       | Project:   | All    |
|       | Format:  | U2     |
|       | This field is ignored (reserved) for a Media Block Write message.                      |        |
| 7:6   | <b>Reserved</b>  |        |
|       | Project:   | All    |
|       | Format:  | Ignore |
|       | Ignored  |        |
| 5:0   | <b>Block Width</b>   |        |
|       | Project:   | All    |
|       | Format:  | U6     |
|       | Width in bytes of the block being accessed. Range = [0,31] representing 1 to 32 Bytes. |        |
|       | <b>Programming Notes</b>   |        |
|       | Must be DWord aligned for Media Block Write message.                                   |        |

## CC\_VIEWPORT

| <b>CC_VIEWPORT</b>  |                        |   |          |     |         |            |
|---|------------------------|---|----------|-----|---------|------------|
| Project:  | CHV, BSW               |   |          |     |         |            |
| Source:   | PRM                    |   |          |     |         |            |
| Size (in bits):   | 64                     |   |          |     |         |            |
| Default Value:  | 0x00000000, 0x00000000 |   |          |     |         |            |
| <p>The viewport state is stored as an array of up to 16 elements, each of which contains the DWords described here. The start of each element is spaced 2 DWords apart. The first element of the viewport state array is aligned to a 32-byte boundary. The Minimum Depth must be greater than or equal to zero on D16_UNORM, D24_UNORM_X8_UINT, or D24_UNORM_S8_UINT depth formats. The Minimum Depth must be greater than or equal to -1.0 for D32_FLOAT_S8X24_UINT or D32_FLOAT formats. The Maximum Depth must be less than or equal to +1.0. The max must be greater than or equal to the min.</p> |                        |   |          |     |         |            |
| DWord   | Bit                    | Description   |          |     |         |            |
| 0   | 31:0                   | <p><b>Minimum Depth</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>Indicates the minimum depth. The interpolated or computed depth is clamped to this value prior to the depth test.</p> <p style="text-align: center;"><b>Programming Notes</b></p> <p>The Minimum depth value must be less-than-or-equal to the Maximum depth value. The Minimum depth value cannot be NAN (Not-A-Number). The Minimum depth value must not be less than -1.0.</p> | Project: | All | Format: | IEEE_Float |
| Project:  | All                    |   |          |     |         |            |
| Format:   | IEEE_Float             |   |          |     |         |            |
| 1   | 31:0                   | <p><b>Maximum Depth</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>Indicates the maximum depth. The interpolated or computed depth is clamped to this value prior to the depth test.</p> <p style="text-align: center;"><b>Programming Notes</b></p> <p>The Maximum depth value cannot be NAN (Not-A-Number). The Maximum depth value must be less-than-or-equal to +1.0.</p>  | Project: | All | Format: | IEEE_Float |
| Project:  | All                    |   |          |     |         |            |
| Format:   | IEEE_Float             |   |          |     |         |            |

## Channel Mask Message Descriptor Control Field

| <b>MDC_CMASK - Channel Mask Message Descriptor Control Field</b> |                       |  |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
|--|-----------------------|--|---------|----------|-----|---------|-------------|-------|------|-------------|---------|-----|-----------------------|--|-----|-----|-----|-------------------------------------|-----|-----|-----|-----------------------------------|-----|-----|----|-----------------------------|-----|-----|-----|------------------------------------|-----|-----|----|------------------------------|-----|-----|----|----------------------------|-----|-----|---|-------------------|-----|-----|-----|-----------------------------------|-----|-----|----|-----------------------------|-----|-----|----|---------------------------|-----|-----|---|------------------|-----|-----|----|----------------------------|-----|-----|---|-------------------|-----|-----|---|-----------------|-----|-----|----------|---------|-----|
| Project:   | CHV, BSW              |  |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| Source:  | PRM                   |  |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| Size (in bits):  | 4                     |  |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| Default Value:   | 0x00000000            |  |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| DWord  | Bit                   | Description  |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 0  | 3:0                   | <b>Mask</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enumeration</td> </tr> </table> <p>For the read message, indicates that which channels are read from the surface and included in the writeback message. For the write message, indicates which channels are included in the message payload and written to the surface.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h</td> <td>RGBA <b>[Default]</b></td> <td>Red, Green, Blue, and Alpha are included</td> <td>All</td> </tr> <tr> <td>01h</td> <td>GBA</td> <td>Green, Blue, and Alpha are included</td> <td>All</td> </tr> <tr> <td>02h</td> <td>RBA</td> <td>Red, Blue, and Alpha are included</td> <td>All</td> </tr> <tr> <td>03h</td> <td>BA</td> <td>Blue and Alpha are included</td> <td>All</td> </tr> <tr> <td>04h</td> <td>RGA</td> <td>Red, Green, and Alpha are included</td> <td>All</td> </tr> <tr> <td>05h</td> <td>GA</td> <td>Green and Alpha are included</td> <td>All</td> </tr> <tr> <td>06h</td> <td>RA</td> <td>Red and Alpha are included</td> <td>All</td> </tr> <tr> <td>07h</td> <td>A</td> <td>Alpha is included</td> <td>All</td> </tr> <tr> <td>08h</td> <td>RGB</td> <td>Red, Green, and Blue are included</td> <td>All</td> </tr> <tr> <td>09h</td> <td>GB</td> <td>Green and Blue are included</td> <td>All</td> </tr> <tr> <td>0Ah</td> <td>RB</td> <td>Red and Blue are included</td> <td>All</td> </tr> <tr> <td>0Bh</td> <td>B</td> <td>Blue is included</td> <td>All</td> </tr> <tr> <td>0Ch</td> <td>RG</td> <td>Red and Green are included</td> <td>All</td> </tr> <tr> <td>0Dh</td> <td>G</td> <td>Green is included</td> <td>All</td> </tr> <tr> <td>0Eh</td> <td>R</td> <td>Red is included</td> <td>All</td> </tr> <tr> <td>0Fh</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </tbody> </table> |         | Project: | All | Format: | Enumeration | Value | Name | Description | Project | 00h | RGBA <b>[Default]</b> | Red, Green, Blue, and Alpha are included | All | 01h | GBA | Green, Blue, and Alpha are included | All | 02h | RBA | Red, Blue, and Alpha are included | All | 03h | BA | Blue and Alpha are included | All | 04h | RGA | Red, Green, and Alpha are included | All | 05h | GA | Green and Alpha are included | All | 06h | RA | Red and Alpha are included | All | 07h | A | Alpha is included | All | 08h | RGB | Red, Green, and Blue are included | All | 09h | GB | Green and Blue are included | All | 0Ah | RB | Red and Blue are included | All | 0Bh | B | Blue is included | All | 0Ch | RG | Red and Green are included | All | 0Dh | G | Green is included | All | 0Eh | R | Red is included | All | 0Fh | Reserved | Ignored | All |
| Project:   | All                   |  |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| Format:  | Enumeration           |  |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| Value  | Name                  | Description  | Project |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 00h  | RGBA <b>[Default]</b> | Red, Green, Blue, and Alpha are included   | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 01h  | GBA                   | Green, Blue, and Alpha are included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 02h  | RBA                   | Red, Blue, and Alpha are included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 03h  | BA                    | Blue and Alpha are included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 04h  | RGA                   | Red, Green, and Alpha are included   | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 05h  | GA                    | Green and Alpha are included   | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 06h  | RA                    | Red and Alpha are included   | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 07h  | A                     | Alpha is included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 08h  | RGB                   | Red, Green, and Blue are included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 09h  | GB                    | Green and Blue are included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 0Ah  | RB                    | Red and Blue are included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 0Bh  | B                     | Blue is included   | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 0Ch  | RG                    | Red and Green are included   | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 0Dh  | G                     | Green is included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 0Eh  | R                     | Red is included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |
| 0Fh  | Reserved              | Ignored  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                     |     |     |     |                                   |     |     |    |                             |     |     |     |                                    |     |     |    |                              |     |     |    |                            |     |     |   |                   |     |     |     |                                   |     |     |    |                             |     |     |    |                           |     |     |   |                  |     |     |    |                            |     |     |   |                   |     |     |   |                 |     |     |          |         |     |



## Channel Mode Message Descriptor Control Field

| <b>MDC_CMODE - Channel Mode Message Descriptor Control Field</b> |              |  |             |
|--|--------------|--|-------------|
| Project:   | CHV, BSW     |  |             |
| Source:  | PRM          |  |             |
| Size (in bits):  | 1            |  |             |
| Default Value:   | 0x00000000   |  |             |
| DWord  | Bit          | Description  |             |
| 0  | 0            | <b>Channel Mode</b>  |             |
|  |              | Project:   | All         |
|  |              | Format:  | Enumeration |
|  |              | Two modes of channel-enable are provided: a SIMD8 or SIMD16 Dword channel serial view of a register, and a SIMD4x2 view of a register. |             |
| Value  | Name         | Description  | Project     |
| 0  | Oword        | All 4 Dwords are read or written if one or more of these channels are enabled  | All         |
| 1  | <b>Dword</b> | Each Dword is read or written only if its corresponding channel is enabled.  | All         |

## COLOR\_CALC\_STATE

| COLOR_CALC_STATE   |   |   |  |
|--|---|---|--|
| Project:   | CHV, BSW  |   |  |
| Source:  | PRM   |   |  |
| Size (in bits):  | 192   |   |  |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000  |   |  |
| This definition applies to [CHV, BSW] devices. It is pointed to by a field in 3DSTATE_CC_STATE_POINTERS, and stored at a 64-byte aligned boundary.                 |   |   |  |
| DWord  | Bit   | Description                             |  |
| 0  | 31:24   | <b>Stencil Reference Value</b>          |  |
|  |   | Project:                                | CHV, BSW   |
|  |   | Format:                                 | U8.0   |
|  | This field specifies the stencil reference value to compare against in the (front face) StencilTest function. |   |  |
|  | 23:16   | <b>BackFace Stencil Reference Value</b> |  |
| Project:   |   | CHV, BSW                                |  |
| Format:  |   | U8.0                                    |  |
| This field specifies the stencil reference value to compare against in the StencilTest function.   |   |   |  |
| 15   | <b>Round Disable Function Disable</b>   |   |  |
|  | Disables the round-disable function of the color calculator.  |   |  |
|  | <b>Value</b>  | <b>Name</b> <b>Description</b>          |  |
|  | 0   | Cancelled                               | Dithering is cancelled based on the data used by blend to avoid drift. |
| 1  | Not Cancelled   | Dithering is NOT cancelled.             |  |
| 14:1   | <b>Reserved</b>   |   |  |
|  | Format:   | MBZ                                     |  |
| 0  | <b>Alpha Test Format</b>  |   |  |
|  | This field selects the format for Alpha Reference Value and the format in which Alpha Test is performed.      |   |  |
|  | <b>Value</b>  | <b>Name</b> <b>Description</b>          |  |
|  | 0h  | ALPHATEST_UNORM8                        | UNorm8   |
|  | 1h  | ALPHATEST_FLOAT32                       | Float32  |
|  | <b>Programming Notes</b>  |   |  |
| Alpha-test format is independent of RT format. When PS outputs UNIT/SINT alpha-value, it will be treated as IEEE 32bit float number for the purpose of alpha-test. |   |   |  |
| 1  | 31:0  | <b>Alpha Reference Value As UNORM8</b>  |  |

| <b>COLOR_CALC_STATE</b> |  |  |            |  |         |                          |
|-------------------------|--|--|------------|--|---------|--------------------------|
|                         |  | <table border="1"> <tr> <td>Exists If:</td> <td>[Alpha Test Format] == 'ALPHATEST_UNORM8'</td> </tr> <tr> <td>Format:</td> <td>UNORM8 Upper 24 bits MBZ</td> </tr> </table> <p>This field specifies the alpha reference value to compare against in the Alpha Test function.</p>                                   | Exists If: | [Alpha Test Format] == 'ALPHATEST_UNORM8'  | Format: | UNORM8 Upper 24 bits MBZ |
| Exists If:              | [Alpha Test Format] == 'ALPHATEST_UNORM8'  |  |            |  |         |                          |
| Format:                 | UNORM8 Upper 24 bits MBZ                   |  |            |  |         |                          |
|                         | 31:0                                       | <p><b>Alpha Reference Value As FLOAT32</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>[Alpha Test Format] == 'ALPHATEST_FLOAT32'</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This field specifies the alpha reference value to compare against in the Alpha Test function.</p> | Exists If: | [Alpha Test Format] == 'ALPHATEST_FLOAT32' | Format: | IEEE_Float               |
| Exists If:              | [Alpha Test Format] == 'ALPHATEST_FLOAT32' |  |            |  |         |                          |
| Format:                 | IEEE_Float                                 |  |            |  |         |                          |
| 2                       | 31:0                                       | <p><b>Blend Constant Color Red</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This field specifies the Red channel of the Constant Color used in Color Buffer Blending.</p>  | Format:    | IEEE_Float                                 |         |                          |
| Format:                 | IEEE_Float                                 |  |            |  |         |                          |
| 3                       | 31:0                                       | <p><b>Blend Constant Color Green</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This field specifies the Green channel of the Constant Color used in Color Buffer Blending.</p>  | Format:    | IEEE_Float                                 |         |                          |
| Format:                 | IEEE_Float                                 |  |            |  |         |                          |
| 4                       | 31:0                                       | <p><b>Blend Constant Color Blue</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This field specifies the Blue channel of the Constant Color used in Color Buffer Blending.</p>  | Format:    | IEEE_Float                                 |         |                          |
| Format:                 | IEEE_Float                                 |  |            |  |         |                          |
| 5                       | 31:0                                       | <p><b>Blend Constant Color Alpha</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This field specifies the Alpha channel of the Constant Color used in Color Buffer Blending.</p>  | Format:    | IEEE_Float                                 |         |                          |
| Format:                 | IEEE_Float                                 |  |            |  |         |                          |

## COLOR\_PROCESSING\_STATE - ACE State

| COLOR_PROCESSING_STATE - ACE State   |   |   |                |         |         |      |      |  |    |           |
|--|---|---|----------------|---------|---------|------|------|--|----|-----------|
| Project:   | CHV, BSW  |   |                |         |         |      |      |  |    |           |
| Source:  | PRM   |   |                |         |         |      |      |  |    |           |
| Size (in bits):  | 416   |   |                |         |         |      |      |  |    |           |
| Default Value:   | 0x00000068, 0x4C382410, 0x9C887460, 0xEBD8C4B0, 0x604C3824, 0xB09C8874, 0x0000D8C4, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000  |   |                |         |         |      |      |  |    |           |
| This state structure contains the ACE state used by the color processing function. It corresponds to DW29..DW41 of the Color Processing State. |   |   |                |         |         |      |      |  |    |           |
| DWord  | Bit   | Description   |                |         |         |      |      |  |    |           |
| 0  | 31:7  | <b>Reserved</b><br><table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:        | MBZ     |         |      |      |  |    |           |
|  | Format:   | MBZ   |                |         |         |      |      |  |    |           |
|  | 6:2   | <b>Skin Threshold</b><br><table border="1"> <tr> <td>Format:</td> <td>U5</td> </tr> </table> <p>Used for Y analysis (min/max) for pixels which are higher than skin threshold.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>1-31</td> <td></td> </tr> <tr> <td>26</td> <td>[Default]</td> </tr> </tbody> </table> | Format:        | U5      | Value   | Name | 1-31 |  | 26 | [Default] |
|  | Format:   | U5  |                |         |         |      |      |  |    |           |
| Value  | Name  |   |                |         |         |      |      |  |    |           |
| 1-31   |   |   |                |         |         |      |      |  |    |           |
| 26   | [Default]   |   |                |         |         |      |      |  |    |           |
| 1  | <b>Full Image Histogram</b><br><table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>Used to ignore the area of interest for full image histogram.</p> | Default Value:  | 0              | Format: | Enable  |      |      |  |    |           |
| Default Value:   | 0   |   |                |         |         |      |      |  |    |           |
| Format:  | Enable  |   |                |         |         |      |      |  |    |           |
| 0  | <b>ACE Enable</b><br><table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table>  | Format:   | Enable         |         |         |      |      |  |    |           |
| Format:  | Enable  |   |                |         |         |      |      |  |    |           |
| 1  | 31:24   | <b>Y3</b><br><table border="1"> <tr> <td>Default Value:</td> <td>76</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 3 in PWL.</p>   | Default Value: | 76      | Format: | U8   |      |  |    |           |
|  | Default Value:  | 76  |                |         |         |      |      |  |    |           |
|  | Format:   | U8  |                |         |         |      |      |  |    |           |
| 23:16  | <b>Y2</b><br><table border="1"> <tr> <td>Default Value:</td> <td>56</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 2 in PWL.</p>                                       | Default Value:  | 56             | Format: | U8      |      |      |  |    |           |
| Default Value:   | 56  |   |                |         |         |      |      |  |    |           |
| Format:  | U8  |   |                |         |         |      |      |  |    |           |
| 15:8   | <b>Y1</b>   |   |                |         |         |      |      |  |    |           |

| COLOR_PROCESSING_STATE - ACE State |   |  |                |                |                |         |         |    |
|------------------------------------|---|--|----------------|----------------|----------------|---------|---------|----|
|                                    |   | <table border="1"> <tr> <td>Default Value:</td> <td>36</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 1 in PWL.</p>   | Default Value: | 36             | Format:        | U8      |         |    |
|                                    |   | Default Value:   | 36             |                |                |         |         |    |
| Format:                            | U8  |  |                |                |                |         |         |    |
| 7:0                                | <b>Ymin</b>   | <table border="1"> <tr> <td>Default Value:</td> <td>16</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 0 in PWL.</p>   | Default Value: | 16             | Format:        | U8      |         |    |
|                                    |   | Default Value:   | 16             |                |                |         |         |    |
| Format:                            | U8  |  |                |                |                |         |         |    |
| 2                                  | 31:24   | <table border="1"> <tr> <td colspan="2"><b>Y7</b></td> </tr> <tr> <td>Default Value:</td> <td>156</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 7 in PWL.</p>    | <b>Y7</b>      |                | Default Value: | 156     | Format: | U8 |
|                                    | <b>Y7</b>   |  |                |                |                |         |         |    |
|                                    | Default Value:  | 156  |                |                |                |         |         |    |
|                                    | Format:   | U8   |                |                |                |         |         |    |
| 23:16                              | <table border="1"> <tr> <td colspan="2"><b>Y6</b></td> </tr> <tr> <td>Default Value:</td> <td>136</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 6 in PWL.</p>   | <b>Y6</b>  |                | Default Value: | 136            | Format: | U8      |    |
| <b>Y6</b>                          |   |  |                |                |                |         |         |    |
| Default Value:                     | 136   |  |                |                |                |         |         |    |
| Format:                            | U8  |  |                |                |                |         |         |    |
| 15:8                               | <table border="1"> <tr> <td colspan="2"><b>Y5</b></td> </tr> <tr> <td>Default Value:</td> <td>116</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 5 in PWL.</p>   | <b>Y5</b>  |                | Default Value: | 116            | Format: | U8      |    |
| <b>Y5</b>                          |   |  |                |                |                |         |         |    |
| Default Value:                     | 116   |  |                |                |                |         |         |    |
| Format:                            | U8  |  |                |                |                |         |         |    |
| 7:0                                | <table border="1"> <tr> <td colspan="2"><b>Y4</b></td> </tr> <tr> <td>Default Value:</td> <td>96</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 4 in PWL.</p>    | <b>Y4</b>  |                | Default Value: | 96             | Format: | U8      |    |
| <b>Y4</b>                          |   |  |                |                |                |         |         |    |
| Default Value:                     | 96  |  |                |                |                |         |         |    |
| Format:                            | U8  |  |                |                |                |         |         |    |
| 3                                  | 31:24   | <table border="1"> <tr> <td colspan="2"><b>Ymax</b></td> </tr> <tr> <td>Default Value:</td> <td>235</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 11 in PWL.</p> | <b>Ymax</b>    |                | Default Value: | 235     | Format: | U8 |
|                                    | <b>Ymax</b>   |  |                |                |                |         |         |    |
| Default Value:                     | 235   |  |                |                |                |         |         |    |
| Format:                            | U8  |  |                |                |                |         |         |    |
| 23:16                              | <table border="1"> <tr> <td colspan="2"><b>Y10</b></td> </tr> <tr> <td>Default Value:</td> <td>216</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 10 in PWL.</p> | <b>Y10</b>   |                | Default Value: | 216            | Format: | U8      |    |
| <b>Y10</b>                         |   |  |                |                |                |         |         |    |
| Default Value:                     | 216   |  |                |                |                |         |         |    |
| Format:                            | U8  |  |                |                |                |         |         |    |

| COLOR_PROCESSING_STATE - ACE State |   |  |                |         |         |    |
|------------------------------------|---|--|----------------|---------|---------|----|
|                                    | 15:8  | <p><b>Y9</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>196</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 9 in PWL.</p> | Default Value: | 196     | Format: | U8 |
|                                    | Default Value:  | 196  |                |         |         |    |
| Format:                            | U8  |  |                |         |         |    |
|                                    | 7:0   | <p><b>Y8</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>176</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the y_pixel for point 8 in PWL.</p> | Default Value: | 176     | Format: | U8 |
| Default Value:                     | 176   |  |                |         |         |    |
| Format:                            | U8  |  |                |         |         |    |
| 4                                  | 31:24   | <p><b>B4</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>96</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 4 in PWL.</p>     | Default Value: | 96      | Format: | U8 |
|                                    | Default Value:  | 96   |                |         |         |    |
|                                    | Format:   | U8   |                |         |         |    |
|                                    | 23:16   | <p><b>B3</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>76</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 3 in PWL.</p>     | Default Value: | 76      | Format: | U8 |
| Default Value:                     | 76  |  |                |         |         |    |
| Format:                            | U8  |  |                |         |         |    |
| 15:8                               | <p><b>B2</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>56</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 2 in PWL.</p>  | Default Value:   | 56             | Format: | U8      |    |
| Default Value:                     | 56  |  |                |         |         |    |
| Format:                            | U8  |  |                |         |         |    |
| 7:0                                | <p><b>B1</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>36</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 1 in PWL.</p>  | Default Value:   | 36             | Format: | U8      |    |
| Default Value:                     | 36  |  |                |         |         |    |
| Format:                            | U8  |  |                |         |         |    |
| 5                                  | 31:24   | <p><b>B8</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>176</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 8 in PWL.</p>    | Default Value: | 176     | Format: | U8 |
|                                    | Default Value:  | 176  |                |         |         |    |
| Format:                            | U8  |  |                |         |         |    |
| 23:16                              | <p><b>B7</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>156</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 7 in PWL.</p> | Default Value:   | 156            | Format: | U8      |    |
| Default Value:                     | 156   |  |                |         |         |    |
| Format:                            | U8  |  |                |         |         |    |

| COLOR_PROCESSING_STATE - ACE State |   |   |                |         |         |    |
|------------------------------------|---|---|----------------|---------|---------|----|
|                                    | 15:8  | <p><b>B6</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>136</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 6 in PWL.</p>   | Default Value: | 136     | Format: | U8 |
|                                    | Default Value:  | 136   |                |         |         |    |
| Format:                            | U8  |   |                |         |         |    |
|                                    | 7:0   | <p><b>B5</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>116</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 5 in PWL.</p>   | Default Value: | 116     | Format: | U8 |
| Default Value:                     | 116   |   |                |         |         |    |
| Format:                            | U8  |   |                |         |         |    |
| 6                                  | 31:16   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:        | MBZ     |         |    |
|                                    | Format:   | MBZ   |                |         |         |    |
|                                    | 15:8  | <p><b>B10</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>216</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 10 in PWL.</p> | Default Value: | 216     | Format: | U8 |
| Default Value:                     | 216   |   |                |         |         |    |
| Format:                            | U8  |   |                |         |         |    |
| 7:0                                | <p><b>B9</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>196</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>The value of the bias for point 9 in PWL.</p> | Default Value:  | 196            | Format: | U8      |    |
| Default Value:                     | 196   |   |                |         |         |    |
| Format:                            | U8  |   |                |         |         |    |
| 7                                  | 31:27   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:        | MBZ     |         |    |
|                                    | Format:   | MBZ   |                |         |         |    |
|                                    | 26:16   | <p><b>S1</b></p> <table border="1"> <tr> <td>Format:</td> <td>U1.10</td> </tr> </table> <p>The value of the slope for point 1 in PWL. The default is 1024/1024.</p>                     | Format:        | U1.10   |         |    |
|                                    | Format:   | U1.10   |                |         |         |    |
| 15:11                              | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:   | MBZ            |         |         |    |
| Format:                            | MBZ   |   |                |         |         |    |
| 10:0                               | <p><b>S0</b></p> <table border="1"> <tr> <td>Format:</td> <td>U1.10</td> </tr> </table> <p>The value of the slope for point 0 in PWL. The default is 1024/1024.</p>                   | Format:   | U1.10          |         |         |    |
| Format:                            | U1.10   |   |                |         |         |    |
| 8                                  | 31:27   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:        | MBZ     |         |    |
|                                    | Format:   | MBZ   |                |         |         |    |
| 26:16                              | <p><b>S3</b></p>  |   |                |         |         |    |

| <b>COLOR_PROCESSING_STATE - ACE State</b>                            |  |  |         |  |  |  |
|--|--|--|---------|--|--|--|
|  |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">U1.10</td> </tr> <tr> <td colspan="2">The value of the slope for point 3 in PWL. The default is 1024/1024.</td> </tr> </table> | Format: | U1.10  | The value of the slope for point 3 in PWL. The default is 1024/1024. |  |
|  | Format:  | U1.10  |         |  |  |  |
|  | The value of the slope for point 3 in PWL. The default is 1024/1024.   |  |         |  |  |  |
| 15:11  | <b>Reserved</b>  |  |         |  |  |  |
|  |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">MBZ</td> </tr> </table>  | Format: | MBZ  |  |  |
|  | Format:  | MBZ  |         |  |  |  |
|  | 10:0   | <b>S2</b>  |         |  |  |  |
|  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">U1.10</td> </tr> <tr> <td colspan="2">The value of the slope for point 2 in PWL. The default is 1024/1024.</td> </tr> </table> | Format:  | U1.10   | The value of the slope for point 2 in PWL. The default is 1024/1024. |  |  |
| Format:  | U1.10  |  |         |  |  |  |
| The value of the slope for point 2 in PWL. The default is 1024/1024. |  |  |         |  |  |  |
| 9  | 31:27  | <b>Reserved</b>  |         |  |  |  |
|  |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">MBZ</td> </tr> </table>  | Format: | MBZ  |  |  |
|  | Format:  | MBZ  |         |  |  |  |
|  | 26:16  | <b>S5</b>  |         |  |  |  |
|  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">U1.10</td> </tr> <tr> <td colspan="2">The value of the slope for point 5 in PWL. The default is 1024/1024.</td> </tr> </table> | Format:  | U1.10   | The value of the slope for point 5 in PWL. The default is 1024/1024. |  |  |
| Format:  | U1.10  |  |         |  |  |  |
| The value of the slope for point 5 in PWL. The default is 1024/1024. |  |  |         |  |  |  |
| 9  | 15:11  | <b>Reserved</b>  |         |  |  |  |
|  |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">MBZ</td> </tr> </table>  | Format: | MBZ  |  |  |
|  | Format:  | MBZ  |         |  |  |  |
|  | 10:0   | <b>S4</b>  |         |  |  |  |
|  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">U1.10</td> </tr> <tr> <td colspan="2">The value of the slope for point 4 in PWL. The default is 1024/1024.</td> </tr> </table> | Format:  | U1.10   | The value of the slope for point 4 in PWL. The default is 1024/1024. |  |  |
| Format:  | U1.10  |  |         |  |  |  |
| The value of the slope for point 4 in PWL. The default is 1024/1024. |  |  |         |  |  |  |
| 10   | 31:27  | <b>Reserved</b>  |         |  |  |  |
|  |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">MBZ</td> </tr> </table>  | Format: | MBZ  |  |  |
|  | Format:  | MBZ  |         |  |  |  |
|  | 26:16  | <b>S7</b>  |         |  |  |  |
|  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">U1.10</td> </tr> <tr> <td colspan="2">The value of the slope for point 7 in PWL. The default is 1024/1024.</td> </tr> </table> | Format:  | U1.10   | The value of the slope for point 7 in PWL. The default is 1024/1024. |  |  |
| Format:  | U1.10  |  |         |  |  |  |
| The value of the slope for point 7 in PWL. The default is 1024/1024. |  |  |         |  |  |  |
| 10   | 15:11  | <b>Reserved</b>  |         |  |  |  |
|  |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">MBZ</td> </tr> </table>  | Format: | MBZ  |  |  |
|  | Format:  | MBZ  |         |  |  |  |
|  | 10:0   | <b>S6</b>  |         |  |  |  |
|  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">U1.10</td> </tr> <tr> <td colspan="2">The value of the slope for point 6 in PWL. The default is 1024/1024.</td> </tr> </table> | Format:  | U1.10   | The value of the slope for point 6 in PWL. The default is 1024/1024. |  |  |
| Format:  | U1.10  |  |         |  |  |  |
| The value of the slope for point 6 in PWL. The default is 1024/1024. |  |  |         |  |  |  |
| 11   | 31:27  | <b>Reserved</b>  |         |  |  |  |
|  |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">MBZ</td> </tr> </table>  | Format: | MBZ  |  |  |
| Format:  | MBZ  |  |         |  |  |  |
| 11   | 26:16  | <b>S9</b>  |         |  |  |  |
|  |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">U1.10</td> </tr> <tr> <td colspan="2">The value of the slope for point 9 in PWL. The default is 1024/1024.</td> </tr> </table> | Format: | U1.10  | The value of the slope for point 9 in PWL. The default is 1024/1024. |  |
| Format:  | U1.10  |  |         |  |  |  |
| The value of the slope for point 9 in PWL. The default is 1024/1024. |  |  |         |  |  |  |



| <b>COLOR_PROCESSING_STATE - ACE State</b> |       |   |
|---|-------|---|
|   | 15:11 | <b>Reserved</b><br>Format: <span style="float: right;">MBZ</span>   |
|   | 10:0  | <b>S8</b><br>Format: <span style="float: right;">U1.10</span><br>The value of the slope for point 8 in PWL. The default is 1024/1024.   |
| 12  | 31:11 | <b>Reserved</b><br>Format: <span style="float: right;">MBZ</span>   |
|   | 10:0  | <b>S10</b><br>Format: <span style="float: right;">U1.10</span><br>The value of the slope for point 10 in PWL. The default is 1024/1024. |

## COLOR\_PROCESSING\_STATE - CSC State

| COLOR_PROCESSING_STATE - CSC State   |  |   |
|--|--|---|
| Project:   | CHV, BSW   |   |
| Source:  | PRM  |   |
| Size (in bits):  | 288  |   |
| Default Value:   | 0x00002000, 0x00000000, 0x00000400, 0x00000000, 0x000004B4, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |
| This state structure contains the CSC state used by the color processing function. It corresponds to DW55..DW63 of the Color Processing State. |  |   |
| DWord  | Bit  | Description   |
| 0  | 31:29  | <b>Reserved</b>                                       |
|  |  | Format: MBZ   |
|  | 28:16  | <b>C1</b>   |
|  |  | Default Value: 0                                      |
|  |  | Format: S2.10 2's complement<br>Transform coefficient |
|  | 15:3   | <b>C0</b>   |
|  |  | Default Value: 1024                                   |
| Format: S2.10 2's complement<br>Transform coefficient  |  |   |
| 2  | <b>YUV_IN</b>  |   |
|  | Default Value: 0   |   |
|  | Format: YUV<br>CSC input offset enable.  |   |
| 1  | <b>YUV_OUT</b>   |   |
|  | Default Value: 0   |   |
|  | Format: RGB<br>CSC output offset enable.   |   |
| 0  | <b>Transform Enable</b>  |   |
|  | Format: Enable   |   |
| 1  | 31:26  | <b>Reserved</b>                                       |
|  |  | Format: MBZ   |
|  | 25:13  | <b>C3</b>   |

| COLOR_PROCESSING_STATE - CSC State |                      |   |                |      |         |                      |                        |  |
|------------------------------------|----------------------|---|----------------|------|---------|----------------------|------------------------|--|
|                                    |                      | <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>S2.10 2's complement</td> </tr> <tr> <td colspan="2">Transform coefficient.</td> </tr> </table>    | Default Value: | 0    | Format: | S2.10 2's complement | Transform coefficient. |  |
|                                    |                      | Default Value:  | 0              |      |         |                      |                        |  |
| Format:                            | S2.10 2's complement |   |                |      |         |                      |                        |  |
| Transform coefficient.             |                      |   |                |      |         |                      |                        |  |
| 12:0                               | <b>C2</b>            | <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>S2.10 2's complement</td> </tr> <tr> <td colspan="2">Transform coefficient.</td> </tr> </table>    | Default Value: | 0    | Format: | S2.10 2's complement | Transform coefficient. |  |
| Default Value:                     | 0                    |   |                |      |         |                      |                        |  |
| Format:                            | S2.10 2's complement |   |                |      |         |                      |                        |  |
| Transform coefficient.             |                      |   |                |      |         |                      |                        |  |
| 2                                  | 31:26                | <b>Reserved</b>   |                |      |         |                      |                        |  |
|                                    |                      | <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ  |         |                      |                        |  |
|                                    | Format:              | MBZ   |                |      |         |                      |                        |  |
| 25:13                              | <b>C5</b>            |   |                |      |         |                      |                        |  |
|                                    |                      | <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>S2.10 2's complement</td> </tr> <tr> <td colspan="2">Transform coefficient.</td> </tr> </table>    | Default Value: | 0    | Format: | S2.10 2's complement | Transform coefficient. |  |
| Default Value:                     | 0                    |   |                |      |         |                      |                        |  |
| Format:                            | S2.10 2's complement |   |                |      |         |                      |                        |  |
| Transform coefficient.             |                      |   |                |      |         |                      |                        |  |
|                                    | 12:0                 | <b>C4</b>   |                |      |         |                      |                        |  |
|                                    |                      | <table border="1"> <tr> <td>Default Value:</td> <td>1024</td> </tr> <tr> <td>Format:</td> <td>S2.10 2's complement</td> </tr> <tr> <td colspan="2">Transform coefficient.</td> </tr> </table> | Default Value: | 1024 | Format: | S2.10 2's complement | Transform coefficient. |  |
| Default Value:                     | 1024                 |   |                |      |         |                      |                        |  |
| Format:                            | S2.10 2's complement |   |                |      |         |                      |                        |  |
| Transform coefficient.             |                      |   |                |      |         |                      |                        |  |
| 3                                  | 31:26                | <b>Reserved</b>   |                |      |         |                      |                        |  |
|                                    |                      | <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ  |         |                      |                        |  |
|                                    | Format:              | MBZ   |                |      |         |                      |                        |  |
| 25:13                              | <b>C7</b>            |   |                |      |         |                      |                        |  |
|                                    |                      | <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>S2.10 2's complement</td> </tr> <tr> <td colspan="2">Transform coefficient.</td> </tr> </table>    | Default Value: | 0    | Format: | S2.10 2's complement | Transform coefficient. |  |
| Default Value:                     | 0                    |   |                |      |         |                      |                        |  |
| Format:                            | S2.10 2's complement |   |                |      |         |                      |                        |  |
| Transform coefficient.             |                      |   |                |      |         |                      |                        |  |
|                                    | 12:0                 | <b>C6</b>   |                |      |         |                      |                        |  |
|                                    |                      | <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>S2.10 2's complement</td> </tr> <tr> <td colspan="2">Transform coefficient.</td> </tr> </table>    | Default Value: | 0    | Format: | S2.10 2's complement | Transform coefficient. |  |
| Default Value:                     | 0                    |   |                |      |         |                      |                        |  |
| Format:                            | S2.10 2's complement |   |                |      |         |                      |                        |  |
| Transform coefficient.             |                      |   |                |      |         |                      |                        |  |
| 4                                  | 31:13                | <b>Reserved</b>   |                |      |         |                      |                        |  |
|                                    |                      | <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ  |         |                      |                        |  |
| Format:                            | MBZ                  |   |                |      |         |                      |                        |  |
|                                    | 12:0                 | <b>C8</b>   |                |      |         |                      |                        |  |
|                                    |                      | <table border="1"> <tr> <td>Default Value:</td> <td>1204</td> </tr> <tr> <td>Format:</td> <td>S2.10 2's complement</td> </tr> </table>  | Default Value: | 1204 | Format: | S2.10 2's complement |                        |  |
| Default Value:                     | 1204                 |   |                |      |         |                      |                        |  |
| Format:                            | S2.10 2's complement |   |                |      |         |                      |                        |  |

| <b>COLOR_PROCESSING_STATE - CSC State</b> |       |   |   |
|---|-------|---|---|
|   |       | Transform coefficient.  |   |
| 5   | 31:20 | <b>Reserved</b><br>Format: _____ MBZ  |   |
|   | 19:10 | <b>Offset out 1</b><br>Default Value: _____ 0<br>Format: _____ S9 2's complement<br>Offset Out for Y/R. |   |
|   |       | 9:0   | <b>Offset In 1</b><br>Default Value: _____ 0<br>Format: _____ S9 2's complement<br>Offset in for Y/R.   |
|   |       |   | 31:20   |
|   | 6     | 19:10   | <b>Offset out 2</b><br>Default Value: _____ 0<br>Format: _____ S9 2's complement<br>Offset out for U/G. |
|   |       | 9:0   | <b>Offset in 2</b><br>Default Value: _____ 0<br>Format: _____ S9 2's complement<br>Offset in for U/G.   |
| 31:20                                     |       |   | <b>Reserved</b><br>Format: _____ MBZ  |
| 7   | 19:10 | <b>Offset out 3</b><br>Default Value: _____ 0<br>Format: _____ S9 2's complement<br>Offset out for V/B. |   |
|   | 9:0   | <b>Offset in 3</b><br>Default Value: _____ 0<br>Format: _____ S9 2's complement<br>Offset in for V/B.   |   |
|   |       | 31:17   | <b>Reserved</b>   |

| <b>COLOR_PROCESSING_STATE - CSC State</b> |                                |                    |                             |
|---|--------------------------------|--------------------|-----------------------------|
|   |                                | Format: MBZ        |                             |
| 16  | <b>Alpha from State Select</b> |                    |                             |
|   | Format:                        | U1 Enumerated Type |                             |
|   | <b>Value</b>                   | <b>Name</b>        | <b>Description</b>          |
|   | 0                              |                    | Alpha is taken from message |
|   | 1                              |                    | Alpha is taken from state   |
| 15:0                                      | <b>Color Pipe Alpha</b>        |                    |                             |
|   | Format:                        | U16                |                             |

## COLOR\_PROCESSING\_STATE - PROCAMP State

| COLOR_PROCESSING_STATE - PROCAMP State   |   |                                     |
|--|---|-------------------------------------|
| Project:   | CHV, BSW  |                                     |
| Source:  | PRM   |                                     |
| Size (in bits):  | 64  |                                     |
| Default Value:   | 0x00020001, 0x01000000  |                                     |
| This state structure contains the PROCAMP state used by the color processing function. It corresponds to DW53..DW54 of the Color Processing State. |   |                                     |
| DWord  | Bit   | Description                         |
| 0  | 31:28   | <b>Reserved</b>                     |
|  |   | Format: MBZ                         |
|  | 27:17   | <b>Contrast</b>                     |
|  |   | Default Value: 1                    |
|  |   | Format: U4.7<br>Contrast magnitude. |
| 16:13  | <b>Reserved</b>   |                                     |
| Format: MBZ  |   |                                     |
| 12:1   | <b>Brightness</b>   |                                     |
|  | Default Value: 0  |                                     |
|  | Format: S7.4 2's complement<br>Brightness magnitude.            |                                     |
|  | 0   | <b>PROCAMP Enable</b>               |
| Default Value: 1   |   |                                     |
| Format: Enable   |   |                                     |
| 1  | 31:16   | <b>Cos_c_s</b>                      |
|  |   | Default Value: 256                  |
|  | Format: S7.8 2's complement<br>UV multiplication cosine factor. |                                     |
|  | 15:0  | <b>Sin_c_s</b>                      |
| Default Value: 0   |   |                                     |
| Format: S7.8 2's complement<br>UV multiplication sine factor.  |   |                                     |

## COLOR\_PROCESSING\_STATE - STD/STE State

| COLOR_PROCESSING_STATE - STD/STE State   |  |                                     |             |
|--|--|-------------------------------------|-------------|
| Project:   | CHV, BSW   |                                     |             |
| Source:  | PRM  |                                     |             |
| Size (in bits):  | 928  |                                     |             |
| Default Value:   | 0x9A6E39F0, 0x400C0000, 0x00001180, 0xFE2F2E00, 0x000000FF, 0x00140000, 0xD82E0000, 0x8285ECEC, 0x00008282, 0x00000000, 0x02117000, 0xA38FEC96, 0x00008CC8, 0x00000000, 0x01478000, 0x0007C300, 0x00000000, 0x00000000, 0x1C180000, 0x00000000, 0x00000000, 0x00000000, 0x0007CF80, 0x00000000, 0x00000000, 0x1C080000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |                                     |             |
| This state structure contains the STD/STE state used by the color processing function. |  |                                     |             |
| DWord  | Bit  | Description                         |             |
| 0  | 31:24  | <b>V_Mid</b>                        |             |
|  |  | Default Value:                      | 154         |
|  |  | Format:                             | U8          |
|  |  | Rectangle middle-point V coordinate |             |
|  | 23:16  | <b>U_Mid</b>                        |             |
|  |  | Default Value:                      | 110         |
|  |  | Format:                             | U8          |
|  |  | Rectangle middle-point U coordinate |             |
|  | 15:10  | <b>Hue Max</b>                      |             |
|  |  | Default Value:                      | 14          |
|  |  | Format:                             | U6          |
|  |  | Rectangle half width                |             |
|  | 9:4  | <b>Sat Max</b>                      |             |
|  |  | Default Value:                      | 31          |
|  |  | Format:                             | U6          |
|  |  | Rectangle half length.              |             |
|  | 3  | <b>Reserved</b>                     |             |
|  |  | Format:                             | MBZ         |
|  | 2  | <b>Output Control</b>               |             |
|  |  | <b>Value</b>                        | <b>Name</b> |
| 0  |  | Output Pixels <b>[Default]</b>      |             |
| 1  |  | Output STD Decisions                |             |

| <b>COLOR_PROCESSING_STATE - STD/STE State</b> |       |  |
|---|-------|--|
|   | 1     | <b>STE Enable</b><br>Format: Enable  |
|   | 0     | <b>STD Enable</b><br>Format: Enable  |
| 1   | 31    | <b>Reserved</b><br>Format: MBZ   |
|   | 30:28 | <b>Diamond Margin</b><br>Default Value: 4<br>Format: U3  |
|   | 27:21 | <b>Diamond du</b><br>Default Value: 0<br>Format: S6 2's complement<br>Rhombus center shift in the sat-direction, relative to the rectangle center. |
|   | 20:18 | <b>HS Margin</b><br>Default Value: 3<br>Format: U3   |
|   | 17:10 | <b>Cos(<math>\alpha</math>)</b><br>Format: S0.7 2's Compliment<br>The default is 79/128  |
|   | 9:8   | <b>Reserved</b><br>Format: MBZ   |
|   | 7:0   | <b>Sin(<math>\alpha</math>)</b><br>Format: S0.7 2's Compliment<br>The default is 101/128   |
|   | 2     | 31:21  |
| 20:13   |       | <b>Diamond Alpha</b><br>Format: U2.6<br>1 / tan( $\beta$ ) The default is 100/64   |
| 12:7  |       | <b>Diamond Th</b><br>Default Value: 35<br>Format: U6<br>Half length of the rhombus axis in the sat-direction.                                      |



| <b>COLOR_PROCESSING_STATE - STD/STE State</b>   |  |  |                |         |         |                   |
|---|--|--|----------------|---------|---------|-------------------|
|   | 6:0  | <b>Diamond dv</b>  |                |         |         |                   |
|   |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Default Value:</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table>  | Default Value: | 0       | Format: | S6 2's complement |
| Default Value:  | 0  |  |                |         |         |                   |
| Format:   | S6 2's complement  |  |                |         |         |                   |
| 3   | 31:24  | <b>Y_point_3</b>   |                |         |         |                   |
|   |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Default Value:</td> <td style="text-align: center;">254</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Third point of the Y piecewise linear membership function.</p> | Default Value: | 254     | Format: | U8                |
|   |  | Default Value:   | 254            |         |         |                   |
|   | Format:  | U8   |                |         |         |                   |
|   | <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Default Value:</td> <td style="text-align: center;">47</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Second point of the Y piecewise linear membership function.</p> | Default Value:   | 47             | Format: | U8      |                   |
|   | Default Value:   | 47   |                |         |         |                   |
|   | Format:  | U8   |                |         |         |                   |
|   | 23:16  | <b>Y_point_2</b>   |                |         |         |                   |
|   |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Default Value:</td> <td style="text-align: center;">47</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Second point of the Y piecewise linear membership function.</p> | Default Value: | 47      | Format: | U8                |
|   | Default Value:   | 47   |                |         |         |                   |
|   | Format:  | U8   |                |         |         |                   |
|   | 15:8   | <b>Y_point_1</b>   |                |         |         |                   |
| <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Default Value:</td> <td style="text-align: center;">46</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>First point of the Y piecewise linear membership function.</p> |  | Default Value:   | 46             | Format: | U8      |                   |
| Default Value:  | 46   |  |                |         |         |                   |
| Format:   | U8   |  |                |         |         |                   |
| 7   | <b>VY_STD_Enable</b>   |  |                |         |         |                   |
| <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>Enable</td> </tr> </table> <p>Enables STD in the VY subspace.</p>   |  | Format:  | Enable         |         |         |                   |
| Format:   | Enable   |  |                |         |         |                   |
| 6:0   | <b>Reserved</b>  |  |                |         |         |                   |
| <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>MBZ</td> </tr> </table>   |  | Format:  | MBZ            |         |         |                   |
| Format:   | MBZ  |  |                |         |         |                   |
| 4   | 31:18  | <b>Reserved</b>  |                |         |         |                   |
|   | <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>MBZ</td> </tr> </table>  |  | Format:        | MBZ     |         |                   |
|   | Format:  | MBZ  |                |         |         |                   |
|   | 17:13  | <b>Y_Slope_2</b>   |                |         |         |                   |
|   | <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>U2.3</td> </tr> </table> <p>Slope between points Y3 and Y4. The default is 31/8.</p>   |  | Format:        | U2.3    |         |                   |
| Format:   | U2.3   |  |                |         |         |                   |
| 12:8  | <b>Y_Slope_1</b>   |  |                |         |         |                   |
| <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>U2.3</td> </tr> </table> <p>Slope between points Y1 and Y2. The default is 31/8.</p>  |  | Format:  | U2.3           |         |         |                   |
| Format:   | U2.3   |  |                |         |         |                   |
| 7:0   | <b>Y_point_4</b>   |  |                |         |         |                   |
|   | <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Default Value:</td> <td style="text-align: center;">255</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Fourth point of the Y piecewise linear membership function</p> | Default Value:   | 255            | Format: | U8      |                   |
|   | Default Value:   | 255  |                |         |         |                   |
| Format:   | U8   |  |                |         |         |                   |
|   |  |  |                |         |         |                   |

| COLOR_PROCESSING_STATE - STD/STE State             |  |  |                |   |                          |  |  |      |             |    |           |                  |
|--|--|--|----------------|---|--------------------------|--|--|------|-------------|----|-----------|------------------|
| 5  | 31:16  | <p><b>INV_skin_types_margin</b></p> <table border="1"> <tr> <td>Format:</td> <td>U0.16</td> </tr> <tr> <td colspan="2">1/(2* Skin_types_margin)</td> </tr> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> <tr> <td>20</td> <td>[Default]</td> <td>Skin_Type_margin</td> </tr> </table> | Format:        | U0.16                                     | 1/(2* Skin_types_margin) |  | Value  | Name | Description | 20 | [Default] | Skin_Type_margin |
|  | Format:  | U0.16  |                |   |                          |  |  |      |             |    |           |                  |
| 1/(2* Skin_types_margin)                           |  |  |                |   |                          |  |  |      |             |    |           |                  |
| Value  | Name   | Description  |                |   |                          |  |  |      |             |    |           |                  |
| 20   | [Default]  | Skin_Type_margin   |                |   |                          |  |  |      |             |    |           |                  |
| 15:0   | <p><b>Inverse Margin VYL</b></p> <table border="1"> <tr> <td>Format:</td> <td>U0.16</td> </tr> <tr> <td colspan="2">1 / Margin_VYL The default is 3300/65536</td> </tr> </table>   | Format:  | U0.16          | 1 / Margin_VYL The default is 3300/65536  |                          |  |  |      |             |    |           |                  |
| Format:  | U0.16  |  |                |   |                          |  |  |      |             |    |           |                  |
| 1 / Margin_VYL The default is 3300/65536           |  |  |                |   |                          |  |  |      |             |    |           |                  |
| 6  | 31:24  | <p><b>P1L</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>216</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Y Point 1 of the lower part of the detection PWLF.</td> </tr> </table>   | Default Value: | 216                                       | Format:                  | U8   | Y Point 1 of the lower part of the detection PWLF. |      |             |    |           |                  |
|  | Default Value:   | 216  |                |   |                          |  |  |      |             |    |           |                  |
|  | Format:  | U8   |                |   |                          |  |  |      |             |    |           |                  |
| Y Point 1 of the lower part of the detection PWLF. |  |  |                |   |                          |  |  |      |             |    |           |                  |
| 23:16  | <p><b>P0L</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>46</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Y Point 0 of the lower part of the detection PWLF.</td> </tr> </table>  | Default Value:   | 46             | Format:                                   | U8                       | Y Point 0 of the lower part of the detection PWLF. |  |      |             |    |           |                  |
| Default Value:                                     | 46   |  |                |   |                          |  |  |      |             |    |           |                  |
| Format:  | U8   |  |                |   |                          |  |  |      |             |    |           |                  |
| Y Point 0 of the lower part of the detection PWLF. |  |  |                |   |                          |  |  |      |             |    |           |                  |
| 15:0   | <p><b>Inverse Margin VYU</b></p> <table border="1"> <tr> <td>Format:</td> <td>U0.16</td> </tr> <tr> <td colspan="2">1 / Margin_VYU The default is 1600/65536.</td> </tr> </table>  | Format:  | U0.16          | 1 / Margin_VYU The default is 1600/65536. |                          |  |  |      |             |    |           |                  |
| Format:  | U0.16  |  |                |   |                          |  |  |      |             |    |           |                  |
| 1 / Margin_VYU The default is 1600/65536.          |  |  |                |   |                          |  |  |      |             |    |           |                  |
| 7  | 31:24  | <p><b>B1L</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>130</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">V Bias 1 of the lower part of the detection PWLF.</td> </tr> </table>  | Default Value: | 130                                       | Format:                  | U8   | V Bias 1 of the lower part of the detection PWLF.  |      |             |    |           |                  |
|  | Default Value:   | 130  |                |   |                          |  |  |      |             |    |           |                  |
|  | Format:  | U8   |                |   |                          |  |  |      |             |    |           |                  |
|  | V Bias 1 of the lower part of the detection PWLF.  |  |                |   |                          |  |  |      |             |    |           |                  |
| 23:16  | <p><b>B0L</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>133</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">V Bias 0 of the lower part of the detection PWLF.</td> </tr> </table>  | Default Value:   | 133            | Format:                                   | U8                       | V Bias 0 of the lower part of the detection PWLF.  |  |      |             |    |           |                  |
| Default Value:                                     | 133  |  |                |   |                          |  |  |      |             |    |           |                  |
| Format:  | U8   |  |                |   |                          |  |  |      |             |    |           |                  |
| V Bias 0 of the lower part of the detection PWLF.  |  |  |                |   |                          |  |  |      |             |    |           |                  |
| 15:8   | <p><b>P3L</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>236</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Y Point 3 of the lower part of the detection PWLF.</td> </tr> </table> | Default Value:   | 236            | Format:                                   | U8                       | Y Point 3 of the lower part of the detection PWLF. |  |      |             |    |           |                  |
| Default Value:                                     | 236  |  |                |   |                          |  |  |      |             |    |           |                  |
| Format:  | U8   |  |                |   |                          |  |  |      |             |    |           |                  |
| Y Point 3 of the lower part of the detection PWLF. |  |  |                |   |                          |  |  |      |             |    |           |                  |
| 7:0  | <p><b>P2L</b></p>  |  |                |   |                          |  |  |      |             |    |           |                  |

| <b>COLOR_PROCESSING_STATE - STD/STE State</b>      |  |  |
|--|--|--|
| 8  | 31:27  | Default Value: 236   |
|  |  | Format: U8   |
|  | Y point 2 of the lower part of the detection PWLF. |  |
|  | 26:16  | <b>S0L</b><br>Format: S2.8 2's complement<br>Slope 0 of the lower part of the detection PWLF. The default is -5/256. |
| 9  | 15:8   | Default Value: 130   |
|  |  | Format: U8   |
|  | V Bias 3 of the lower part of the detection PWLF.  |  |
|  | 7:0  | <b>B2L</b><br>Default Value: 130<br>Format: U8<br>V Bias 2 of the lower part of the detection PWLF.                  |
| 9  | 31:22  | <b>Reserved</b><br>Format: MBZ   |
|  | 21:11  | <b>S2L</b><br>Format: S2.8 2's complement<br>Slope 2 of the lower part of the detection PWLF. The default is 0/256.  |
|  | 10:0   | <b>S1L</b><br>Format: S2.8 2's complement<br>Slope 1 of the lower part of the detection PWLF. The default is 0/256.  |
| 10   | 31:27  | <b>Reserved</b><br>Format: MBZ   |
|  | 26:19  | Default Value: 66  |
|  |  | Format: U8   |
| Y Point 1 of the upper part of the detection PWLF. |  |  |
| 18:11  | <b>POU</b>   |  |

| COLOR_PROCESSING_STATE - STD/STE State                                 |  |  |
|--|--|--|
|  |  | Default Value: 46                                  |
|  |  | Format: U8   |
| Y Point 0 of the upper part of the detection PWLF.                     |  |  |
|  | 10:0   | <b>S3L</b>   |
|  |  | Format: S2.8 2's complement                        |
| Slope 3 of the lower part of the detection PWLF. The default is 0/256. |  |  |
| 11   | 31:24  | <b>B1U</b>   |
|  |  | Default Value: 163                                 |
|  |  | Format: U8   |
|  |  | V Bias 1 of the upper part of the detection PWLF.  |
|  | 23:16  | <b>B0U</b>   |
|  |  | Default Value: 143                                 |
|  |  | Format: U8   |
|  |  | V Bias 0 of the upper part of the detection PWLF.  |
|  | 15:8   | <b>P3U</b>   |
|  |  | Default Value: 236                                 |
|  |  | Format: U8   |
|  |  | Y Point 3 of the upper part of the detection PWLF. |
| 7:0  | <b>P2U</b>   |  |
|  | Default Value: 150   |  |
|  | Format: U8   |  |
|  | Y Point 2 of the upper part of the detection PWLF.                       |  |
| 12   | 31:27  | <b>Reserved</b>                                    |
|  |  | Format: MBZ  |
|  | 26:16  | <b>S0U</b>   |
|  |  | Format: S2.8 2's complement                        |
|  | Slope 0 of the upper part of the detection PWLF. The default is 256/256. |  |
|  | 15:8   | <b>B3U</b>   |
| Default Value: 140   |  |  |
| Format: U8   |  |  |
| V Bias 3 of the upper part of the detection PWLF.                      |  |  |

| COLOR_PROCESSING_STATE - STD/STE State |   |  |             |      |             |   |           |         |
|--|---|--|-------------|------|-------------|---|-----------|---------|
|  | 7:0   | <b>B2U</b><br>Default Value: 200<br>Format: U8<br>V Bias 2 of the upper part of the detection PWLF.  |             |      |             |   |           |         |
|  |   | <b>Reserved</b><br>Format: MBZ   |             |      |             |   |           |         |
| 13                                     | 31:22   | <b>Reserved</b><br>Format: MBZ   |             |      |             |   |           |         |
|  | 21:11   | <b>S2U</b><br>Format: S2.8 2's complement<br>Slope 2 of the upper part of the detection PWLF. The default is -179/256.   |             |      |             |   |           |         |
|  | 10:0  | <b>S1U</b><br>Format: S2.8 2's complement<br>Slope 1 of the upper part of the detection PWLF. The default is -113/256.   |             |      |             |   |           |         |
| 14                                     | 31:28   | <b>Reserved</b><br>Format: MBZ   |             |      |             |   |           |         |
|  | 27:20   | <b>Skin Types Margin</b><br>Default Value: 20<br>Format: U8<br>Skin types Y margin.  |             |      |             |   |           |         |
|  | 19:12   | <b>Skin Types Thresh</b><br>Default Value: 120<br>Format: U8<br>Skin types Y threshold.  |             |      |             |   |           |         |
|  | 11  | <b>Skin Type Enable</b><br>Format: Enable<br>Treat differently bright and dark skin types. <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>[Default]</td> <td>Disable</td> </tr> </tbody> </table> | Value       | Name | Description | 0 | [Default] | Disable |
|  | Value   | Name   | Description |      |             |   |           |         |
| 0                                      | [Default]   | Disable  |             |      |             |   |           |         |
| 10:0                                   | <b>S3U</b><br>Format: S2.8 2's complement<br>Slope 3 of the upper part of the detection PWLF. The default is 0/256. |  |             |      |             |   |           |         |
| 15                                     | 31  | <b>Reserved</b><br>Format: MBZ   |             |      |             |   |           |         |

| COLOR_PROCESSING_STATE - STD/STE State |   |   |                     |                     |                   |                   |
|--|---|---|---------------------|---------------------|-------------------|-------------------|
|  | 30:21   | <p><b>SATB1</b></p> <table border="1"> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>First bias for the saturation PWLF (bright skin). The default is -8/4.</p>                          | Format:             | S7.2 2's complement |                   |                   |
|  | Format:   | S7.2 2's complement   |                     |                     |                   |                   |
|  | 20:14   | <p><b>SATP3</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>31</td> </tr> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table> <p>Third point for the saturation PWLF (bright skin).</p> | Default Value:      | 31                  | Format:           | S6 2's complement |
|  | Default Value:  | 31  |                     |                     |                   |                   |
| Format:                                | S6 2's complement   |   |                     |                     |                   |                   |
| 13:7                                   | <p><b>SATP2</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>6</td> </tr> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table> <p>Second point for the saturation PWLF (bright skin).</p> | Default Value:  | 6                   | Format:             | S6 2's complement |                   |
| Default Value:                         | 6   |   |                     |                     |                   |                   |
| Format:                                | S6 2's complement   |   |                     |                     |                   |                   |
| 6:0                                    | <p><b>SATP1</b></p> <table border="1"> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table> <p>First point for the saturation PWLF (bright skin). The default is -6.</p>                             | Format:   | S6 2's complement   |                     |                   |                   |
| Format:                                | S6 2's complement   |   |                     |                     |                   |                   |
| 16                                     | 31  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:             | MBZ                 |                   |                   |
|  | Format:   | MBZ   |                     |                     |                   |                   |
|  | 30:20   | <p><b>SATS0</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>Zeroth slope for the saturation PWLF (bright skin). The default is 297/256.</p>                                    | Format:             | U3.8                |                   |                   |
|  | Format:   | U3.8  |                     |                     |                   |                   |
| 19:10                                  | <p><b>SATB3</b></p> <table border="1"> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>Third bias for the saturation PWLF (bright skin). The default is 124/4.</p>                         | Format:   | S7.2 2's complement |                     |                   |                   |
| Format:                                | S7.2 2's complement   |   |                     |                     |                   |                   |
| 9:0                                    | <p><b>SATB2</b></p> <table border="1"> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>Second bias for the saturation PWLF (bright skin). The default is 8/4.</p>                          | Format:   | S7.2 2's complement |                     |                   |                   |
| Format:                                | S7.2 2's complement   |   |                     |                     |                   |                   |
| 17                                     | 31:22   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:             | MBZ                 |                   |                   |
|  | Format:   | MBZ   |                     |                     |                   |                   |
|  | 21:11   | <p><b>SATS2</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>Second slope for the saturation PWLF (bright skin). The default is 297/256.</p>                                    | Format:             | U3.8                |                   |                   |
| Format:                                | U3.8  |   |                     |                     |                   |                   |
| 10:0                                   | <p><b>SATS1</b></p>   |   |                     |                     |                   |                   |

| <b>COLOR_PROCESSING_STATE - STD/STE State</b> |   |   |                     |                     |         |                   |
|---|---|---|---------------------|---------------------|---------|-------------------|
|   |   | <table border="1"> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>First slope for the saturation PWLF (bright skin). The default is 85/256.</p>  | Format:             | U3.8                |         |                   |
| Format:                                       | U3.8  |   |                     |                     |         |                   |
| 18  | 31:25   | <p><b>HUEP3</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>14</td> </tr> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table> <p>Third point for the hue PWLF (bright skin)</p> | Default Value:      | 14                  | Format: | S6 2's complement |
|   | Default Value:  | 14  |                     |                     |         |                   |
|   | Format:   | S6 2's complement   |                     |                     |         |                   |
|   | 24:18   | <p><b>HUEP2</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>6</td> </tr> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table> <p>Second point for the hue PWLF (bright skin)</p> | Default Value:      | 6                   | Format: | S6 2's complement |
| Default Value:                                | 6   |   |                     |                     |         |                   |
| Format:                                       | S6 2's complement   |   |                     |                     |         |                   |
| 17:11   | <p><b>HUEP1</b></p> <table border="1"> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table> <p>First point for the hue PWLF (bright skin). The default is -6.</p>    | Format:   | S6 2's complement   |                     |         |                   |
| Format:                                       | S6 2's complement   |   |                     |                     |         |                   |
| 10:0  | <p><b>SATS3</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>Thrid slope for the saturation PWLF (bright skin). The default is 256/256.</p>     | Format:   | U3.8                |                     |         |                   |
| Format:                                       | U3.8  |   |                     |                     |         |                   |
| 19  | 31:30   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:             | MBZ                 |         |                   |
|   | Format:   | MBZ   |                     |                     |         |                   |
|   | 29:20   | <p><b>HUEB3</b></p> <table border="1"> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>Third bias for the hue PWLF (bright skin). The default is 56/4.</p>                         | Format:             | S7.2 2's complement |         |                   |
|   | Format:   | S7.2 2's complement   |                     |                     |         |                   |
| 19:10   | <p><b>HUEB2</b></p> <table border="1"> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>Second bias for the hue PWLF (bright skin). The default is 8/4.</p> | Format:   | S7.2 2's complement |                     |         |                   |
| Format:                                       | S7.2 2's complement   |   |                     |                     |         |                   |
| 9:0   | <p><b>HUEB1</b></p> <table border="1"> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>First bias for the hue PWLF (bright skin). The default is -8/4.</p> | Format:   | S7.2 2's complement |                     |         |                   |
| Format:                                       | S7.2 2's complement   |   |                     |                     |         |                   |
| 20  | 31:22   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:             | MBZ                 |         |                   |
|   | Format:   | MBZ   |                     |                     |         |                   |
| 21:11   | <p><b>HUES1</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table>   | Format:   | U3.8                |                     |         |                   |
| Format:                                       | U3.8  |   |                     |                     |         |                   |

| COLOR_PROCESSING_STATE - STD/STE State |       |   |
|--|-------|---|
|  |       | First slope for the hue PWLF (bright skin) The default is 85/256.   |
|  | 10:0  | <b>HUES0</b><br>Format: U3.8<br>Zeroth slope for the hue PWLF (bright skin) The default is 384/256.                     |
| 21                                     | 31:22 | <b>Reserved</b><br>Format: MBZ  |
|  | 21:11 | <b>HUES3</b><br>Format: U3.8<br>Third slope for the hue PWLF (bright skin) The default is 256/256.                      |
|  | 10:0  | <b>HUES2</b><br>Format: U3.8<br>Second slope for the hue PWLF (bright skin) The default is 384/256.                     |
| 22                                     | 31    | <b>Reserved</b><br>Format: MBZ  |
|  | 30:21 | <b>SATB1_DARK</b><br>Format: S7.2 2's complement<br>First bias for the saturation PWLF (dark skin) The default is 0/4.  |
|  | 20:14 | <b>SATP3_DARK</b><br>Default Value: 31<br>Format: S6 2's complement<br>Third point for the saturation PWLF (dark skin)  |
|  | 13:7  | <b>SATP2_DARK</b><br>Default Value: 31<br>Format: S6 2's complement<br>Second point for the saturation PWLF (dark skin) |
|  | 6:0   | <b>SATP1_DARK</b><br>Format: S6 2's complement<br>First point for the saturation PWLF (dark skin). The default is -11.  |
| 23                                     | 31    | <b>Reserved</b><br>Format: MBZ  |
|  | 30:20 | <b>SATS0_DARK</b>   |



| <b>COLOR_PROCESSING_STATE - STD/STE State</b> |  |   |                     |                     |                   |                   |
|---|--|---|---------------------|---------------------|-------------------|-------------------|
|   |  | <table border="1"> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>Zeroth slope for the saturation PWLF (dark skin). The default is 397/256.</p>  | Format:             | U3.8                |                   |                   |
|   | Format:  | U3.8  |                     |                     |                   |                   |
|   | 19:10  | <p><b>SATB3_DARK</b></p> <table border="1"> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>Third bias for the saturation PWLF (dark skin). The default is 124/4.</p>                  | Format:             | S7.2 2's complement |                   |                   |
| Format:                                       | S7.2 2's complement  |   |                     |                     |                   |                   |
| 9:0   | <p><b>SATB2_DARK</b></p> <table border="1"> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>Second bias for the saturation PWLF (dark skin). The default is 124/4.</p>                | Format:   | S7.2 2's complement |                     |                   |                   |
| Format:                                       | S7.2 2's complement  |   |                     |                     |                   |                   |
| 24  | 31:22  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:             | MBZ                 |                   |                   |
|   | Format:  | MBZ   |                     |                     |                   |                   |
|   | 21:11  | <p><b>SATS2_DARK</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>Second slope for the saturation PWLF (dark skin). The default is 256/256.</p>                             | Format:             | U3.8                |                   |                   |
| Format:                                       | U3.8   |   |                     |                     |                   |                   |
| 10:0  | <p><b>SATS1_DARK</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>First slope for the saturation PWLF (dark skin). The default is 189/256.</p>                             | Format:   | U3.8                |                     |                   |                   |
| Format:                                       | U3.8   |   |                     |                     |                   |                   |
| 25  | 31:25  | <p><b>HUEP3_DARK</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>14</td> </tr> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table> <p>Third point for the hue PWLF (dark skin).</p> | Default Value:      | 14                  | Format:           | S6 2's complement |
|   | Default Value:   | 14  |                     |                     |                   |                   |
|   | Format:  | S6 2's complement   |                     |                     |                   |                   |
|   | 24:18  | <p><b>HUEP2_DARK</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>2</td> </tr> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table> <p>Third point for the hue PWLF (dark skin).</p>  | Default Value:      | 2                   | Format:           | S6 2's complement |
| Default Value:                                | 2  |   |                     |                     |                   |                   |
| Format:                                       | S6 2's complement  |   |                     |                     |                   |                   |
| 17:11   | <p><b>HUEP1_DARK</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>S6 2's complement</td> </tr> </table> <p>Third point for the hue PWLF (dark skin).</p> | Default Value:  | 0                   | Format:             | S6 2's complement |                   |
| Default Value:                                | 0  |   |                     |                     |                   |                   |
| Format:                                       | S6 2's complement  |   |                     |                     |                   |                   |
| 10:0  | <p><b>SATS3_DARK</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>Third slope for the saturation PWLF (dark skin). The default is 256/256.</p>                             | Format:   | U3.8                |                     |                   |                   |
| Format:                                       | U3.8   |   |                     |                     |                   |                   |

| <b>COLOR_PROCESSING_STATE - STD/STE State</b> |  |  |                     |                     |
|---|--|--|---------------------|---------------------|
| 26  | 31:30  | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>MBZ</td> </tr> </table>   | Format:             | MBZ                 |
|   | Format:  | MBZ  |                     |                     |
|   | 29:20  | <b>HUEB3_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 40%;">Format:</td> <td>S7.2 2's complement</td> </tr> </table> Third bias for the hue PWLF (dark skin). The default is 56/4. | Format:             | S7.2 2's complement |
|   | Format:  | S7.2 2's complement  |                     |                     |
| 19:10   | <b>HUEB2_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 40%;">Format:</td> <td>S7.2 2's complement</td> </tr> </table> Second bias for the hue PWLF (dark skin). The default is 0/4. | Format:  | S7.2 2's complement |                     |
| Format:                                       | S7.2 2's complement  |  |                     |                     |
| 9:0   | <b>HUEB1_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 40%;">Format:</td> <td>S7.2 2's complement</td> </tr> </table> First bias for the hue PWLF (dark skin). The default is 0/4.  | Format:  | S7.2 2's complement |                     |
| Format:                                       | S7.2 2's complement  |  |                     |                     |
| 27  | 31:22  | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>MBZ</td> </tr> </table>   | Format:             | MBZ                 |
|   | Format:  | MBZ  |                     |                     |
|   | 21:11  | <b>HUES1_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U3.8</td> </tr> </table> First slope for the hue PWLF (dark skin). The default is 0/256.              | Format:             | U3.8                |
| Format:                                       | U3.8   |  |                     |                     |
| 10:0  | <b>HUES0_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U3.8</td> </tr> </table> Zeroth slope for the hue PWLF (dark skin). The default is 256/256.           | Format:  | U3.8                |                     |
| Format:                                       | U3.8   |  |                     |                     |
| 28  | 31:22  | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>MBZ</td> </tr> </table>   | Format:             | MBZ                 |
|   | Format:  | MBZ  |                     |                     |
|   | 21:11  | <b>HUES3_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U3.8</td> </tr> </table> Third slope for the hue PWLF (dark skin). The default is 256/256.            | Format:             | U3.8                |
| Format:                                       | U3.8   |  |                     |                     |
| 10:0  | <b>HUES2_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U3.8</td> </tr> </table> Second slope for the hue PWLF (dark skin). The default is 299/256.           | Format:  | U3.8                |                     |
| Format:                                       | U3.8   |  |                     |                     |

## COLOR\_PROCESSING\_STATE - TCC State

| COLOR_PROCESSING_STATE - TCC State   |  |                                   |      |
|--|--|-----------------------------------|------|
| Project:   | CHV, BSW   |                                   |      |
| Source:  | PRM  |                                   |      |
| Size (in bits):  | 352  |                                   |      |
| Default Value:   | 0xDCDCDC00, 0xDCDCDC00, 0x1E34CC91, 0x3E3CCE91, 0x02E80195, 0x0197046B, 0x01790174, 0x00096000, 0x00000000, 0x03030000, 0x009201C0 |                                   |      |
| This state structure contains the TCC state used by the color processing function. It corresponds to DW42..DW52 of the Color Processing State. |  |                                   |      |
| DWord  | Bit  | Description                       |      |
| 0  | 31:24  | <b>SatFactor3</b>                 |      |
|  |  | Default Value:                    | 220  |
|  |  | Format:                           | U1.7 |
|  |  | The saturation factor for yellow. |      |
|  | 23:16  | <b>SatFactor2</b>                 |      |
|  |  | Default Value:                    | 220  |
|  |  | Format:                           | U1.7 |
|  |  | The saturation factor for red.    |      |
|  | 15:8   | <b>SatFactor1</b>                 |      |
|  |  | Default Value:                    | 220  |
| Format:  |  | U1.7                              |      |
| The saturation factor for magenta.   |  |                                   |      |
| 7  | <b>TCC Enable</b>  |                                   |      |
|  | Format:  | Enable                            |      |
| 6:0  | <b>Reserved</b>  |                                   |      |
|  | Format:  | MBZ                               |      |
| 1  | 31:24  | <b>SatFactor6</b>                 |      |
|  |  | Default Value:                    | 220  |
|  |  | Format:                           | U1.7 |
|  |  | The saturation factor for blue.   |      |
|  | 23:16  | <b>SatFactor5</b>                 |      |
|  |  | Default Value:                    | 220  |
| Format:  | U1.7   |                                   |      |
| The saturation factor for cyan.  |  |                                   |      |

| COLOR_PROCESSING_STATE - TCC State |   |  |                |         |         |       |
|------------------------------------|---|--|----------------|---------|---------|-------|
|                                    | 15:8  | <p><b>SatFactor4</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>220</td> </tr> <tr> <td>Format:</td> <td>U1.7</td> </tr> </table> <p>The saturation factor for green.</p>   | Default Value: | 220     | Format: | U1.7  |
|                                    | Default Value:  | 220  |                |         |         |       |
| Format:                            | U1.7  |  |                |         |         |       |
|                                    | 7:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ     |         |       |
| Format:                            | MBZ   |  |                |         |         |       |
| 2                                  | 31:30   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ     |         |       |
|                                    | Format:   | MBZ  |                |         |         |       |
|                                    | 29:20   | <p><b>Base Color 3</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>483</td> </tr> <tr> <td>Format:</td> <td>U10</td> </tr> </table>  | Default Value: | 483     | Format: | U10   |
|                                    | Default Value:  | 483  |                |         |         |       |
| Format:                            | U10   |  |                |         |         |       |
| 19:10                              | <p><b>Base Color 2</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>307</td> </tr> <tr> <td>Format:</td> <td>U10</td> </tr> </table> | Default Value:   | 307            | Format: | U10     |       |
| Default Value:                     | 307   |  |                |         |         |       |
| Format:                            | U10   |  |                |         |         |       |
| 9:0                                | <p><b>Base Color 1</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>145</td> </tr> <tr> <td>Format:</td> <td>U10</td> </tr> </table> | Default Value:   | 145            | Format: | U10     |       |
| Default Value:                     | 145   |  |                |         |         |       |
| Format:                            | U10   |  |                |         |         |       |
| 3                                  | 31:30   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ     |         |       |
|                                    | Format:   | MBZ  |                |         |         |       |
|                                    | 29:20   | <p><b>Base Color 6</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>995</td> </tr> <tr> <td>Format:</td> <td>U10</td> </tr> </table>  | Default Value: | 995     | Format: | U10   |
|                                    | Default Value:  | 995  |                |         |         |       |
| Format:                            | U10   |  |                |         |         |       |
| 19:10                              | <p><b>Base Color 5</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>819</td> </tr> <tr> <td>Format:</td> <td>U10</td> </tr> </table> | Default Value:   | 819            | Format: | U10     |       |
| Default Value:                     | 819   |  |                |         |         |       |
| Format:                            | U10   |  |                |         |         |       |
| 9:0                                | <p><b>Base Color 4</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>657</td> </tr> <tr> <td>Format:</td> <td>U10</td> </tr> </table> | Default Value:   | 657            | Format: | U10     |       |
| Default Value:                     | 657   |  |                |         |         |       |
| Format:                            | U10   |  |                |         |         |       |
| 4                                  | 31:16   | <p><b>Color Transit Slope 23</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>744</td> </tr> <tr> <td>Format:</td> <td>U0.16</td> </tr> </table> <p>The calculation result of <math>1 / (BC3 - BC2) [1/62]</math></p> | Default Value: | 744     | Format: | U0.16 |
|                                    | Default Value:  | 744  |                |         |         |       |
| Format:                            | U0.16   |  |                |         |         |       |
|                                    | 15:0  | <p><b>Color Transit Slope 12</b></p>   |                |         |         |       |

| <b>COLOR_PROCESSING_STATE - TCC State</b>          |   |  |                |         |         |  |  |  |
|--|---|--|----------------|---------|---------|--|--|--|
|  |   | <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">405</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U0.16</td> </tr> <tr> <td colspan="2">The calculation result of <math>1 / (BC2 - BC1)</math> [1/57]</td> </tr> </table>                               | Default Value: | 405     | Format: | U0.16  | The calculation result of $1 / (BC2 - BC1)$ [1/57] |  |
| Default Value:                                     | 405   |  |                |         |         |  |  |  |
| Format:  | U0.16   |  |                |         |         |  |  |  |
| The calculation result of $1 / (BC2 - BC1)$ [1/57] |   |  |                |         |         |  |  |  |
| 5  | 31:16   | <b>Color Transit Slope 45</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">407</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U0.16</td> </tr> <tr> <td colspan="2">The calculation result of <math>1 / (BC5 - BC4)</math> [1/57]</td> </tr> </table> | Default Value: | 407     | Format: | U0.16  | The calculation result of $1 / (BC5 - BC4)$ [1/57] |  |
|  |   | Default Value:   | 407            |         |         |  |  |  |
|  |   | Format:  | U0.16          |         |         |  |  |  |
|  | The calculation result of $1 / (BC5 - BC4)$ [1/57]  |  |                |         |         |  |  |  |
| 15:0   | <b>Color Transit Slope 34</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">1131</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U0.16</td> </tr> <tr> <td colspan="2">The calculation result of <math>1 / (BC4 - BC3)</math> [1/61]</td> </tr> </table> | Default Value:   | 1131           | Format: | U0.16   | The calculation result of $1 / (BC4 - BC3)$ [1/61] |  |  |
| Default Value:                                     | 1131  |  |                |         |         |  |  |  |
| Format:  | U0.16   |  |                |         |         |  |  |  |
| The calculation result of $1 / (BC4 - BC3)$ [1/61] |   |  |                |         |         |  |  |  |
| 6  | 31:16   | <b>Color Transit Slope 61</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">377</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U0.16</td> </tr> <tr> <td colspan="2">The calculation result of <math>1 / (BC1 - BC6)</math> [1/62]</td> </tr> </table> | Default Value: | 377     | Format: | U0.16  | The calculation result of $1 / (BC1 - BC6)$ [1/62] |  |
|  |   | Default Value:   | 377            |         |         |  |  |  |
|  |   | Format:  | U0.16          |         |         |  |  |  |
|  | The calculation result of $1 / (BC1 - BC6)$ [1/62]  |  |                |         |         |  |  |  |
| 15:0   | <b>Color Transit Slope 56</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">372</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U0.16</td> </tr> <tr> <td colspan="2">The calculation result of <math>1 / (BC6 - BC5)</math> [1/62]</td> </tr> </table>  | Default Value:   | 372            | Format: | U0.16   | The calculation result of $1 / (BC6 - BC5)$ [1/62] |  |  |
| Default Value:                                     | 372   |  |                |         |         |  |  |  |
| Format:  | U0.16   |  |                |         |         |  |  |  |
| The calculation result of $1 / (BC6 - BC5)$ [1/62] |   |  |                |         |         |  |  |  |
| 7  | 31:22   | <b>Color Bias 3</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U2.8</td> </tr> <tr> <td colspan="2">Color bias for BaseColor3.</td> </tr> </table>   | Default Value: | 0       | Format: | U2.8   | Color bias for BaseColor3.                         |  |
|  |   | Default Value:   | 0              |         |         |  |  |  |
|  |   | Format:  | U2.8           |         |         |  |  |  |
|  | Color bias for BaseColor3.  |  |                |         |         |  |  |  |
|  | 21:12   | <b>Color Bias 2</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">150</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U2.8</td> </tr> <tr> <td colspan="2">Color bias for BaseColor2.</td> </tr> </table>   | Default Value: | 150     | Format: | U2.8   | Color bias for BaseColor2.                         |  |
|  |   | Default Value:   | 150            |         |         |  |  |  |
| Format:  | U2.8  |  |                |         |         |  |  |  |
| Color bias for BaseColor2.                         |   |  |                |         |         |  |  |  |
| 11:2   | <b>Color Bias 1</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U2.8</td> </tr> <tr> <td colspan="2">Color bias for BaseColor1.</td> </tr> </table>  | Default Value:   | 0              | Format: | U2.8    | Color bias for BaseColor1.                         |  |  |
| Default Value:                                     | 0   |  |                |         |         |  |  |  |
| Format:  | U2.8  |  |                |         |         |  |  |  |
| Color bias for BaseColor1.                         |   |  |                |         |         |  |  |  |

| <b>COLOR_PROCESSING_STATE - TCC State</b> |  |  |                |         |         |      |
|---|--|--|----------------|---------|---------|------|
|   | 1:0  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ     |         |      |
| Format:                                   | MBZ  |  |                |         |         |      |
| 8   | 31:22  | <p><b>Color Bias 6</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>U2.8</td> </tr> </table> <p>Color bias for BaseColor6.</p> | Default Value: | 0       | Format: | U2.8 |
|   |  | Default Value:   | 0              |         |         |      |
|   | Format:  | U2.8   |                |         |         |      |
|   | 21:12  | <p><b>Color Bias 5</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>U2.8</td> </tr> </table> <p>Color bias for BaseColor5.</p> | Default Value: | 0       | Format: | U2.8 |
| Default Value:                            |  | 0  |                |         |         |      |
| Format:                                   | U2.8   |  |                |         |         |      |
| 11:2                                      | <p><b>ColorBias4</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>U2.8</td> </tr> </table> <p>Color bias for BaseColor4.</p>         | Default Value:   | 0              | Format: | U2.8    |      |
|   | Default Value:   | 0  |                |         |         |      |
| Format:                                   | U2.8   |  |                |         |         |      |
| 1:0                                       | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:  | MBZ            |         |         |      |
|   | Format:  | MBZ  |                |         |         |      |
| 9   | 31   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ     |         |      |
|   | Format:  | MBZ  |                |         |         |      |
|   | 30:24  | <p><b>UV Threshold</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>3</td> </tr> <tr> <td>Format:</td> <td>U7</td> </tr> </table> <p>Low UV threshold.</p>            | Default Value: | 3       | Format: | U7   |
|   |  | Default Value:   | 3              |         |         |      |
|   | Format:  | U7   |                |         |         |      |
|   | 23:19  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ     |         |      |
| Format:                                   |  | MBZ  |                |         |         |      |
| 18:16                                     | <p><b>UV Threshold Bits</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>3</td> </tr> <tr> <td>Format:</td> <td>U3</td> </tr> </table> <p>Low UV transition width bits.</p> | Default Value:   | 3              | Format: | U3      |      |
|   | Default Value:   | 3  |                |         |         |      |
| Format:                                   | U3   |  |                |         |         |      |
| 15:13                                     | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:  | MBZ            |         |         |      |
|   | Format:  | MBZ  |                |         |         |      |
| 12:8                                      | <p><b>STE Threshold</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>U5</td> </tr> </table>  | Default Value:   | 0              | Format: | U5      |      |
|   | Default Value:   | 0  |                |         |         |      |
| Format:                                   | U5   |  |                |         |         |      |

| <b>COLOR_PROCESSING_STATE - TCC State</b> |  |  |                |         |         |       |
|---|--|--|----------------|---------|---------|-------|
|   |  | Skin tone pixels enhancement threshold.  |                |         |         |       |
|   | 7:3  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ     |         |       |
| Format:                                   | MBZ  |  |                |         |         |       |
|   | 2:0  | <p><b>STE Slope Bits</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>U3</td> </tr> </table> <p>Skin tone pixels enhancement slope bits.</p>                 | Default Value: | 0       | Format: | U3    |
| Default Value:                            | 0  |  |                |         |         |       |
| Format:                                   | U3   |  |                |         |         |       |
| 10  | 31:16  | <p><b>Inverse UVMax Color</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>146</td> </tr> <tr> <td>Format:</td> <td>U0.16</td> </tr> </table> <p>1 / UVMaxColor. Used for the SFs2 calculation.</p> | Default Value: | 146     | Format: | U0.16 |
|   |  | Default Value:   | 146            |         |         |       |
|   |  | Format:  | U0.16          |         |         |       |
| 15:9                                      | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:  | MBZ            |         |         |       |
| Format:                                   | MBZ  |  |                |         |         |       |
| 8:0                                       | <p><b>UVMax Color</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>448</td> </tr> <tr> <td>Format:</td> <td>U9</td> </tr> </table> <p>The maximum absolute value of the legal UV pixels. Used for the SFs2 calculation.</p> | Default Value:   | 448            | Format: | U9      |       |
| Default Value:                            | 448  |  |                |         |         |       |
| Format:                                   | U9   |  |                |         |         |       |

## Color Calculator State Pointer Message Header Control

| <b>MHC_RT_CCSP - Color Calculator State Pointer Message Header Control</b> |  |   |          |     |         |                          |
|--|--|---|----------|-----|---------|--------------------------|
| Project:   | CHV, BSW   |   |          |     |         |                          |
| Source:  | PRM  |   |          |     |         |                          |
| Size (in bits):  | 32   |   |          |     |         |                          |
| Default Value:   | 0x00000000   |   |          |     |         |                          |
| DWord  | Bit  | Description   |          |     |         |                          |
| 0  | 31:6   | <p><b>Color Calculator State Pointer</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>GeneralStateOffset[31:6]</td> </tr> </table> <p>Specifies the 64-byte aligned point to the color calculator state. This pointer is relative to the General State Base Address.</p> | Project: | All | Format: | GeneralStateOffset[31:6] |
|  | Project:   | All   |          |     |         |                          |
| Format:  | GeneralStateOffset[31:6]   |   |          |     |         |                          |
| 5:0  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p> |   | Project: | All | Format: | Ignore                   |
| Project:   | All  |   |          |     |         |                          |
| Format:  | Ignore   |   |          |     |         |                          |



## Color Code Message Header Control

| <b>MHC_RT_CC - Color Code Message Header Control</b>   |            |  |
|--|------------|--|
| Project:   | CHV, BSW   |  |
| Source:  | PRM        |  |
| Size (in bits):  | 32         |  |
| Default Value:   | 0x00000000 |  |
| DWord  | Bit        | Description  |
| 0  | 31:10      | <b>Reserved</b>  |
|  |            | Project: All   |
|  |            | Format: Ignore   |
|  |            | Ignored  |
|  | 9:8        | <b>Color Code</b>  |
|  |            | Project: All   |
|  |            | Format: U2   |
|  |            | This ID is assigned by the Windower unit and is used to track synchronizing events. Reserved for HW implementation use |
|  | 7:0        | <b>FFTID</b>   |
|  |            | Project: All   |
| Format: U8   |            |  |
| This ID is assigned by the fixed function unit and is a unique identifier for the thread. It is used to free up resources used by the thread upon thread completion. |            |  |

## Context Descriptor Format

| Context Descriptor Format  |                        |   |  |         |                        |
|--|------------------------|---|--|---------|------------------------|
| Project:   | CHV, BSW               |   |  |         |                        |
| Source:  | PRM                    |   |  |         |                        |
| Size (in bits):  | 64                     |   |  |         |                        |
| Default Value:   | 0x00000020, 0x00000000 |   |  |         |                        |
| This is the format of context descriptors which make up submitted execlists. |                        |   |  |         |                        |
| DWord  | Bit                    | Description   |  |         |                        |
| 0  | 63:32                  | <p><b>Context ID</b></p> <p>Context ID is a unique field assigned by GFX driver when a new context is created by which it is identified across all hierarchies of SW and HW.</p> <ul style="list-style-type: none"> <li>Context ID is used for semaphore signaling by hardware and software.</li> <li>Context ID matching is used by hardware to detect Lite Restore.</li> <li>Context ID is used by hardware for page fault reporting and response with IOMMU.</li> <li>Context switch reason and the associated Context ID are reported to Context Switch Status Buffer by hardware on a context switch.</li> </ul> <p>Context ID which is a 32 bit field is further divided in to three segments described below:</p> <ul style="list-style-type: none"> <li><b>Bits[63:55] (Bits 31:23 of Context ID)</b> is referred to as GroupID. GroupId+PASID combination of a context must be a unique identifier for contexts that are active in the system. The definition of active context is listed as: <ul style="list-style-type: none"> <li>Any Context that is already submitted to h/w or already running in h/w.</li> <li>Any Context that hit page faults, was preempted (didn't run to context complete), and is waiting to be resubmitted pending IOMMU "last in group" response.</li> <li>Any Context that has experienced reset but not all faults are responded to.</li> </ul> </li> <li><b>Bit[54] (Bit 22 of Context ID)</b> – MBZ for SW programming; this bit is used by hardware to distinguish between F&amp;H vs F&amp;S page requests and response messages to and from IOMMU. This bit is used by hardware on receiving page response to properly manage the page fault counters</li> <li><b>Bit[53] (Bit 21 of Context ID)</b> – MBZ from SW programming, is reserved for future hardware use.</li> <li><b>Bits[52:32] (Bits 20:0 of Context ID)</b> are for software use-only and must be unique field assigned by GFX driver when a new context is created.</li> </ul> |  |         |                        |
|  |                        | 31:12   | <p><b>Logical Ring Context Address (LRCA)</b></p> <table border="1"> <tr> <td>Format:</td> <td>GraphicsAddress[31:12]</td> </tr> </table> <p>This field contains the 4 KB-aligned address of the Logical Ring Context associated with this execlist element. LRCA must be always programmed in GGTT memory.</p> | Format: | GraphicsAddress[31:12] |
|  |                        | Format:   | GraphicsAddress[31:12]   |         |                        |
| 11:9   | <b>Reserved</b>        |   |  |         |                        |

## Context Descriptor Format

|   | Format:  | MBZ  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
|---|--|--|----------|----------|---------|--|---------|---------------------------|-------------|----------|----|----------------|--|--|----|----------|----------|--|----|----------|----------|--|----|----------|--|--|-------------------|---------|---|----------|
| 8   | <b>Privilege Access</b><br>This field when set indicates PPGTT enabled in legacy context mode. In advanced context mode this field is reserved and must be zero.   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 7:6   | <b>Fault Handling</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Source:</td> <td>RenderCS</td> </tr> </table><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #e1eef6;"> <th style="width: 10%;">Value</th> <th style="width: 15%;">Name</th> <th style="width: 60%;">Description</th> <th style="width: 15%;">Project</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>Fault and Hang</td> <td>Fault model is not supported and fault occurrence is treated as catastrophic. GAM indicates Fault Error to Command streamer. Fault Error interrupt is reported to scheduler. Command Streamer will not initiate context switch on occurrence of Fault Error.</td> <td></td> </tr> <tr> <td>1h</td> <td>Reserved</td> <td>Reserved</td> <td></td> </tr> <tr> <td>2h</td> <td>Reserved</td> <td>Reserved</td> <td></td> </tr> <tr> <td>3h</td> <td>Reserved</td> <td></td> <td></td> </tr> </tbody> </table><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #e1eef6;"> <th style="width: 85%;">Programming Notes</th> <th style="width: 15%;">Project</th> </tr> </thead> <tbody> <tr> <td>When execlist mode is set to "Legacy Context mode" Fault Handling mode must be set to "Fault and Hang." For proper programming for Page Fault modes, refer to memory interface section of the PRM for the corresponding generation.</td> <td>CHV, BSW</td> </tr> </tbody> </table> |  | Project: | CHV, BSW | Source: | RenderCS   | Value   | Name                      | Description | Project  | 0h | Fault and Hang | Fault model is not supported and fault occurrence is treated as catastrophic. GAM indicates Fault Error to Command streamer. Fault Error interrupt is reported to scheduler. Command Streamer will not initiate context switch on occurrence of Fault Error. |  | 1h | Reserved | Reserved |  | 2h | Reserved | Reserved |  | 3h | Reserved |  |  | Programming Notes | Project | When execlist mode is set to "Legacy Context mode" Fault Handling mode must be set to "Fault and Hang." For proper programming for Page Fault modes, refer to memory interface section of the PRM for the corresponding generation. | CHV, BSW |
| Project:  | CHV, BSW   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Source:   | RenderCS   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Value   | Name   | Description  | Project  |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 0h  | Fault and Hang   | Fault model is not supported and fault occurrence is treated as catastrophic. GAM indicates Fault Error to Command streamer. Fault Error interrupt is reported to scheduler. Command Streamer will not initiate context switch on occurrence of Fault Error. |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 1h  | Reserved   | Reserved   |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 2h  | Reserved   | Reserved   |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 3h  | Reserved   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Programming Notes   | Project  |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| When execlist mode is set to "Legacy Context mode" Fault Handling mode must be set to "Fault and Hang." For proper programming for Page Fault modes, refer to memory interface section of the PRM for the corresponding generation. | CHV, BSW   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 7:6   | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Source:</td> <td>BlitterCS, VideoCS, VideoCS2, VideoEnhancementCS</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   |  | Project: | CHV, BSW | Source: | BlitterCS, VideoCS, VideoCS2, VideoEnhancementCS | Format: | MBZ                       |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Project:  | CHV, BSW   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Source:   | BlitterCS, VideoCS, VideoCS2, VideoEnhancementCS   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Format:   | MBZ  |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 5   | <b>L3-LLC Coherency</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> </table> <p>The L3-LLC Coherency is controlled by HDC_Chicken0::ForceNonCoherent (bit 4). The L3-LLC Coherency bit must be set for the ForceNonCoherent control to work properly.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #e1eef6;"> <th style="width: 30%;">Value</th> <th style="width: 70%;">Name</th> </tr> </thead> <tbody> <tr> <td>1h</td> <td>Required <b>[Default]</b></td> </tr> <tr> <td>0h</td> <td>Reserved</td> </tr> </tbody> </table>   |  | Project: | CHV, BSW | Value   | Name   | 1h      | Required <b>[Default]</b> | 0h          | Reserved |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Project:  | CHV, BSW   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Value   | Name   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 1h  | Required <b>[Default]</b>  |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 0h  | Reserved   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| 4:3   | <b>Addressing Mode &amp; Legacy Context</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U2</td> </tr> </table> <p>Legacy context set indicates GPU is operating in legacy context mode of operation and doesn't support any SVM features. Legacy context reset indicates GPU is operating in advanced context mode of operation and support SVM features. Based on the Context mode set Addressing mode is interpreted appropriately. The table below summarizes the combinations supported.</p>  |  | Project: | CHV, BSW | Format: | U2   |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Project:  | CHV, BSW   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |
| Format:   | U2   |  |          |          |         |  |         |                           |             |          |    |                |  |  |    |          |          |  |    |          |          |  |    |          |  |  |                   |         |   |          |

## Context Descriptor Format

GFX engine always uses 32b virtual addressing mode when translated using GGTT irrespective of below options.

| Value | Name                                     | Description   |
|-------|--|---|
| 00b   | Advanced Context with no A/D support     | GPU is enabled for advanced context mode and supports SVM features. GPU DOESN'T support Access and Dirty bit management in page tables. GPU supports 64b(48bit canonical) PPGTT graphics virtual addressing. PDP0_DESCRIPTOR contains the PASID (process address space identifier) and other PDP Descriptors are ignored. |
| 01b   | Legacy Context with no 64 bit VA support | GPU is enabled for legacy context mode of operation and DOESN'T support any SVM features. GPU supports 32b PPGTT graphics virtual addressing. PDP*_DESCRIPTOR contains the base address to 4GB of memory space supported.   |
| 10b   | Advanced Context with A/D support        | GPU is enabled for advanced context mode and supports SVM features. GPU DOES support Access and Dirty bit management in page tables. GPU supports 64b (48bit canonical) PPGTT graphics virtual addressing. PDP0_DESCRIPTOR contains the PASID (process address space identifier) and other PDP Descriptors are ignored.   |
| 11b   | Legacy Context with 64 bit VA support    | GPU is enabled for legacy context mode of operation and DOESN'T support any SVM features. GPU supports 64b (48bit canonical) PPGTT graphics virtual addressing and PDP0_DESCRIPTOR contains the base address to PML4 and other PDP Descriptors are ignored.   |

| Programming Notes  |  | Project  |
|--|--|----------|
| Advanced context and 64 bit Virtual addressing are not supported on CHV, BSW. Only legal value that must be programmed on CHV, BSW is "01b: Legacy Context with no 64 bit VA support". |  | CHV, BSW |

2 **Force Restore**  
 Setting this bit will force a context restore operation when switching to this context even if the LRCA in the CCID register (normally the LRCA of the last context from the prior execlist) matches this one.  
 Note that it is legal (and likely desirable) for the **Render Context Restore Inhibit** bit (part of the CTXT\_SR\_CTL register) in the context image being restored to also be set. The "ring" context is being forced to be restored from a newly initialized context despite a possible LRCA match. However, the render context for such a newly initialized context will likely be uninitialized and so should not be restored.

| Programming Notes  | Project  | Source |
|--|----------|--------|
| Force Restore bit must be always be set on all context submissions, when SW intends to use semaphore signaling (MI_SEMAPHORE_SIGNAL) between command streamers, this is to address known HW issue. | CHV, BSW | PRMPRM |

1 **Force PD Restore**  
 Setting this bit will cause the on-chip page directory to be reloaded from the PD image in memory even on an LRCA match. No other operations of context restore will occur on an LRCA match, however. Software should set this bit if it has updated a context's page directory and

| <b>Context Descriptor Format</b> |   |  |
|----------------------------------|---|--|
|                                  |   | wants the context to begin using the new page directory without having to switch away from it (to another context) and back again. Setting this bit will have no effect if <b>Force Restore</b> is also set; a complete context restore (including the PD) will be performed.        |
|                                  | 0 | <p><b>Valid</b></p> <p>Set if this register holds a valid context descriptor. SW should set this bit in the Element registers that it has set up to contain valid context descriptors. Any execlist elements that are not used in a submitted execlist must have this bit clear.</p> |

## Context Status

| Context Status   |   |                            |
|--|---|----------------------------|
| Project:   | CHV, BSW  |                            |
| Source:  | PRM   |                            |
| Size (in bits):  | 64  |                            |
| Default Value:   | 0x00000000, 0x00000000  |                            |
| DWord  | Bit   | Description                |
| 0  | 63:32   | <b>Context ID</b>          |
|  |   | Format: U32                |
|  | 31:25   | <b>Reserved</b>            |
|  |   | Format: MBZ                |
|  | 24:20   | <b>Reserved</b>            |
|  |   | Project:                   |
|  |   | Format: MBZ                |
|  | 19:16   | <b>Reserved</b>            |
|  |   | Project: CHV, BSW          |
|  |   | Format: MBZ                |
| 19:16  | <b>Display Plane</b>  |                            |
|  | Project: CHV, BSW   |                            |
|  | This indicates the display plane for which Wait on Scanline/V-Blank/Sync Flip has been executed leading to context switch. This field is only valid when one of the "Wait on Scanline" or "Wait on Vblnak" or "Wait on sync Flip" is set. |                            |
|  | Value   | Name                       |
|  | 0h  | Reserved (future Sprite A) |
|  | 1h  | Reserved (future Sprite B) |
|  | 2h  | Reserved (future Sprite C) |
|  | 3h  | Display Plane Sprite A2    |
|  | 4h  | Display Plane Sprite B2    |
|  | 5h  | Display Plane Sprite C2    |
|  | 6h  | Display Plane Sprite A3    |
|  | 7h  | Display Plane Sprite B3    |
|  | 8h  | Display Plane Sprite C3    |
| [9h, Fh]   | Reserved  |                            |
| 15   | <b>Lite Restore</b>   |                            |
|  | Format: Enable  |                            |
| This bit is only valid only when Preempted bit is set. When set, this bit indicates that a given |   |                            |

| <b>Context Status</b> |   |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
|-----------------------|---|----------|----------|-------|-------------|----|-----------------|----|-----------------|----|-----------------|----|------------------------|----|------------------------|----|------------------------|
|                       | context got preempted with the same context resulting in Lite Restore in HW.  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 14:12                 | <p><b>Display Plane</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> </table> <p>This indicates the display plane for which Wait on Scanline/V-Blank/Sync Flip has been executed leading to context switch. This field is only valid when one of the "Wait on Scanline" or "Wait on Vblnak" or "Wait on sync Flip" is set. (Future - could remove the Sprites and move to bits 19:16)</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 30%;">Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>Display Plane-A</td> </tr> <tr> <td>1h</td> <td>Display Plane-B</td> </tr> <tr> <td>2h</td> <td>Display Plane-C</td> </tr> <tr> <td>3h</td> <td>Display Plane Sprite A</td> </tr> <tr> <td>4h</td> <td>Display Plane Sprite B</td> </tr> <tr> <td>5h</td> <td>Display Plane Sprite C</td> </tr> </tbody> </table> | Project: | CHV, BSW | Value | Name        | 0h | Display Plane-A | 1h | Display Plane-B | 2h | Display Plane-C | 3h | Display Plane Sprite A | 4h | Display Plane Sprite B | 5h | Display Plane Sprite C |
| Project:              | CHV, BSW  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| Value                 | Name  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 0h                    | Display Plane-A   |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 1h                    | Display Plane-B   |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 2h                    | Display Plane-C   |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 3h                    | Display Plane Sprite A  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 4h                    | Display Plane Sprite B  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 5h                    | Display Plane Sprite C  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 11                    | <p><b>Semaphore Wait Mode</b></p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 40%;">Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>Signal Mode</td> </tr> <tr> <td>1h</td> <td>Poll Mode</td> </tr> </tbody> </table>  | Value    | Name     | 0h    | Signal Mode | 1h | Poll Mode       |    |                 |    |                 |    |                        |    |                        |    |                        |
| Value                 | Name  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 0h                    | Signal Mode   |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 1h                    | Poll Mode   |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 10:9                  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td>MBZ</td> </tr> </table>  | Format:  | MBZ      |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| Format:               | MBZ   |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 8                     | <b>Wait on Scanline</b>   |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 7                     | <b>Wait on Semaphore</b>  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 6                     | <b>Wait on V-blank</b>  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 5                     | <b>Wait on Sync Flip</b>  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 4                     | <p><b>Context Complete</b><br/>Element is completely processed (Head eqv to Tail) and resulted in a context switch.</p>   |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 3                     | <p><b>ACTIVE to IDLE</b><br/>Following this context switch there is no active element available in HW to execute</p>  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 2                     | <p><b>Element Switch</b><br/>Context Switch happened from first element in the current execlist to the second element of the same execlist</p>  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 1                     | <p><b>Preempted</b><br/>Submission of a new execlist has resulted in context switch. The switch is from element in current execlist to element in pending execlist</p>  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |
| 0                     | <p><b>IDLE to ACTIVE</b><br/>Execlist submitted when HW is IDLE. When this bit is set rest of the fields in CSQ are not valid.</p>  |          |          |       |             |    |                 |    |                 |    |                 |    |                        |    |                        |    |                        |

## Data Port 0 Message Types

| MT_DP0 - Data Port 0 Message Types  |            |                              |  |                                    |         |
|---|------------|------------------------------|--|------------------------------------|---------|
| Project:  | CHV, BSW   |                              |  |                                    |         |
| Source:   | DataPort 0 |                              |  |                                    |         |
| Size (in bits):   | 5          |                              |  |                                    |         |
| Default Value:  | 0x00000000 |                              |  |                                    |         |
| Lists all the Message Types in a Data Port 0 Message Descriptor [18:14]. The Legacy messages are encoded in Data Port 0 with Bit 18 set to zero. The Message Header is optional for many (but not all) of these operations. The Scratch Block messages are encoded in Data Port 0 with Bit 18 set to one. A Message Header is required. |            |                              |  |                                    |         |
| DWord   | Bit        | Description                  |  |                                    |         |
| 0   | 4          | <b>Legacy DAP-DC Message</b> |  |                                    |         |
|   |            | Format: Enumeration          |  |                                    |         |
|   |            | Legacy Message               |  |                                    |         |
|   |            | Value                        | Name   | Description                        |         |
|   | 0h         | No<br><b>[Default]</b>       | Legacy DAP-DC Message  |                                    |         |
|   | 1h         | Reserved                     | Scratch Block Message, descriptor uses different Message Type encoding |                                    |         |
|   | 3:0        | <b>Message Type</b>          |  |                                    |         |
|   |            | Format: Enumeration          |  |                                    |         |
|   |            | Specifies type of message    |  |                                    |         |
|   |            | Value                        | Name   | Description                        | Project |
|   |            | 00h                          | MT0R_OWb <b>[Default]</b>  | Oword Block Read message           |         |
|   |            | 01h                          | MT0R_OWUB  | Unaligned Oword Block Read message |         |
|   |            | 02h                          | MT0R_OWDB  | Oword Dual Block Read message      |         |
|   |            | 03h                          | MT0R_DWS   | Dword Scattered Read message       |         |
| 04h   |            | MT0R_BS                      | Byte Scattered Read message  |                                    |         |
| 07h   |            | MT0_MEMFENCE                 | Memory Fence message   |                                    |         |
| 08h   |            | MT0W_OWb                     | Oword Block Write message  |                                    |         |
| 0Ah   |            | MT0W_OWDB                    | Oword Dual Block Write message   |                                    |         |
| 0Bh   |            | MT0W_DWS                     | Dword Scattered Write message  |                                    |         |
| 0Ch   | MT0W_BS    | Byte Scattered Write message |  |                                    |         |
| Others  | Reserved   | Ignored                      |  |                                    |         |



## Data Port 1 Message Types

| MT_DP1 - Data Port 1 Message Types   |                |  |                     |  |             |
|--|----------------|--|---------------------|--|-------------|
| Project:   | CHV, BSW       |  |                     |  |             |
| Source:  | DataPort 1     |  |                     |  |             |
| Size (in bits):  | 5              |  |                     |  |             |
| Default Value:   | 0x00000000     |  |                     |  |             |
| <p>Lists all the Message Types in a Data Port 1 Message Descriptor [18:14]. Most surface and atomic operations, both typed and untyped, are encoded on Data Port 1. The Message Header is optional for many (but not all) of these operations. Most A64 Stateless operations are also encoded on Data Port 1. The Message Header is forbidden for all A64 messages on Data Port 1.</p> |                |  |                     |  |             |
| DWord  | Bit            | Description                                  |                     |  |             |
| 0  | 4:0            | <b>Message Type</b>                          |                     |  |             |
|  |                | Format:                                      | Enumeration         |  |             |
|  |                | Specifies type of message                    |                     |  |             |
|  |                | Value  | Name                | Description                                      | Project     |
|  |                | 00h  | MT1R_T<br>[Default] | Transpose Read message                           |             |
|  |                | 01h  | MT1R_US             | Untyped Surface Read message                     |             |
|  |                | 02h  | MT1A_UI             | Untyped Atomic Integer Operation message         |             |
|  |                | 03h  | MT1A_UI4x2          | Untyped Atomic Integer Operation SIMD4x2 message |             |
|  |                | 04h  | MT1R_MB             | Media Block Read message                         |             |
|  |                | 05h  | MT1R_TS             | Typed Surface Read message                       |             |
|  |                | 06h  | MT1A_TA             | Typed Atomic Integer Operation message           |             |
|  |                | 07h  | MT1A_TA4x2          | Typed Atomic Integer Operation SIMD4x2 message   |             |
|  |                | 08h  | Reserved            | Ignored  | CHV,<br>BSW |
|  |                | 09h  | MT1W_US             | Untyped Surface Write message                    |             |
|  |                | 0Ah  | MT1W_MB             | Media Block Write message                        |             |
|  |                | 0Bh  | MT1A_TC             | Typed Atomic Counter Operation message           |             |
|  |                | 0Ch  | MT1A_TC4x2          | Typed Atomic Counter Operation SIMD4x2 message   |             |
| 0Dh  | MT1W_TS        | Typed Surface Write message                  |                     |  |             |
| 0Eh  | Reserved       | Ignored                                      | CHV,<br>BSW         |  |             |
| 10h  | MT1R_A64_SB    | A64 Scattered Read message                   |                     |  |             |
| 11h  | MT1R_A64_US    | A64 Untyped Surface Read message             |                     |  |             |
| 12h  | MT1A_A64_UI    | A64 Untyped Atomic Integer Operation message |                     |  |             |
| 13h  | MT1A_A64_UI4x2 | A64 Untyped Atomic Integer Operation SIMD4x2 |                     |  |             |

### MT\_DP1 - Data Port 1 Message Types

|        |                | message  |             |
|--------|----------------|--|-------------|
| 14h    | MT1R_A64_B     | A64 Block Read message                             |             |
| 15h    | MT1W_A64_B     | A64 Block Write message                            |             |
| 18h    | Reserved       | Ignored  | CHV,<br>BSW |
| 19h    | MT1W_A64_US    | A64 Untyped Surface Write message                  |             |
| 1Ah    | MT1W_A64_SB    | A64 Scattered Write message                        |             |
| 1Bh    | MT1A_UF        | Untyped Atomic Float Operation message             |             |
| 1Ch    | MT1A_UF4x2     | Untyped Atomic Float Operation SIMD4x2 message     |             |
| 1Dh    | MT1A_A64_UF    | A64 Untyped Atomic Float Operation message         |             |
| 1Eh    | MT1A_A64_UF4x2 | A64 Untyped Atomic Float Operation SIMD4x2 message |             |
| Others | Reserved       | Ignored  |             |

## Data Size Message Descriptor Control Field

| <b>MDC_DS - Data Size Message Descriptor Control Field</b> |            |   |             |
|--|------------|---|-------------|
| Project:   | CHV, BSW   |   |             |
| Source:  | PRM        |   |             |
| Size (in bits):  | 2          |   |             |
| Default Value:   | 0x00000000 |   |             |
| DWord  | Bit        | Description   |             |
| 0  | 1:0        | <b>Data Size</b>                                    |             |
|  |            | Project:  | All         |
|  |            | Format:   | Enumeration |
|  |            | Specifies the number of Bytes to be read or written |             |
| Value  | Name       | Description   | Project     |
| 00h  | B          | 1 Byte  | All         |
| 01h  | W          | 2 Bytes   | All         |
| 02h  | DW         | 4 Bytes   | All         |
| 03h  | Reserved   | Reserved  | All         |

## DstRegNum

| <b>DstRegNum</b>   |                                      |  |       |      |             |       |                                      |  |        |                                      |   |
|--|--------------------------------------|--|-------|------|-------------|-------|--------------------------------------|--|--------|--------------------------------------|---|
| Project:   | CHV, BSW                             |  |       |      |             |       |                                      |  |        |                                      |   |
| Source:  | Eulsa                                |  |       |      |             |       |                                      |  |        |                                      |   |
| Size (in bits):  | 8                                    |  |       |      |             |       |                                      |  |        |                                      |   |
| Default Value:   | 0x00000000                           |  |       |      |             |       |                                      |  |        |                                      |   |
| Description  |                                      | Project  |       |      |             |       |                                      |  |        |                                      |   |
| <p>Register Number The register number for the operand. For a GRF register, is the part of a register address that aligns to a 256-bit (32-byte) boundary. For an ARF register, this field is encoded such that MSBs identify the architecture register type and LSBs provide the register number. An ARF register can only be dst or src0. Any src1 or src2 operands cannot be ARF registers. RegNum and SubRegNum together provide the byte-aligned address for the origin of a register region. RegNum provides bits 12:5 of that address. For one-source and two-source instructions, SubregNum provides bits 4:0. For three-source instructions, the address must be DWord-aligned; SubRegNum provides bits 4:2 of the address and bits 1:0 are zero. This field is present for the direct addressing mode and not present for indirect addressing. This field applies to both source and destination operands.</p> |                                      | CHV, BSW   |       |      |             |       |                                      |  |        |                                      |   |
| DWord  | Bit                                  | Description  |       |      |             |       |                                      |  |        |                                      |   |
| 0  | 7:0                                  | <p><b>Destination Register Number</b></p> <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0-127</td> <td>If {Dst/Src0/Src1/Src2}.RegFile==GRF</td> <td></td> </tr> <tr> <td style="text-align: center;">0-0ffh</td> <td>If {Dst/Src0/Src1/Src2}.RegFile==ARF</td> <td>This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details.</td> </tr> </tbody> </table> | Value | Name | Description | 0-127 | If {Dst/Src0/Src1/Src2}.RegFile==GRF |  | 0-0ffh | If {Dst/Src0/Src1/Src2}.RegFile==ARF | This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details. |
| Value  | Name                                 | Description  |       |      |             |       |                                      |  |        |                                      |   |
| 0-127  | If {Dst/Src0/Src1/Src2}.RegFile==GRF |  |       |      |             |       |                                      |  |        |                                      |   |
| 0-0ffh   | If {Dst/Src0/Src1/Src2}.RegFile==ARF | This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details.  |       |      |             |       |                                      |  |        |                                      |   |

## DstSubRegNum

| <b>DstSubRegNum</b>   |                                      |   |       |      |             |      |                                      |  |        |                                      |   |
|---|--------------------------------------|---|-------|------|-------------|------|--------------------------------------|--|--------|--------------------------------------|---|
| Project:  | CHV, BSW                             |   |       |      |             |      |                                      |  |        |                                      |   |
| Source:   | Eulsa                                |   |       |      |             |      |                                      |  |        |                                      |   |
| Size (in bits):   | 5                                    |   |       |      |             |      |                                      |  |        |                                      |   |
| Default Value:  | 0x00000000                           |   |       |      |             |      |                                      |  |        |                                      |   |
| Description   |                                      | Project   |       |      |             |      |                                      |  |        |                                      |   |
| <p>Subregister Number The subregister number for the operand. For a GRF register, is the byte address within a 256-bit (32-byte) register. For an ARF register, determines the sub-register number according to the specified encoding for the given architecture register. RegNum and SubRegNum together provide the byte-aligned address for the origin of a GRF register region. RegNum provides bits 12:5 of that address. For one-source and two-source instructions, SubregNum provides bits 4:0. For three-source instructions, the address must be DWord-aligned; SubRegNum provides bits 4:2 of the address and bits 1:0 are zero.</p> |                                      | CHV, BSW  |       |      |             |      |                                      |  |        |                                      |   |
| Programming Notes   |                                      |   |       |      |             |      |                                      |  |        |                                      |   |
| <p>Note: The recommended instruction syntax uses subregister numbers within the GRF in units of actual data element size, corresponding to the data type used. For example for the F (Float) type, the assembler syntax uses subregister numbers 0 to 7, corresponding to subregister byte addresses of 0 to 28 in steps of 4, the element size.</p>  |                                      |   |       |      |             |      |                                      |  |        |                                      |   |
| DWord   | Bit                                  | Description   |       |      |             |      |                                      |  |        |                                      |   |
| 0   | 4:0                                  | <p><b>Destination Sub Register Number</b></p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0-31</td> <td>If {Dst/Src0/Src1/Src2}.RegFile==GRF</td> <td></td> </tr> <tr> <td>0-0ffh</td> <td>If {Dst/Src0/Src1/Src2}.RegFile==ARF</td> <td>This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details.</td> </tr> </tbody> </table> | Value | Name | Description | 0-31 | If {Dst/Src0/Src1/Src2}.RegFile==GRF |  | 0-0ffh | If {Dst/Src0/Src1/Src2}.RegFile==ARF | This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details. |
| Value   | Name                                 | Description   |       |      |             |      |                                      |  |        |                                      |   |
| 0-31  | If {Dst/Src0/Src1/Src2}.RegFile==GRF |   |       |      |             |      |                                      |  |        |                                      |   |
| 0-0ffh  | If {Dst/Src0/Src1/Src2}.RegFile==ARF | This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details.   |       |      |             |      |                                      |  |        |                                      |   |

## Dword Data Payload Register

| <b>MDCR_DW - Dword Data Payload Register</b> |  |  |
|--|--|--|
| Project:                                     | CHV, BSW   |  |
| Source:                                      | PRM  |  |
| Size (in bits):                              | 256  |  |
| Default Value:                               | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord  | Bit  | Description  |
| 0.0  | 31:0   | <b>Dword0</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U32  |
|  |  | Specifies the slot 0 data in this payload register |
| 0.1  | 31:0   | <b>Dword1</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U32  |
|  |  | Specifies the slot 1 data in this payload register |
| 0.2  | 31:0   | <b>Dword2</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U32  |
|  |  | Specifies the slot 2 data in this payload register |
| 0.3  | 31:0   | <b>Dword3</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U32  |
|  |  | Specifies the slot 3 data in this payload register |
| 0.4  | 31:0   | <b>Dword4</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U32  |
|  |  | Specifies the slot 4 data in this payload register |
| 0.5  | 31:0   | <b>Dword5</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U32  |
|  |  | Specifies the slot 5 data in this payload register |

| <b>MDCR_DW - Dword Data Payload Register</b> |      |  |
|--|------|--|
| 0.6  | 31:0 | <b>Dword6</b>                                      |
|  |      | Project: All                                       |
|  |      | Format: U32  |
|  |      | Specifies the slot 6 data in this payload register |
| 0.7  | 31:0 | <b>Dword7</b>                                      |
|  |      | Project: All                                       |
|  |      | Format: U32  |
|  |      | Specifies the slot 7 data in this payload register |

## Dword SIMD4x2 Atomic CMPWR Message Data Payload

| <b>MDP_AOP4X2_DW2 - Dword SIMD4x2 Atomic CMPWR Message Data Payload</b> |  |   |         |             |
|---|--|---|---------|-------------|
| Project:  | CHV, BSW   |   |         |             |
| Source:   | PRM  |   |         |             |
| Size (in bits):   | 256  |   |         |             |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |         |             |
| DWord   | Bit  | Description   |         |             |
| 0   | 31:0   | <b>Src0 Slot0</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>U32 S31 F32</td> </tr> </table> Specifies the Slot 0 Source 0 data | Format: | U32 S31 F32 |
| Format:   | U32 S31 F32  |   |         |             |
| 1   | 31:0   | <b>Src1 Slot0</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>U32 S31 F32</td> </tr> </table> Specifies the Slot 0 Source 1 data | Format: | U32 S31 F32 |
| Format:   | U32 S31 F32  |   |         |             |
| 2-3   | 63:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>Ignore</td> </tr> </table> Ignored                                   | Format: | Ignore      |
| Format:   | Ignore   |   |         |             |
| 4   | 31:0   | <b>Src0 Slot1</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>U32 S31 F32</td> </tr> </table> Specifies the Slot 1 Source 0 data | Format: | U32 S31 F32 |
| Format:   | U32 S31 F32  |   |         |             |
| 5   | 31:0   | <b>Src1 Slot1</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>U32 S31 F32</td> </tr> </table> Specifies the Slot 1 Source 1 data | Format: | U32 S31 F32 |
| Format:   | U32 S31 F32  |   |         |             |
| 6-7   | 63:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>Ignore</td> </tr> </table> Ignored                                   | Format: | Ignore      |
| Format:   | Ignore   |   |         |             |



## Dword SIMD4x2 Atomic Operation Message Data Payload

| <b>MDP_AOP4X2_DW1 - Dword SIMD4x2 Atomic Operation Message Data Payload</b> |  |   |         |             |
|---|--|---|---------|-------------|
| Project:  | CHV, BSW   |   |         |             |
| Source:   | PRM  |   |         |             |
| Size (in bits):   | 256  |   |         |             |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |         |             |
| DWord   | Bit  | Description   |         |             |
| 0   | 31:0   | <b>Dword0</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>U32 S31 F32</td> </tr> </table> Specifies the Slot 0 Source or Return data | Format: | U32 S31 F32 |
| Format:   | U32 S31 F32  |   |         |             |
| 1-3   | 95:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>Ignore</td> </tr> </table> Ignored                                       | Format: | Ignore      |
| Format:   | Ignore   |   |         |             |
| 4   | 31:0   | <b>Dword1</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>U32 S31 F32</td> </tr> </table> Specifies the Slot 1 Source or Return data | Format: | U32 S31 F32 |
| Format:   | U32 S31 F32  |   |         |             |
| 5-7   | 95:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>Ignore</td> </tr> </table> Ignored                                       | Format: | Ignore      |
| Format:   | Ignore   |   |         |             |

## Dword SIMD4x2 Data Payload

| <b>MDP_DW_SIMD4X2 - Dword SIMD4x2 Data Payload</b> |   |  |          |     |         |     |
|--|---|--|----------|-----|---------|-----|
| Project:   | CHV, BSW  |  |          |     |         |     |
| Source:  | PRM   |  |          |     |         |     |
| Size (in bits):                                    | 256   |  |          |     |         |     |
| Default Value:                                     | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |  |          |     |         |     |
| DWord  | Bit   | Description  |          |     |         |     |
| 0  | 31:0  | <p><b>Red Slot0</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the Slot 0 red channel data</p>     | Project: | All | Format: | U32 |
| Project:   | All   |  |          |     |         |     |
| Format:  | U32   |  |          |     |         |     |
| 1  | 31:0  | <p><b>Green Slot0</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the Slot 0 green channel data</p> | Project: | All | Format: | U32 |
| Project:   | All   |  |          |     |         |     |
| Format:  | U32   |  |          |     |         |     |
| 2  | 31:0  | <p><b>Blue Slot0</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the Slot 0 blue channel data</p>   | Project: | All | Format: | U32 |
| Project:   | All   |  |          |     |         |     |
| Format:  | U32   |  |          |     |         |     |
| 3  | 31:0  | <p><b>Alpha Slot0</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the Slot 0 alpha channel data</p> | Project: | All | Format: | U32 |
| Project:   | All   |  |          |     |         |     |
| Format:  | U32   |  |          |     |         |     |
| 4  | 31:0  | <p><b>Red Slot1</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the Slot 1 red channel data</p>     | Project: | All | Format: | U32 |
| Project:   | All   |  |          |     |         |     |
| Format:  | U32   |  |          |     |         |     |
| 5  | 31:0  | <p><b>Green Slot1</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the Slot 1 green channel data</p> | Project: | All | Format: | U32 |
| Project:   | All   |  |          |     |         |     |
| Format:  | U32   |  |          |     |         |     |

| <b>MDP_DW_SIMD4X2 - Dword SIMD4x2 Data Payload</b> |      |   |
|--|------|---|
| 6  | 31:0 | <b>Blue Slot1</b>                       |
|  |      | Project: All                            |
|  |      | Format: U32                             |
|  |      | Specifies the Slot 1 blue channel data  |
| 7  | 31:0 | <b>Alpha Slot1</b>                      |
|  |      | Project: All                            |
|  |      | Format: U32                             |
|  |      | Specifies the Slot 1 alpha channel data |

## Dword SIMD8 Atomic Operation CMPWR Message Data Payload

| <b>MDP_AOP8_DW2 - Dword SIMD8 Atomic Operation CMPWR Message Data Payload</b> |  |   |          |     |         |                    |
|---|--|---|----------|-----|---------|--------------------|
| Project:  | CHV, BSW   |   |          |     |         |                    |
| Source:   | PRM  |   |          |     |         |                    |
| Size (in bits):   | 512  |   |          |     |         |                    |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |     |         |                    |
| DWord   | Bit  | Description   |          |     |         |                    |
| 0.0-0.7   | 255:0  | <b>Src0</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the Slot [7:0] Source 0 data | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |         |                    |
| 1.0-1.7   | 255:0  | <b>Src1</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the Slot [7:0] Source 1 data | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |         |                    |

## Dword SIMD8 Data Payload

| <b>MDP_DW_SIMD8 - Dword SIMD8 Data Payload</b> |   |   |          |     |         |                    |
|--|---|---|----------|-----|---------|--------------------|
| Project:                                       | CHV, BSW  |   |          |     |         |                    |
| Source:  | PRM   |   |          |     |         |                    |
| Size (in bits):                                | 256   |   |          |     |         |                    |
| Default Value:                                 | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |   |          |     |         |                    |
| DWord  | Bit   | Description   |          |     |         |                    |
| 0.0-0.7  | 255:0   | <b>Data[7:0]</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the Slot [7:0] data | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:                                       | All   |   |          |     |         |                    |
| Format:  | MDCR_DW [CHV, BSW]  |   |          |     |         |                    |

## Dword SIMD16 Atomic Operation CMPWR Message Data Payload

| <b>MDP_AOP16_DW2 - Dword SIMD16 Atomic Operation CMPWR Message Data Payload</b> |  |   |          |     |         |                    |
|---|--|---|----------|-----|---------|--------------------|
| Project:  | CHV, BSW   |   |          |     |         |                    |
| Source:   | PRM  |   |          |     |         |                    |
| Size (in bits):   | 1024   |   |          |     |         |                    |
| Default Value:  | 0x00000000, 0x00000000 |   |          |     |         |                    |
| DWord   | Bit  | Description   |          |     |         |                    |
| 0.0-0.7   | 255:0  | <b>Src0[7:0]</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the Source 0 data for Slot [7:0]   | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |         |                    |
| 1.0-1.7   | 255:0  | <b>Src0[15:8]</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the Source 0 data for Slot [15:8] | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |         |                    |
| 2.0-2.7   | 255:0  | <b>Src1[7:0]</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the Source 1 data for Slot [7:0]   | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |         |                    |
| 3.0-3.7   | 255:0  | <b>Src1[15:8]</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the Source 1 data for Slot [15:8] | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |         |                    |

## Dword SIMD16 Data Payload

| <b>MDP_DW_SIMD16 - Dword SIMD16 Data Payload</b> |  |                            |
|--|--|----------------------------|
| Project:   | CHV, BSW   |                            |
| Source:  | PRM  |                            |
| Size (in bits):                                  | 512  |                            |
| Default Value:                                   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |                            |
| DWord  | Bit  | Description                |
| 0.0-0.7  | 255:0  | <b>Data[7:0]</b>           |
|  |  | Project: All               |
|  |  | Format: MDCR_DW [CHV, BSW] |
| Specifies the Slot [7:0] data                    |  |                            |
| 1.0-1.7  | 255:0  | <b>Data[15:8]</b>          |
|  |  | Project: All               |
|  |  | Format: MDCR_DW [CHV, BSW] |
| Specifies the Slot [15:8] data                   |  |                            |

## DX9\_CONSTANTB\_ENTRY

| DX9_CONSTANTB_ENTRY  |            |   |         |     |
|--|------------|---|---------|-----|
| Project:   | CHV, BSW   |   |         |     |
| Source:  | RenderCS   |   |         |     |
| Size (in bits):  | 32         |   |         |     |
| Default Value:   | 0x00000000 |   |         |     |
| <p>This structure is the payload of the 3DSTATE_DX9_CONSTANTB_* commands. Each entry provides the values for the one boolean constant being updated.</p> |            |   |         |     |
| DWord  | Bit        | Description   |         |     |
| 0  | 31:0       | <p><b>Component</b></p> <table border="1"> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>The boolean value to be stored.</p> | Format: | U32 |
| Format:  | U32        |   |         |     |



## DX9\_CONSTANTF\_ENTRY

| DX9_CONSTANTF_ENTRY   |   |   |            |            |
|---|---|---|------------|------------|
| Project:  | CHV, BSW  |   |            |            |
| Source:   | RenderCS  |   |            |            |
| Size (in bits):   | 128   |   |            |            |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000  |   |            |            |
| <p>This structure is the payload of the 3DSTATE_DX9_CONSTANTF_* commands. Each entry provides the values for the four components of one float constant being updated.</p> |   |   |            |            |
| DWord   | Bit   | Description   |            |            |
| 0   | 127:96  | <p><b>Component 3</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>The 4th component of the nth float to be stored.</p> | Format:    | IEEE_Float |
|   | Format:   | IEEE_Float  |            |            |
|   | 95:64   | <p><b>Component 2</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>The 3rd component of the nth float to be stored.</p> | Format:    | IEEE_Float |
|   | Format:   | IEEE_Float  |            |            |
| 63:32   | <p><b>Component 1</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>The 2nd component of the nth float to be stored.</p> | Format:   | IEEE_Float |            |
| Format:   | IEEE_Float  |   |            |            |
| 31:0  | <p><b>Component 0</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>The 1st component of the nth float to be stored.</p> | Format:   | IEEE_Float |            |
| Format:   | IEEE_Float  |   |            |            |

## DX9\_CONSTANTI\_ENTRY

| <b>DX9_CONSTANTI_ENTRY</b>  |  |   |         |     |
|---|--|---|---------|-----|
| Project:  | CHV, BSW                                       |   |         |     |
| Source:   | RenderCS                                       |   |         |     |
| Size (in bits):   | 128  |   |         |     |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |         |     |
| <p>This structure is the payload of the 3DSTATE_DX9_CONSTANTI_* commands. Each entry provides the values for the four components of one integer constant being updated.</p> |  |   |         |     |
| DWord   | Bit  | Description   |         |     |
| 0   | 31:0   | <p><b>Component 0</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> <p>The 1st component of the nth float to be stored.</p> | Format: | U32 |
| Format:   | U32  |   |         |     |
| 1   | 31:0   | <p><b>Component 1</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> <p>The 2nd component of the nth float to be stored.</p> | Format: | U32 |
| Format:   | U32  |   |         |     |
| 2   | 31:0   | <p><b>Component 2</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> <p>The 3rd component of the nth float to be stored.</p> | Format: | U32 |
| Format:   | U32  |   |         |     |
| 3   | 31:0   | <p><b>Component 3</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> <p>The 4th component of the nth float to be stored.</p> | Format: | U32 |
| Format:   | U32  |   |         |     |

## Encoder Statistics Format

| Encoder Statistics Format  |  |   |          |      |             |         |   |                |
|--|--|---|----------|------|-------------|---------|---|----------------|
| Project:   | CHV, BSW                                       |   |          |      |             |         |   |                |
| Source:  | VideoEnhancementCS                             |   |          |      |             |         |   |                |
| Size (in bits):  | 128  |   |          |      |             |         |   |                |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |      |             |         |   |                |
| <p>The per block data is intended for use by the video encoder and consists of 16 bytes of Denoise block data and FMD variances. Much of the data is encoded as an 8-bit mantissa with the leading 1 removed and a 4-bit shift. To recover the original 17-bit integer this code can be used: If (exp != 0) Number = ((0x100   Mantissa) &lt;&lt; exp) &gt;&gt; 7; else Number = mantissa;</p> |  |   |          |      |             |         |   |                |
| DWord  | Bit  | Description   |          |      |             |         |   |                |
| 0  | 31:24  | <b>Tearing_Count 1 (FMD Variance[8])</b>  |          |      |             |         |   |                |
|  |  | Format: U8  |          |      |             |         |   |                |
|  |  | Number of pixels that have (diff_cTcB > diff_cTcT + diff_cBcB)  |          |      |             |         |   |                |
|  |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DI is Disabled |
| Value  | Name   | Description   |          |      |             |         |   |                |
| 0  |  | DI is Disabled  |          |      |             |         |   |                |
| 23:16  |  | <b>Tearing_Count 2</b>  |          |      |             |         |   |                |
|  |  | Format: U8  |          |      |             |         |   |                |
|  |  | If the frame is Deinterlaced with Top First in the DN/DI state then this is (FMD Variance[9]) = Number of pixels that have (diff_cTpB > diff_cTcT + diff_pBpB)  |          |      |             |         |   |                |
|  |  | If the frame is bottom first then this is (FMD Variance[10]) = Number of pixels that have (diff_cBpT > diff_pTpT + diff_cBcB)   |          |      |             |         |   |                |
|  |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DI is Disabled |
| Value  | Name   | Description   |          |      |             |         |   |                |
| 0  |  | DI is Disabled  |          |      |             |         |   |                |
| 15:8   |  | <b>Motion_Count (FMD Variance[7])</b>   |          |      |             |         |   |                |
|  |  | Format: U8  |          |      |             |         |   |                |
|  |  | Number of pixels that are moving (different above a threshold)  |          |      |             |         |   |                |
|  |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DI is Disabled |
| Value  | Name   | Description   |          |      |             |         |   |                |
| 0  |  | DI is Disabled  |          |      |             |         |   |                |
| 7:0  |  | <b>Reserved</b>   |          |      |             |         |   |                |
|  |  | Format: MBZ   |          |      |             |         |   |                |
| 1  | 31:28  | <b>sSTAD</b>  |          |      |             |         |   |                |
|  |  | Format: U4  |          |      |             |         |   |                |
|  |  | Shift for the Sum in time of absolute differences for 16x4.   |          |      |             |         |   |                |
|  |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DN is Disabled</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Value    | Name | Description | Project | 0 |                |
| Value  | Name   | Description   | Project  |      |             |         |   |                |
| 0  |  | DN is Disabled  | CHV, BSW |      |             |         |   |                |

| <b>Encoder Statistics Format</b> |  |  |                |       |       |             |             |   |                |                |
|----------------------------------|--|--|----------------|-------|-------|-------------|-------------|---|----------------|----------------|
|                                  | 27:24  | <p><b>sSHCM</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U4</td> </tr> </table> <p>Shift for the Sum horizontalty of absolute differences.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 33%;">Value</th> <th style="width: 33%;">Name</th> <th style="width: 33%;">Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DN is Disabled</td> </tr> </tbody> </table>                            | Format:        | U4    | Value | Name        | Description | 0 |                | DN is Disabled |
|                                  | Format:  | U4   |                |       |       |             |             |   |                |                |
|                                  | Value  | Name   | Description    |       |       |             |             |   |                |                |
|                                  | 0  |  | DN is Disabled |       |       |             |             |   |                |                |
|                                  | 23:20  | <p><b>sSVCM</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U4</td> </tr> </table> <p>Shift for the Sum vertically of absolute differences.</p>  | Format:        | U4    |       |             |             |   |                |                |
|                                  | Format:  | U4   |                |       |       |             |             |   |                |                |
|                                  | 19:16  | <p><b>sDiff_cTpT</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U4</td> </tr> </table> <p>Shift for the sum of differences in top fields of current and previous frame.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 33%;">Value</th> <th style="width: 33%;">Name</th> <th style="width: 33%;">Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table> | Format:        | U4    | Value | Name        | Description | 0 |                | DI is Disabled |
|                                  | Format:  | U4   |                |       |       |             |             |   |                |                |
| Value                            | Name   | Description  |                |       |       |             |             |   |                |                |
| 0                                |  | DI is Disabled   |                |       |       |             |             |   |                |                |
| 15:12                            | <p><b>sDiff_cBpB</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U4</td> </tr> </table> <p>Shift for the sum of differences in bottom field of current and previous frame.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 33%;">Value</th> <th style="width: 33%;">Name</th> <th style="width: 33%;">Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table> | Format:  | U4             | Value | Name  | Description | 0           |   | DI is Disabled |                |
| Format:                          | U4   |  |                |       |       |             |             |   |                |                |
| Value                            | Name   | Description  |                |       |       |             |             |   |                |                |
| 0                                |  | DI is Disabled   |                |       |       |             |             |   |                |                |
| 11:8                             | <p><b>sDiff_cTcB</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U4</td> </tr> </table> <p>Shift for the sum of differences between top and bottom field in current frame.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 33%;">Value</th> <th style="width: 33%;">Name</th> <th style="width: 33%;">Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table> | Format:  | U4             | Value | Name  | Description | 0           |   | DI is Disabled |                |
| Format:                          | U4   |  |                |       |       |             |             |   |                |                |
| Value                            | Name   | Description  |                |       |       |             |             |   |                |                |
| 0                                |  | DI is Disabled   |                |       |       |             |             |   |                |                |
| 7:4                              | <p><b>sDiff_cTpB</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U4</td> </tr> </table> <p>Shift for the sum of differences between current top and previous bottom.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 33%;">Value</th> <th style="width: 33%;">Name</th> <th style="width: 33%;">Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>       | Format:  | U4             | Value | Name  | Description | 0           |   | DI is Disabled |                |
| Format:                          | U4   |  |                |       |       |             |             |   |                |                |
| Value                            | Name   | Description  |                |       |       |             |             |   |                |                |
| 0                                |  | DI is Disabled   |                |       |       |             |             |   |                |                |
| 3:0                              | <p><b>sDiff_cBpT</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U4</td> </tr> </table> <p>Shift for the sum of differences between current bottom and previous top.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 33%;">Value</th> <th style="width: 33%;">Name</th> <th style="width: 33%;">Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>       | Format:  | U4             | Value | Name  | Description | 0           |   | DI is Disabled |                |
| Format:                          | U4   |  |                |       |       |             |             |   |                |                |
| Value                            | Name   | Description  |                |       |       |             |             |   |                |                |
| 0                                |  | DI is Disabled   |                |       |       |             |             |   |                |                |
| 2                                | <p>31:24 <b>mDiff_cBpB (FMD Variance[1])</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U8</td> </tr> </table> <p>Mantissa of sum of differences in bottom field of current and previous frame.</p>   | Format:  | U8             |       |       |             |             |   |                |                |
| Format:                          | U8   |  |                |       |       |             |             |   |                |                |

| Encoder Statistics Format |       |   |          |      |             |         |   |                |                |          |  |
|---------------------------|-------|---|----------|------|-------------|---------|---|----------------|----------------|----------|--|
|                           |       | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DI is Disabled |                |          |  |
| Value                     | Name  | Description   |          |      |             |         |   |                |                |          |  |
| 0                         |       | DI is Disabled  |          |      |             |         |   |                |                |          |  |
|                           | 23:16 | <b>mDiff_cTcB (FMD Variance[2])</b><br>Format: U8<br>Mantissa of sum of differences between top and bottom field in current frame.  |          |      |             |         |   |                |                |          |  |
|                           |       | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DI is Disabled |                |          |  |
| Value                     | Name  | Description   |          |      |             |         |   |                |                |          |  |
| 0                         |       | DI is Disabled  |          |      |             |         |   |                |                |          |  |
|                           | 15:8  | <b>mDiff_cTpB (FMD Variance[3])</b><br>Format: U8<br>Mantissa of sum of differences between current top and previous bottom.  |          |      |             |         |   |                |                |          |  |
|                           |       | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DI is Disabled |                |          |  |
| Value                     | Name  | Description   |          |      |             |         |   |                |                |          |  |
| 0                         |       | DI is Disabled  |          |      |             |         |   |                |                |          |  |
|                           | 7:0   | <b>mDiff_cBpT (FMD Variance[4])</b><br>Format: U8<br>Mantissa of sum of differences between current bottom and previous top.  |          |      |             |         |   |                |                |          |  |
|                           |       | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DI is Disabled |                |          |  |
| Value                     | Name  | Description   |          |      |             |         |   |                |                |          |  |
| 0                         |       | DI is Disabled  |          |      |             |         |   |                |                |          |  |
| 3                         | 31:24 | <b>mSTAD</b><br>Format: U8<br>Mantissa of Sum in time of absolute differences for 16x4.   |          |      |             |         |   |                |                |          |  |
|                           |       | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DN is Disabled</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Value    | Name | Description | Project | 0 |                | DN is Disabled | CHV, BSW |  |
| Value                     | Name  | Description   | Project  |      |             |         |   |                |                |          |  |
| 0                         |       | DN is Disabled  | CHV, BSW |      |             |         |   |                |                |          |  |
|                           | 23:16 | <b>mSHCM</b><br>Format: U8<br>Mantissa of Sum horizontal of absolute differences.   |          |      |             |         |   |                |                |          |  |
|                           |       | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DN is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DN is Disabled |                |          |  |
| Value                     | Name  | Description   |          |      |             |         |   |                |                |          |  |
| 0                         |       | DN is Disabled  |          |      |             |         |   |                |                |          |  |
|                           | 15:8  | <b>mM</b><br>Format: U8<br>Mantissa of Sum vertically of absolute differences.  |          |      |             |         |   |                |                |          |  |
|                           |       | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DN is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DN is Disabled |                |          |  |
| Value                     | Name  | Description   |          |      |             |         |   |                |                |          |  |
| 0                         |       | DN is Disabled  |          |      |             |         |   |                |                |          |  |
|                           | 7:0   | <b>mDiff_cTpT (FMD Variance[0])</b><br>Format: U8<br>Mantissa of sum of differences in top fields of current and previous frame.  |          |      |             |         |   |                |                |          |  |
|                           |       | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>DI is Disabled</td> </tr> </tbody> </table>                                    | Value    | Name | Description | 0       |   | DI is Disabled |                |          |  |
| Value                     | Name  | Description   |          |      |             |         |   |                |                |          |  |
| 0                         |       | DI is Disabled  |          |      |             |         |   |                |                |          |  |



## EU\_INSTRUCTION\_BASIC\_ONE\_SRC

| EU_INSTRUCTION_BASIC_ONE_SRC |   |  |
|------------------------------|---|--|
| Project:                     | CHV, BSW  |  |
| Source:                      | Eulsa   |  |
| Size (in bits):              | 128   |  |
| Default Value:               | 0x00000000, 0x00000000, 0x00000000, 0x00000000  |  |
| DWord                        | Bit   | Description  |
| 0..3                         | 127:64  | <b>RegSource</b>                                     |
|                              |   | Exists If: ([Operand Controls][Src0.RegFile]!='IMM') |
|                              | Format: EU_INSTRUCTION_SOURCES_REG [CHV, BSW]   |  |
|                              | 127:64  | <b>ImmSource</b>                                     |
|                              |   | Exists If: ([Operand Controls][Src0.RegFile]='IMM')  |
|                              | Format: EU_INSTRUCTION_SOURCES_IMM32 [CHV, BSW] |  |
|                              | 63:32   | <b>Operand Controls</b>                              |
|                              |   | Format: EU_INSTRUCTION_OPERAND_CONTROLS [CHV, BSW]   |
| 31:0                         | <b>Header</b>                                   |  |
|                              | Format: EU_INSTRUCTION_HEADER [CHV, BSW]        |  |

## EU\_INSTRUCTION\_BASIC\_THREE\_SRC

| EU_INSTRUCTION_BASIC_THREE_SRC |  |  |             |
|--------------------------------|--|--|-------------|
| Project:                       | CHV, BSW                                       |  |             |
| Source:                        | Eulsa  |  |             |
| Size (in bits):                | 128  |  |             |
| Default Value:                 | 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |             |
| DWord                          | Bit  | Description  |             |
| 0..3                           | 127  | <b>Reserved</b><br>Format: MBZ   |             |
|                                | 126:106  | <b>Source 2</b><br>Project: CHV, BSW<br>Format: EU_INSTRUCTION_OPERAND_SRC_REG_THREE_SRC [CHV, BSW]  |             |
|                                | 105:85   | <b>Source 1</b><br>Project: CHV, BSW<br>Format: EU_INSTRUCTION_OPERAND_SRC_REG_THREE_SRC [CHV, BSW]  |             |
|                                | 84:64  | <b>Source 0</b><br>Project: CHV, BSW<br>Format: EU_INSTRUCTION_OPERAND_SRC_REG_THREE_SRC [CHV, BSW]  |             |
|                                | 63:56  | <b>Destination Register Number</b><br>Format: DstRegNum [CHV, BSW]   |             |
|                                | 55:53  | <b>Destination Subregister Number</b>  |             |
|                                | 52:49  | <b>Destination Channel Enable</b><br>Format: ChanEn[4]<br>Four channel enables are defined for controlling which channels are written into the destination region. These channel mask bits are applied in a modulo-four manner to all ExecSize channels. There is 1-bit Channel Enable for each channel within the group of 4. If the bit is cleared, the write for the corresponding channel is disabled. If the bit is set, the write is enabled. Mnemonics for the bit being set for the group of 4 are x, y, z, and w, respectively, where x corresponds to Channel 0 in the group and w corresponds to channel 3 in the group |             |
|                                | 48:46  | <b>Destination Data Type</b>   |             |
|                                |  | <b>Value</b>   | <b>Name</b> |
|                                |  | 000b   | :f          |
| 001b                           |  | :d   |             |
| 010b                           |  | :ud  |             |
| 011b                           |  | :df  |             |
| 100b                           | :hf  |  |             |
|                                |  | <b>Description</b>   |             |
|                                |  | single precision Float (32-bit)  |             |
|                                |  | signed Doubleword integer  |             |
|                                |  | Unsigned Doubleword integer  |             |
|                                |  | Double precision Float (64-bit)  |             |
|                                |  | Half Float (16-bit)  |             |



| <b>EU_INSTRUCTION_BASIC_THREE_SRC</b>  |   |  |  |
|--|---|--|--|
|  | 101b-111b   | Reserved                               |  |
| 45:43  | <b>Source Data Type</b>   |  |  |
|  | <b>Value</b>  | <b>Name</b>                            | <b>Description</b>   |
|  | 000b  | :f                                     | single precision Float (32-bit)  |
|  | 001b  | :d                                     | signed Doubleword integer  |
|  | 010b  | :ud                                    | Unsigned Doubleword integer  |
|  | 011b  | :df                                    | Double precision Float (64-bit)  |
|  | 100b  | :hf                                    | Half Float (16-bit)  |
|  | 101b-111b   | Reserved                               |  |
| 42:41  | <b>Source 2 Modifier</b>  |  |  |
|  | Exists If:  | (Property[Source Modifier] == 'true')  |  |
|  | Format:   | SrcMod [CHV, BSW]                      |  |
| 40:39  | <b>Source 1 Modifier</b>  |  |  |
|  | Exists If:  | (Property[Source Modifier] == 'true')  |  |
|  | Format:   | SrcMod [CHV, BSW]                      |  |
| 42:37  | <b>Reserved</b>   |  |  |
|  | Exists If:  | (Property[Source Modifier] == 'false') |  |
|  | Format:   | MBZ                                    |  |
| 38:37  | <b>Source 0 Modifier</b>  |  |  |
|  | Exists If:  | (Property[Source Modifier] == 'true')  |  |
|  | Format:   | SrcMod [CHV, BSW]                      |  |
| 36:35  | <b>Reserved</b>   |  |  |
|  | Project:  | CHV, BSW                               |  |
|  | Format:   | MBZ                                    |  |
| 34   | <b>MaskCtrl</b>   |  |  |
|  | Project:  | CHV, BSW                               |  |
|  | (formerly WECtrl/Write Enable Control). This flag disables the normal write enables; it should normally be 0. |  |  |
|  | <b>Value</b>  | <b>Name</b>                            | <b>Description</b>   |
|  | 0   | Normal                                 | Use the normal write enables in Dst.ChanEn (normal setting).   |
|  | 1   | NoMask                                 | Write all channels except those disabled by predication or by other masks besides the write enables. |
|  | <b>Programming Notes</b>  |  |  |
| MaskCtrl = NoMask also skips the check for PclP[n] == ExIP before enabling a channel, as described in the Evaluate Write Enable section. |   |  |  |
| 33   | <b>Flag Register Number</b>   |  |  |

| <b>EU_INSTRUCTION_BASIC_THREE_SRC</b> |   |         |                                  |
|---------------------------------------|---|---------|----------------------------------|
|                                       | This field contains the flag register number for instructions with a non-zero Conditional Modifier.   |         |                                  |
| 32                                    | <b>Flag Subregister Number</b><br>This field contains the flag subregister number for instructions with a non-zero Conditional Modifier.                    |         |                                  |
| 31:0                                  | <b>Header</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Format:</td> <td>EU_INSTRUCTION_HEADER [CHV, BSW]</td> </tr> </table> | Format: | EU_INSTRUCTION_HEADER [CHV, BSW] |
| Format:                               | EU_INSTRUCTION_HEADER [CHV, BSW]  |         |                                  |

## EU\_INSTRUCTION\_BASIC\_TWO\_SRC

| EU_INSTRUCTION_BASIC_TWO_SRC |  |                         |  |
|------------------------------|--|-------------------------|--|
| Project:                     | CHV, BSW                                       |                         |  |
| Source:                      | Eulsa  |                         |  |
| Size (in bits):              | 128  |                         |  |
| Default Value:               | 0x00000000, 0x00000000, 0x00000000, 0x00000000 |                         |  |
| DWord                        | Bit  | Description             |  |
| 0..3                         | 127:64   | <b>RegSource</b>        |  |
|                              |  | Exists If:              | ([RegSource][Src1.RegFile]!='IMM')         |
|                              |  | Format:                 | EU_INSTRUCTION_SOURCES_REG_REG [CHV, BSW]  |
|                              | 127:64   | <b>ImmSource</b>        |  |
|                              |  | Exists If:              | ([ImmSource][Src1.RegFile]='IMM')          |
|                              |  | Format:                 | EU_INSTRUCTION_SOURCES_REG_IMM [CHV, BSW]  |
|                              | 63:32  | <b>Operand Controls</b> |  |
|                              |  | Format:                 | EU_INSTRUCTION_OPERAND_CONTROLS [CHV, BSW] |
|                              | 31:0   | <b>Header</b>           |  |
|                              |  | Format:                 | EU_INSTRUCTION_HEADER [CHV, BSW]           |

## EU\_INSTRUCTION\_BRANCH\_CONDITIONAL

| EU_INSTRUCTION_BRANCH_CONDITIONAL   |   |                                    |  |
|---|---|------------------------------------|--|
| Project:  | CHV, BSW  |                                    |  |
| Source:   | Eulsa   |                                    |  |
| Size (in bits):   | 128   |                                    |  |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000  |                                    |  |
| DWord   | Bit   | Description                        |  |
| 0..3  | 127:64  | <b>Sources</b>                     |  |
|   |   | Exists If: ([Src1.RegFile]!='IMM') |  |
|   | Format: EU_INSTRUCTION_SOURCES_REG_REG [CHV, BSW]   |                                    |  |
|   | 127:64  | <b>Sources</b>                     |  |
|   |   | Exists If: ([Src1.RegFile]=='IMM') |  |
|   | Format: EU_INSTRUCTION_SOURCES_REG_IMM [CHV, BSW]   |                                    |  |
|   | 63:48   | <b>JIP</b>                         |  |
|   |   | Format: S15                        |  |
|   | Jump Target Offset. The jump distance in number of eight-byte units if a jump is taken for the instruction.   |                                    |  |
|   | 47  | <b>Reserved</b>                    |  |
| Format: MBZ   |   |                                    |  |
| 46:44   | <b>Src1.SrcType</b>   |                                    |  |
|   | Format: DataType  |                                    |  |
|   | This field specifies the numeric data type of the source operand src1. The bits of a source operand are interpreted as the identified numeric data type, rather than coerced into a type implied by the operator. Depending on RegFile field of the source operand, there are two different encoding for this field. If a source is a register operand, this field follows the Source Register Type Encoding. If a source is an immediate operand, this field follows the Source Immediate Type Encoding. |                                    |  |
|   | <b>Programming Notes</b>  |                                    |  |
|   | Both source operands, src0 and src1, support immediate types, but only one immediate is allowed for a given instruction and it must be the last operand.  |                                    |  |
| Halfbyte integer vector (v) type can only be used in instructions in packed-word execution mode. Therefore, in a two-source instruction where src1 is of type :v, src0 must be of type :b, :ub, :w, or :uw. |   |                                    |  |
| 43:42   | <b>Src1.RegFile</b>   |                                    |  |
|   | Format: RegFile [CHV, BSW]  |                                    |  |
| 41:39   | <b>Src0.SrcType</b>   |                                    |  |
|   | Format: DataType  |                                    |  |

| <b>EU_INSTRUCTION_BRANCH_CONDITIONAL</b> |   |   |       |      |             |     |          |   |
|--|---|---|-------|------|-------------|-----|----------|---|
| 38:37                                    | <b>Src0.RegFile</b>   |   |       |      |             |     |          |   |
|  | Format:   | RegFile [CHV, BSW]  |       |      |             |     |          |   |
| 36:34                                    | <b>Destination Data Type</b>  |   |       |      |             |     |          |   |
|  | Format:   | DataType  |       |      |             |     |          |   |
|  | <p>This field specifies the numeric data type of the destination operand dst. The bits of the destination operand are interpreted as the identified numeric data type, rather than coerced into a type implied by the operator. For a send instruction, this field applies to the CurrDst ? the current destination operand.</p>  |   |       |      |             |     |          |   |
| 33:32                                    | <b>Destination Register File</b>  |   |       |      |             |     |          |   |
|  | Format:   | RegFile [CHV, BSW]  |       |      |             |     |          |   |
|  | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Value</th> <th style="text-align: left;">Name</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr> <td>11b</td> <td>Reserved</td> <td>Note that it is obvious that immediate cannot be a destination operand.</td> </tr> </tbody> </table> |   | Value | Name | Description | 11b | Reserved | Note that it is obvious that immediate cannot be a destination operand. |
| Value                                    | Name  | Description   |       |      |             |     |          |   |
| 11b                                      | Reserved  | Note that it is obvious that immediate cannot be a destination operand. |       |      |             |     |          |   |
| 31:0                                     | <b>Header</b>   |   |       |      |             |     |          |   |
|  | Format:   | EU_INSTRUCTION_HEADER [CHV, BSW]  |       |      |             |     |          |   |

## EU\_INSTRUCTION\_BRANCH\_ONE\_SRC

| EU_INSTRUCTION_BRANCH_ONE_SRC |  |  |          |
|-------------------------------|--|--|----------|
| Project:                      | CHV, BSW   |  |          |
| Source:                       | Eulsa  |  |          |
| Size (in bits):               | 128  |  |          |
| Default Value:                | 0x00000000, 0x00000000, 0x00000000, 0x00000000                 |  |          |
| DWord                         | Bit  | Description  |          |
| 0..3                          | 127:96   | <b>JIP</b>   |          |
|                               |  | Project:   | CHV, BSW |
|                               |  | Format:  | S31      |
|                               |  | Jump Target Offset. The relative offset in bytes if a jump is taken for the instruction. |          |
|                               | 95   | <b>Source 0 Address Immediate [9] Sign Bit</b>   |          |
|                               | Project:   | CHV, BSW   |          |
|                               | 94:91  | <b>Src1.SrcType</b>  |          |
|                               | Project:   | CHV, BSW   |          |
|                               | Format:  | SrcType [CHV, BSW]   |          |
|                               | 90:89  | <b>Src1.RegFile</b>  |          |
| Project:                      | CHV, BSW   |  |          |
| Format:                       | RegFile [CHV, BSW]   |  |          |
| 88:64                         | <b>Source 0</b>  |  |          |
| Exists If:                    | (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]== 'Align16') |  |          |
| Format:                       | EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16 [CHV, BSW]              |  |          |
| 88:64                         | <b>Source 0</b>  |  |          |
| Exists If:                    | (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]== 'Align1')  |  |          |
| Format:                       | EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN1 [CHV, BSW]               |  |          |
| 63:32                         | <b>Operand Control</b>   |  |          |
| Format:                       | EU_INSTRUCTION_OPERAND_CONTROLS [CHV, BSW]                     |  |          |
| 31:0                          | <b>Header</b>  |  |          |
| Format:                       | EU_INSTRUCTION_HEADER [CHV, BSW]                               |  |          |

## EU\_INSTRUCTION\_BRANCH\_TWO\_SRC

| EU_INSTRUCTION_BRANCH_TWO_SRC  |  |                   |
|--|--|-------------------|
| Project:   | CHV, BSW   |                   |
| Source:  | Eulsa  |                   |
| Size (in bits):  | 128  |                   |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000                     |                   |
| DWord  | Bit  | Description       |
| 0..3   | 127:96   | <b>JIP</b>        |
|  |  | Project: CHV, BSW |
|  | Format: S31  |                   |
|  | The byte-aligned jump distance if a jump is taken for the channel. |                   |
| 95:64  | <b>UIP</b>   |                   |
|  | Project: CHV, BSW  |                   |
| Format: S31  |  |                   |
| The byte aligned jump distance if a jump is taken for the instruction. |  |                   |
| 63:32  | <b>Operand Control</b>   |                   |
| Format:  | EU_INSTRUCTION_OPERAND_CONTROLS [CHV, BSW]                         |                   |
| 31:0   | <b>Header</b>  |                   |
| Format:  | EU_INSTRUCTION_HEADER [CHV, BSW]                                   |                   |

## EU\_INSTRUCTION\_COMPACT\_THREE\_SRC

| EU_INSTRUCTION_COMPACT_THREE_SRC  |  |  |                   |                |
|---|--|--|-------------------|----------------|
| Project:  | CHV, BSW   |  |                   |                |
| Source:   | Eulsa  |  |                   |                |
| Size (in bits):   | 64   |  |                   |                |
| Default Value:  | 0x00000000, 0x00000000   |  |                   |                |
| DWord   | Bit  | Description  |                   |                |
| 0..1  | 63:57  | <b>Src2.RegNum[6:0]</b>  |                   |                |
|   |  | Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 100px;"></td><td>SrcRegNum[6:0]</td></tr></table> |                   | SrcRegNum[6:0] |
|   |  |  | SrcRegNum[6:0]    |                |
|   | Src2.RegNum[6:0]. The SourceIndex field in the compact instruction determines Src2.RegNum[7].<br>Maps to 124:118   |  |                   |                |
|   | 56:50  | <b>Src1.RegNum[6:0]</b>  |                   |                |
|   |  | Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 100px;"></td><td>SrcRegNum[6:0]</td></tr></table> |                   | SrcRegNum[6:0] |
|   |  |  | SrcRegNum[6:0]    |                |
| Src1.RegNum[6:0]. The SourceIndex field in the compact instruction determines Src1.RegNum[7].<br>Maps to 103:97 |  |  |                   |                |
| 49:43   | <b>Src0.RegNum[6:0]</b>  |  |                   |                |
|   | Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 100px;"></td><td>SrcRegNum[6:0]</td></tr></table>                       |  | SrcRegNum[6:0]    |                |
|   |  | SrcRegNum[6:0]   |                   |                |
| Src0.RegNum[6:0]. The SourceIndex field in the compact instruction determines Src0.RegNum[7].<br>Maps to 82:76  |  |  |                   |                |
| 42:40   | <b>Src2.SubRegNum</b>  |  |                   |                |
|   | Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 100px;"></td><td>SrcSubRegNum[4:2]</td></tr></table><br>Maps to 117:115 |  | SrcSubRegNum[4:2] |                |
|   | SrcSubRegNum[4:2]  |  |                   |                |
| 39:37   | <b>Src1.SubRegNum</b>  |  |                   |                |
|   | Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 100px;"></td><td>SrcSubRegNum[4:2]</td></tr></table><br>Maps to 96:94   |  | SrcSubRegNum[4:2] |                |
|   | SrcSubRegNum[4:2]  |  |                   |                |
| 36:34   | <b>Src0.SubRegNum</b>  |  |                   |                |
|   | Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 100px;"></td><td>SrcSubRegNum[4:2]</td></tr></table><br>Maps to 75:73   |  | SrcSubRegNum[4:2] |                |
|   | SrcSubRegNum[4:2]  |  |                   |                |
| 33  | <b>Src2.RepCtrl</b>  |  |                   |                |



| <b>EU_INSTRUCTION_COMPACT_THREE_SRC</b> |   |   |
|---|---|---|
|   | Format:   | RepCtrl [CHV, BSW]  |
|   | Maps to 106   |   |
| 32                                      | <b>Src1.RepCtrl</b>   |   |
|   | Format:   | RepCtrl [CHV, BSW]  |
|   | Maps to 85  |   |
| 31                                      | <b>Reserved</b>   |   |
|   | Exists If:  | (Property[Saturation]== 'false')                                  |
|   | Format:   | MBZ   |
| 31                                      | <b>Saturate</b>   |   |
|   | Exists If:  | (Property[Saturation]== 'true')                                   |
|   | Maps to 31  |   |
| 30                                      | <b>Reserved</b>   |   |
| 29                                      | <b>Compaction Control</b>   |   |
|   | Format:   | CmptCtrl  |
| 28                                      | <b>Src0.RepCtrl</b>   |   |
|   | Format:   | RepCtrl [CHV, BSW]  |
|   | Maps to 64  |   |
| 27:19                                   | <b>Reserved</b>   |   |
|   | Format:   | MBZ   |
| 18:12                                   | <b>Dst.RegNum[6:0]</b>  |   |
|   | Format:   | DstRegNum[6:0]  |
|   | Dst.RegNum[7:0] with MSB of zero and [6:0] from the compact instruction   |   |
|   | Maps to 63:56 (Dst.RegNum)  |   |
| 11:10                                   | <b>SourceIndex</b>  |   |
|   | Project:  | CHV, BSW  |
|   | Lookup one of four 49-bit values. That value is used (from MSB to LSB) for the Src2.SubRegNum, Src2.RegNum[7], Src1.RegNum, Src1.RegNum[7], Src0.SubRegNum, Src0.RegNum[7], Src2.ChanSel, Src1.ChanSel, Src0.ChanSel, Dst.SubRegNum, Dst.ChanEnable, Dst.DstType, SrcType, Src2.Modifier, Src1.Modifier, and Src0.Modifier bit fields |   |
|   | Maps to 126, 125, 105, 104, 84, 83, 114:107, 93:86, 72:65, 55:49, 48:43, 42:37  |   |
|   | <b>Value</b>  | <b>Name</b> <span style="float: right;"><b>Description</b></span> |

| <b>EU_INSTRUCTION_COMPACT_THREE_SRC</b> |  |   |                       |
|---|--|---|-----------------------|
|   | 0  | 0000001110010011100100111001000001111000000000000 | No Negation           |
|   | 1  | 0000001110010011100100111001000001111000000000010 | Negate Src0           |
|   | 2  | 0000001110010011100100111001000001111000000001000 | Negate Src1           |
|   | 3  | 0000001110010011100100111001000001111000000100000 | Negate Src2           |
| 9:8                                     | <b>ControllIndex</b>   |   |                       |
|   | Project:   | CHV, BSW  |                       |
|   | <p>Lookup one of four 26-bit values. That value is used (from MSB to LSB) for the Src1.Type, Src2.Type MaskCtrl, FlagRegNum/FlagSubRegNum, AccWrCtrl, CondModifier, ExecSize, PredInv, PredCtrl, ThreadCtrl, QtrCtrl, NibCtrl, DepCtrl, and AccessMode bit fields.</p> <p>Maps to 36:35, 34, 33:32, 28:8</p> |   |                       |
|   | <b>Value</b>   | <b>Name</b>                                       | <b>Description</b>    |
|   | 0  | 0010000000001100000000000001                      | (8) Q1 NoMask Align16 |
|   | 1  | 0000000000001100000000000001                      | (8) Q1 Align16        |
|   | 2  | 0000000000010000000000000001                      | (16) H1 Align16       |
|   | 3  | 00000000000100000000000100001                     | (16) H2 Align16       |
| 7                                       | <b>Reserved</b>  |   |                       |
|   | Format:  | MBZ   |                       |
| 6:0                                     | <b>Opcode</b>  |   |                       |

## EU\_INSTRUCTION\_COMPACT\_TWO\_SRC

| <b>EU_INSTRUCTION_COMPACT_TWO_SRC</b> |                        |
|---------------------------------------|------------------------|
| Project:                              | CHV, BSW               |
| Source:                               | Eulsa                  |
| Size (in bits):                       | 64                     |
| Default Value:                        | 0x00000000, 0x00000000 |

The following table describes the EU compact instruction format. The compact instruction format for 1 or 2-source instructions is essentially identical to the compact instruction format for earlier generations, but the compact fields expand to somewhat different fields in the native instruction format, as the native instruction format changed for CHV, BSW.

| DWord      | Bit   | Description   |   |   |                     |                      |
|------------|---|---|---|---|---------------------|----------------------|
| 0..1       | 63:56   | <b>Src1.RegNum</b><br><table border="1"> <tr> <td>Exists If:</td> <td>(([DataTypeIndex][Src1.RegFile]!='IMM')</td> </tr> <tr> <td>Format:</td> <td>SrcRegNum [CHV, BSW]</td> </tr> </table> Maps to 108:101 (Src1.RegNum) | Exists If:                              | (([DataTypeIndex][Src1.RegFile]!='IMM') | Format:             | SrcRegNum [CHV, BSW] |
|            | Exists If:  | (([DataTypeIndex][Src1.RegFile]!='IMM')   |   |   |                     |                      |
| Format:    | SrcRegNum [CHV, BSW]  |   |   |   |                     |                      |
| 63:56      | <b>Src1.RegNum</b><br><table border="1"> <tr> <td>Exists If:</td> <td>(([DataTypeIndex][Src1.RegFile]='IMM')</td> </tr> </table> Maps to 103:96 (Imm32[7:0])  | Exists If:  | (([DataTypeIndex][Src1.RegFile]='IMM')  |   |                     |                      |
| Exists If: | (([DataTypeIndex][Src1.RegFile]='IMM')  |   |   |   |                     |                      |
| 55:48      | <b>Src0.RegNum</b><br><table border="1"> <tr> <td>Format:</td> <td>SrcRegNum [CHV, BSW]</td> </tr> </table> Maps to 76:69 (Src0.RegNum)   | Format:   | SrcRegNum [CHV, BSW]                    |   |                     |                      |
| Format:    | SrcRegNum [CHV, BSW]  |   |   |   |                     |                      |
| 47:40      | <b>Dst.RegNum</b><br><table border="1"> <tr> <td>Format:</td> <td>DstRegNum [CHV, BSW]</td> </tr> </table> Maps to 60:53 (Dst.RegNum)   | Format:   | DstRegNum [CHV, BSW]                    |   |                     |                      |
| Format:    | DstRegNum [CHV, BSW]  |   |   |   |                     |                      |
| 39:35      | <b>Src1Index</b><br><table border="1"> <tr> <td>Exists If:</td> <td>(([DataTypeIndex][Src1.RegFile]!='IMM')</td> </tr> <tr> <td>Format:</td> <td>SrcIndex [CHV, BSW]</td> </tr> </table><br>If not an immediate operand, lookup one of 32 12-bit values that maps to bits 120:109. That value is used (from MSB to LSB) for the Src1.VertStride, various Src1 bit fields based on AccessMode (Src1.ChanSel[7:4], Src1.Width, Src1.HorzStride), Src1.AddrMode, and Src1.SrcMod bit fields<br>Maps to 120:109 | Exists If:  | (([DataTypeIndex][Src1.RegFile]!='IMM') | Format:                                 | SrcIndex [CHV, BSW] |                      |
|            | Exists If:  | (([DataTypeIndex][Src1.RegFile]!='IMM')   |   |   |                     |                      |
| Format:    | SrcIndex [CHV, BSW]   |   |   |   |                     |                      |
| 39:35      | <b>Src1Index</b><br><table border="1"> <tr> <td>Exists If:</td> <td>(([DataTypeIndex][Src1.RegFile]='IMM')</td> </tr> </table>  | Exists If:  | (([DataTypeIndex][Src1.RegFile]='IMM')  |   |                     |                      |
| Exists If: | (([DataTypeIndex][Src1.RegFile]='IMM')  |   |   |   |                     |                      |

## EU\_INSTRUCTION\_COMPACT\_TWO\_SRC

|            |  | <p>If an immediate operand, there is no lookup. Determines bits 127:104 (Imm32[31:8]) as follows: map bits 39:35 directly to bits 108:104. Sign extend to fill bits 127:109. Compact format bit 39 is thus copied to all of bits 127:108 for an immediate operand.</p> <p>Maps to 127:104</p>  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
|------------|--|--|------------|--|-------------|-------------------------|------------------|-----------|---|------------------|-------------------|---|-----------------|-----------|---|-----------------|----------------------|---|----------------|------------|---|-----------------|-----------|
|            | 34:30                                      | <p><b>Src0Index</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Format:</td> <td>SrcIndex [CHV, BSW]</td> </tr> </table> <p>Lookup one of 32 12-bit values. That value is used (from MSB to LSB) for the Src0.VertStride, various Src0 bit fields based on AccessMode (Src0.ChanSel[7:4], Src0.Width, Src0.HorzStride), Src0.AddrMode, and Src0.SrcMod bit fields. Note that this field spans a DWord boundary within the QWord compacted instruction.</p> <p>Maps to 88:77</p>  | Format:    | SrcIndex [CHV, BSW]                        |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| Format:    | SrcIndex [CHV, BSW]                        |  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
|            | 29   | <p><b>Compaction Control</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Format:</td> <td>CmptCtrl</td> </tr> </table>   | Format:    | CmptCtrl                                   |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| Format:    | CmptCtrl                                   |  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
|            | 28   | <p><b>Reserved</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Format:</td> <td>MBZ</td> </tr> </table>  | Format:    | MBZ  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| Format:    | MBZ  |  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
|            | 27:24                                      | <p><b>Reserved</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Exists If:</td> <td>(Property[Conditional Modifier]== 'false')</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Exists If: | (Property[Conditional Modifier]== 'false') | Format:     | MBZ                     |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| Exists If: | (Property[Conditional Modifier]== 'false') |  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| Format:    | MBZ  |  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
|            | 27:24                                      | <p><b>Conditional Modifier</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Exists If:</td> <td>(Property[Conditional Modifier]== 'true')</td> </tr> <tr> <td>Format:</td> <td>CondModifier [CHV, BSW]</td> </tr> </table>  | Exists If: | (Property[Conditional Modifier]== 'true')  | Format:     | CondModifier [CHV, BSW] |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| Exists If: | (Property[Conditional Modifier]== 'true')  |  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| Format:    | CondModifier [CHV, BSW]                    |  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
|            | 23   | <p><b>Accumulator Write Control</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Format:</td> <td>AccWrCtrl</td> </tr> </table>   | Format:    | AccWrCtrl                                  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| Format:    | AccWrCtrl                                  |  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
|            | 22:18                                      | <p><b>SubRegIndex</b></p> <p>Lookup one of 32 15-bit values. That value is used (from MSB to LSB) for various fields for Src1, Src0, and Dst, including ChanEn/ChanSel, SubRegNum, and AddrImm[4] or AddrImm[4:0], depending on AddrMode and AccessMode.</p> <p>Maps to 100:96, 68:64, 52:48</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 45%;">Name</th> <th style="width: 40%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0000000000000000</td> <td style="text-align: center;">0   0   0  </td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0000000000000001</td> <td style="text-align: center;">0.x   0.xx   0.xx</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">000000000001000</td> <td style="text-align: center;">8   0   0  </td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">000000000001111</td> <td style="text-align: center;">0.xyzw   0.xx   0.xx</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">00000000010000</td> <td style="text-align: center;">16   0   0  </td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">000000010000000</td> <td style="text-align: center;">0   4   0  </td> </tr> </tbody> </table> | Value      | Name                                       | Description | 0                       | 0000000000000000 | 0   0   0 | 1 | 0000000000000001 | 0.x   0.xx   0.xx | 2 | 000000000001000 | 8   0   0 | 3 | 000000000001111 | 0.xyzw   0.xx   0.xx | 4 | 00000000010000 | 16   0   0 | 5 | 000000010000000 | 0   4   0 |
| Value      | Name                                       | Description  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| 0          | 0000000000000000                           | 0   0   0  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| 1          | 0000000000000001                           | 0.x   0.xx   0.xx  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| 2          | 000000000001000                            | 8   0   0  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| 3          | 000000000001111                            | 0.xyzw   0.xx   0.xx   |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| 4          | 00000000010000                             | 16   0   0   |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |
| 5          | 000000010000000                            | 0   4   0  |            |  |             |                         |                  |           |   |                  |                   |   |                 |           |   |                 |                      |   |                |            |   |                 |           |

### EU\_INSTRUCTION\_COMPACT\_TWO\_SRC

|    |                 |                      |
|----|-----------------|----------------------|
| 6  | 000000100000000 | 0   8   0            |
| 7  | 000000110000000 | 0   12   0           |
| 8  | 000001000000000 | 0   16   0           |
| 9  | 000001000010000 | 16   16   0          |
| 10 | 000001010000000 | 0   20   0           |
| 11 | 001000000000000 | 0   0   4            |
| 12 | 001000000000001 | 0.x   0.xx   0.xy    |
| 13 | 001000010000001 | 0.x   0.xy   0.xy    |
| 14 | 001000010000010 | 0.y   0.xy   0.xy    |
| 15 | 001000010000011 | 0.xy   0.xy   0.xy   |
| 16 | 001000010000100 | 0.z   0.xy   0.xy    |
| 17 | 001000010000111 | 0.xyz   0.xy   0.xy  |
| 18 | 001000010001000 | 0.w   0.xy   0.xy    |
| 19 | 001000010001110 | 0.yzw   0.xy   0.xy  |
| 20 | 001000010001111 | 0.xyzw   0.xy   0.xy |
| 21 | 001000110000000 | 0   12   4           |
| 22 | 001000111101000 | 0.w   0.ww   0.xy    |
| 23 | 010000000000000 | 0   0   8            |
| 24 | 010000110000000 | 0   12   8           |
| 25 | 011000000000000 | 0   0   12           |
| 26 | 011110010000111 | 0.xyz   0.xy   0.ww  |
| 27 | 100000000000000 | 0   0   16           |
| 28 | 101000000000000 | 0   0   20           |
| 29 | 110000000000000 | 0   0   24           |
| 30 | 111000000000000 | 0   0   28           |
| 31 | 111000000011100 | 28   0   28          |

**17:13 DataTypeIdIndex**  
 Lookup one of 32 21-bit values. That value is used (from MSB to LSB) for the Dst.AddrMode, Dst.HorzStride, Src1.SrcType, Src1.RegFile, Src0.SrcType, Src0.RegFile, Dst.DstType, and Dst.RegFile bit fields.  
 Maps to 63:61, 94:89, 46:35

| Value | Name                   | Description                    |
|-------|------------------------|--------------------------------|
| 0     | 0010000000000000000001 | r:ud   a:ud   a:ud   <1>   dir |
| 1     | 001000000000001000000  | a:ud   r:ud   a:ud   <1>   dir |
| 2     | 001000000000001000001  | r:ud   r:ud   a:ud   <1>   dir |
| 3     | 00100000000011000001   | r:ud   i:ud   a:ud   <1>   dir |

## EU\_INSTRUCTION\_COMPACT\_TWO\_SRC

| 4     | 00100000000101011101  | r:f   r:d   a:ud   <1>   dir   |       |      |             |   |                     |                          |   |                     |                     |
|-------|---|--------------------------------|-------|------|-------------|---|---------------------|--------------------------|---|---------------------|---------------------|
| 5     | 001000000010111011101   | r:f   i:vf   a:ud   <1>   dir  |       |      |             |   |                     |                          |   |                     |                     |
| 6     | 001000000011101000001   | r:ud   r:f   a:ud   <1>   dir  |       |      |             |   |                     |                          |   |                     |                     |
| 7     | 001000000011101000101   | r:d   r:f   a:ud   <1>   dir   |       |      |             |   |                     |                          |   |                     |                     |
| 8     | 001000000011101011101   | r:f   r:f   a:ud   <1>   dir   |       |      |             |   |                     |                          |   |                     |                     |
| 9     | 001000001000001000001   | r:ud   r:ud   r:ud   <1>   dir |       |      |             |   |                     |                          |   |                     |                     |
| 10    | 001000011000001000000   | a:ud   r:ud   i:ud   <1>   dir |       |      |             |   |                     |                          |   |                     |                     |
| 11    | 001000011000001000001   | r:ud   r:ud   i:ud   <1>   dir |       |      |             |   |                     |                          |   |                     |                     |
| 12    | 001000101000101000101   | r:d   r:d   r:d   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 13    | 001000111000101000100   | a:d   r:d   i:d   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 14    | 001000111000101000101   | r:d   r:d   i:d   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 15    | 001011100011101011101   | r:f   r:f   a:f   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 16    | 001011101011100011101   | r:f   a:f   r:f   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 17    | 001011101011101011100   | a:f   r:f   r:f   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 18    | 001011101011101011101   | r:f   r:f   r:f   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 19    | 001011111011101011100   | a:f   r:f   i:f   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 20    | 000000000010000001100   | a:w   a:ub   a:ud   <0>   dir  |       |      |             |   |                     |                          |   |                     |                     |
| 21    | 001000000000001011101   | r:f   r:ud   a:ud   <1>   dir  |       |      |             |   |                     |                          |   |                     |                     |
| 22    | 001000000000101000101   | r:d   r:d   a:ud   <1>   dir   |       |      |             |   |                     |                          |   |                     |                     |
| 23    | 001000001000001000000   | a:ud   r:ud   r:ud   <1>   dir |       |      |             |   |                     |                          |   |                     |                     |
| 24    | 001000101000101000100   | a:d   r:d   r:d   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 25    | 001000111000100000100   | a:d   a:d   i:d   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 26    | 001001001001000001001   | r:uw   a:uw   r:uw   <1>   dir |       |      |             |   |                     |                          |   |                     |                     |
| 27    | 001010111011101011101   | r:f   r:f   i:vf   <1>   dir   |       |      |             |   |                     |                          |   |                     |                     |
| 28    | 001011111011101011101   | r:f   r:f   i:f   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 29    | 001001111001101001100   | a:w   r:w   i:w   <1>   dir    |       |      |             |   |                     |                          |   |                     |                     |
| 30    | 001001001001001001000   | a:uw   r:uw   r:uw   <1>   dir |       |      |             |   |                     |                          |   |                     |                     |
| 31    | 001001011001001001000   | a:uw   r:uw   i:uw   <1>   dir |       |      |             |   |                     |                          |   |                     |                     |
| 12:8  | <p><b>ControllIndex</b></p> <p>Lookup one of 32 19-bit values. That value is used (from MSB to LSB) for the FlagRegNum, FlagSubRegNum, Saturate, ExecSize, PredInv, PredCtrl, ThreadCtrl, QtrCtrl, DepCtrl, MaskCtrl, and AccessMode bit fields.</p> <p>Maps to 33:32, 31, 23:12, 10:9, 34, 8</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 35%;">Name</th> <th style="width: 50%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>0000000000000000010</td> <td>Align1   We   (1)   f0.0</td> </tr> <tr> <td style="text-align: center;">1</td> <td>0000100000000000000</td> <td>Align1   (4)   f0.0</td> </tr> </tbody> </table> |                                | Value | Name | Description | 0 | 0000000000000000010 | Align1   We   (1)   f0.0 | 1 | 0000100000000000000 | Align1   (4)   f0.0 |
| Value | Name  | Description                    |       |      |             |   |                     |                          |   |                     |                     |
| 0     | 0000000000000000010   | Align1   We   (1)   f0.0       |       |      |             |   |                     |                          |   |                     |                     |
| 1     | 0000100000000000000   | Align1   (4)   f0.0            |       |      |             |   |                     |                          |   |                     |                     |

### EU\_INSTRUCTION\_COMPACT\_TWO\_SRC

|     |                      |  |
|-----|----------------------|--|
| 2   | 00001000000000000001 | Align16   (4)   f0.0                         |
| 3   | 00001000000000000010 | Align1   We   (4)   f0.0                     |
| 4   | 00001000000000000011 | Align16   We   (4)   f0.0                    |
| 5   | 00001000000000000100 | Align1   NoDDClr   (4)   f0.0                |
| 6   | 00001000000000000101 | Align16   NoDDClr   (4)   f0.0               |
| 7   | 00001000000000000111 | Align16   We   NoDDClr   (4)   f0.0          |
| 8   | 00001000000000001000 | Align1   NoDDChk   (4)   f0.0                |
| 9   | 00001000000000001001 | Align16   NoDDChk   (4)   f0.0               |
| 10  | 00001000000000001101 | Align16   NoDDClr, NoDDChk   (4)   f0.0      |
| 11  | 00001100000000000000 | Align1   Q1   (8)   f0.0                     |
| 12  | 00001100000000000001 | Align16   Q1   (8)   f0.0                    |
| 13  | 00001100000000000010 | Align1   We   Q1   (8)   f0.0                |
| 14  | 00001100000000000011 | Align16   We   Q1   (8)   f0.0               |
| 15  | 00001100000000000100 | Align1   NoDDClr   Q1   (8)   f0.0           |
| 16  | 00001100000000000101 | Align16   NoDDClr   Q1   (8)   f0.0          |
| 17  | 00001100000000000111 | Align16   We   NoDDClr   Q1   (8)   f0.0     |
| 18  | 00001100000000001001 | Align16   NoDDChk   Q1   (8)   f0.0          |
| 19  | 00001100000000001101 | Align16   NoDDClr, NoDDChk   Q1   (8)   f0.0 |
| 20  | 0000110000000010000  | Align1   Q2   (8)   f0.0                     |
| 21  | 00001100001000000000 | Align1   Q1   +f.xyzw   (8)   f0.0           |
| 22  | 00010000000000000000 | Align1   H1   (16)   f0.0                    |
| 23  | 00010000000000000010 | Align1   We   H1   (16)   f0.0               |
| 24  | 00010000000000000100 | Align1   NoDDClr   H1   (16)   f0.0          |
| 25  | 00010000001000000000 | Align1   H1   +f.xyzw   (16)   f0.0          |
| 26  | 00101100000000000000 | Align1   Q1   (8)   .sat   f0.0              |
| 27  | 00101100000000001000 | Align1   Q2   (8)   .sat   f0.0              |
| 28  | 00110000000000000000 | Align1   H1   (16)   .sat   f0.0             |
| 29  | 00110000001000000000 | Align1   H1   +f.xyzw   (16)   .sat   f0.0   |
| 30  | 01010000000000000000 | Align1   H1   (16)   f0.1                    |
| 31  | 01010000001000000000 | Align1   H1   +f.xyzw   (16)   f0.1          |
| 7   | <b>Reserved</b>      |  |
| 6:0 | <b>Opcode</b>        |  |

## EU\_INSTRUCTION\_CONTROLS\_A

| EU_INSTRUCTION_CONTROLS_A |   |   |   |      |             |   |                              |   |   |          |
|---------------------------|---|---|---|------|-------------|---|------------------------------|---|---|----------|
| Project:                  | CHV, BSW  |   |   |      |             |   |                              |   |   |          |
| Source:                   | Eulsa   |   |   |      |             |   |                              |   |   |          |
| Size (in bits):           | 16  |   |   |      |             |   |                              |   |   |          |
| Default Value:            | 0x00000000  |   |   |      |             |   |                              |   |   |          |
| DWord                     | Bit   | Description   |   |      |             |   |                              |   |   |          |
| 0                         | 15:13   | <b>ExecSize</b>   |   |      |             |   |                              |   |   |          |
|                           |   | Format: ExecSize [CHV, BSW]<br>This field determines the number of channels operating in parallel for this instruction. The size cannot exceed the maximum number of channels allowed for the given data type.  |   |      |             |   |                              |   |   |          |
|                           | 12  | <b>Reserved</b>   |   |      |             |   |                              |   |   |          |
|                           |   | Exists If: (Property[Predication]='false')  |   |      |             |   |                              |   |   |          |
|                           | 12  | <b>PredInv</b>  |   |      |             |   |                              |   |   |          |
|                           |   | Exists If: (Property[Predication]='true')   |   |      |             |   |                              |   |   |          |
|                           |   | This field, together with PredCtrl, enables and controls the generation of the predication mask for the instruction. When it is set, the predication uses the inverse of the predication bits generated according to setting of Predicate Control. In other words, effect of PredInv happens after PredCtrl. This field is ignored by hardware if Predicate Control is set to 0000 there is no predication. PMask is the final predication mask produced by the effects of both fields. |   |      |             |   |                              |   |   |          |
|                           |   | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Positive<br/><b>[Default]</b></td> <td>Positive polarity of predication. Use the predication mask produced by PredCtrl</td> </tr> <tr> <td>1</td> <td>Negative</td> <td>Negative polarity of predication. If PredCtrl is nonzero, invert the predication mask.</td> </tr> </tbody> </table>  | Value   | Name | Description | 0 | Positive<br><b>[Default]</b> | Positive polarity of predication. Use the predication mask produced by PredCtrl | 1 | Negative |
|                           | Value   | Name  | Description   |      |             |   |                              |   |   |          |
|                           | 0   | Positive<br><b>[Default]</b>  | Positive polarity of predication. Use the predication mask produced by PredCtrl |      |             |   |                              |   |   |          |
| 1                         | Negative  | Negative polarity of predication. If PredCtrl is nonzero, invert the predication mask.  |   |      |             |   |                              |   |   |          |
| 11:8                      | <b>Reserved</b>   |   |   |      |             |   |                              |   |   |          |
|                           | Exists If: (Property[Predication]='false')  |   |   |      |             |   |                              |   |   |          |
| 11:8                      | <b>PredCtrl</b>   |   |   |      |             |   |                              |   |   |          |
|                           | Exists If: (Property[Predication]='true')   |   |   |      |             |   |                              |   |   |          |
|                           | Format: PredCtrl [CHV, BSW]<br>This field, together with PredInv, enables and controls the generation of the predication mask for the instruction. It allows per-channel conditional execution of the instruction based on the content of the selected flag register. Encoding depends on the access mode. In Align16 access mode, there are eight encodings (including no predication). All encodings are based on group-of-4 predicate bits, including channel sequential, replication swizzles and horizontal any/all operations. The same configuration is repeated for each group-of-4 execution channels. |   |   |      |             |   |                              |   |   |          |



| <b>EU_INSTRUCTION_CONTROLS_A</b> |   |  |                       |             |   |     |  |   |      |  |
|----------------------------------|---|--|-----------------------|-------------|---|-----|--|---|------|--|
| 7:6                              | <p><b>Thread Control</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>ThreadCtrl [CHV, BSW]</td> </tr> </table> <p>Thread Control. This field provides explicit control for thread switching. If this field is set to 00b, it is up to the GEN execution units to manage thread switching. This is the normal (and unnamed) mode. In this mode, for example, if the current instruction cannot proceed due to operand dependencies, the EU switches to the next available thread to fill the compute pipe. In another example, if the current instruction is ready to go, however, there is another thread with higher priority that also has an instruction ready, the EU switches to that thread. If this field is set to Switch, a forced thread switch occurs after the current instruction is executed and before the next instruction. In addition, a long delay (longer than the execution pipe latency) is introduced for the current thread. Particularly, the instruction queue of the current thread is flushed after the current instruction is dispatched for execution. Switch is designed primarily as a safety feature in case there are race conditions for certain instructions.</p> | Format:  | ThreadCtrl [CHV, BSW] |             |   |     |  |   |      |  |
| Format:                          | ThreadCtrl [CHV, BSW]   |  |                       |             |   |     |  |   |      |  |
| 5:4                              | <p><b>QtrCtrl</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>QtrCtrl [CHV, BSW]</td> </tr> </table> <p>Quarter Control. This field provides explicit control for ARF selection. This field combined with NibCtrl and ExecSize determines which channels are used for the ARF registers.</p>  | Format:  | QtrCtrl [CHV, BSW]    |             |   |     |  |   |      |  |
| Format:                          | QtrCtrl [CHV, BSW]  |  |                       |             |   |     |  |   |      |  |
| 3                                | <p><b>NibCtrl</b></p> <p>Nibble Control. This field is used in some instructions along with QtrCtrl. See the description of QtrCtrl below. NibCtrl is only used for SIMD4 instructions with a DF (Double Float) source or destination.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #e1eef6;"> <th style="width: 10%;">Value</th> <th style="width: 10%;">Name</th> <th style="width: 80%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">Odd</td> <td>Use an odd 1/8th for DMask/VMask and ARF (first, third, fifth, or seventh depending on QtrCtrl).</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">Even</td> <td>Use an even 1/8th for DMask/VMask and ARF (second, fourth, sixth, or eighth depending on QtrCtrl).</td> </tr> </tbody> </table> <div style="text-align: center; background-color: #e1eef6; padding: 5px; margin-top: 10px;"><b>Programming Notes</b></div> <p>Note that if eighths are given zero-based indices from 0 to 7, then NibCtrl = 0 indicates even indices and NibCtrl = 1 indicates odd indices.</p>                                   | Value  | Name                  | Description | 0 | Odd | Use an odd 1/8th for DMask/VMask and ARF (first, third, fifth, or seventh depending on QtrCtrl). | 1 | Even | Use an even 1/8th for DMask/VMask and ARF (second, fourth, sixth, or eighth depending on QtrCtrl). |
| Value                            | Name  | Description  |                       |             |   |     |  |   |      |  |
| 0                                | Odd   | Use an odd 1/8th for DMask/VMask and ARF (first, third, fifth, or seventh depending on QtrCtrl).   |                       |             |   |     |  |   |      |  |
| 1                                | Even  | Use an even 1/8th for DMask/VMask and ARF (second, fourth, sixth, or eighth depending on QtrCtrl). |                       |             |   |     |  |   |      |  |
| 2:1                              | <p><b>DepCtrl</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>DepCtrl [CHV, BSW]</td> </tr> </table> <p>Destination Dependency Control. This field selectively disables destination dependency check and clear for this instruction. When it is set to 00, normal destination dependency control is performed for the instruction hardware checks for destination hazards to ensure data integrity. Specifically, destination register dependency check is conducted before the instruction is made ready for execution. After the instruction is executed, the destination register scoreboard will be cleared when the destination operands retire. When bit 10 is set (NoDDClr), the destination register scoreboard will NOT be cleared when the destination operands retire. When bit 11 is set (NoDDChk), hardware does not check for destination register dependency before the instruction is made ready for execution. NoDDClr and NoDDChk are not mutual exclusive. When this field is</p>  | Format:  | DepCtrl [CHV, BSW]    |             |   |     |  |   |      |  |
| Format:                          | DepCtrl [CHV, BSW]  |  |                       |             |   |     |  |   |      |  |

| <b>EU_INSTRUCTION_CONTROLS_A</b> |   |       |      |   |                         |   |         |
|----------------------------------|---|-------|------|---|-------------------------|---|---------|
|                                  | <p>not all-zero, hardware does not protect against destination hazards for the instruction. This is typically used to assemble data in a fine grained fashion (e.g. matrix-vector compute with dot-product instructions), where the data integrity is guaranteed by software based on the intended usage of instruction sequences.</p>  |       |      |   |                         |   |         |
| 0                                | <p><b>AccessMode</b><br/>Access Mode. This field determines the operand access for the instruction. It applies to all source and destination operands. When it is cleared (Align1), the instruction uses byte-aligned addressing for source and destination operands. Source swizzle control and destination mask control are not supported. When it is set (Align16), the instruction uses 16-byte-aligned addressing for all source and destination operands. Source swizzle control and destination mask control are supported in this mode.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Align1 <b>[Default]</b></td> </tr> <tr> <td style="text-align: center;">1</td> <td>Align16</td> </tr> </tbody> </table> | Value | Name | 0 | Align1 <b>[Default]</b> | 1 | Align16 |
| Value                            | Name  |       |      |   |                         |   |         |
| 0                                | Align1 <b>[Default]</b>   |       |      |   |                         |   |         |
| 1                                | Align16   |       |      |   |                         |   |         |

## EU\_INSTRUCTION\_CONTROLS\_B

| EU_INSTRUCTION_CONTROLS_B   |  |   |             |             |   |  |   |   |           |  |
|---|--|---|-------------|-------------|---|--|---|---|-----------|--|
| Project:  | CHV, BSW   |   |             |             |   |  |   |   |           |  |
| Source:   | Eulsa  |   |             |             |   |  |   |   |           |  |
| Size (in bits):   | 4  |   |             |             |   |  |   |   |           |  |
| Default Value:  | 0x00000000   |   |             |             |   |  |   |   |           |  |
| DWord   | Bit  | Description   |             |             |   |  |   |   |           |  |
| 0   | 3  | <b>Reserved</b>   |             |             |   |  |   |   |           |  |
|   |  | Exists If: (Property[Saturation]='false')                                     |             |             |   |  |   |   |           |  |
|   |  | Format: MBZ   |             |             |   |  |   |   |           |  |
|   | 3  | <b>Saturate</b>   |             |             |   |  |   |   |           |  |
| Exists If: (Property[Saturation]='true')  |  |   |             |             |   |  |   |   |           |  |
| <p>Enables or disables destination saturation. When it is set, output values to the destination register are saturated. The saturation operation depends on the destination data type. Saturation is the operation that converts any value outside the saturation target range for the data type to the closest value in the target range. For a floating-point destination type, the saturation target range is [0.0, 1.0]. For a floating-point NaN, there is no closest value; any NaN saturates to 0.0. Note that enabling Saturate overrides all of the NaN propagation behaviors described for various numeric instructions. Any floating-point number greater than 1.0, including +INF, saturates to 1.0. Any negative floating-point number, including -INF, saturates to 0.0. Any floating-point number in the range 0.0 to 1.0 is not changed by saturation. For an integer destination type, the maximum range for that type is the saturation target range. For example, the saturation range for B (Signed Byte Integer) is [-128, 127]. When Saturate is clear, destination values are not saturated. For example, a wrapped result (modulo) is output to the destination for an overflowed integer value. See the Numeric Data Types section for information about data types and their ranges.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>No destination modification <b>[Default]</b></td> <td></td> </tr> <tr> <td>1</td> <td>sat</td> <td>Saturate the output</td> </tr> </tbody> </table> |  | Value   | Name        | Description | 0 | No destination modification <b>[Default]</b> |   | 1 | sat       | Saturate the output  |
| Value   | Name   | Description   |             |             |   |  |   |   |           |  |
| 0   | No destination modification <b>[Default]</b>   |   |             |             |   |  |   |   |           |  |
| 1   | sat  | Saturate the output   |             |             |   |  |   |   |           |  |
| 2   | <b>Reserved</b>  |   |             |             |   |  |   |   |           |  |
| 1   | <b>CmptCtrl</b>  |   |             |             |   |  |   |   |           |  |
|   | <p>Compaction Control Indicates whether the instruction is compacted to the 64-bit compact instruction format. When this bit is set, the 64-bit compact instruction format is used. The EU decodes the compact format using lookup tables internal to the hardware, but documented for use by software tools. Only some instruction variations can be compacted, the variations supported by those lookup tables and the compact format. See EU Compact Instruction Format [CHV, BSW] for more information.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>NoCompaction</td> <td>No compaction. 128-bit native instruction supporting all instruction options.</td> </tr> <tr> <td>1</td> <td>Compacted</td> <td>Compaction is enabled. 64-bit compact instruction supporting only some</td> </tr> </tbody> </table> | Value   | Name        | Description | 0 | NoCompaction                                 | No compaction. 128-bit native instruction supporting all instruction options. | 1 | Compacted | Compaction is enabled. 64-bit compact instruction supporting only some |
|   | Value  | Name  | Description |             |   |  |   |   |           |  |
| 0   | NoCompaction   | No compaction. 128-bit native instruction supporting all instruction options. |             |             |   |  |   |   |           |  |
| 1   | Compacted  | Compaction is enabled. 64-bit compact instruction supporting only some        |             |             |   |  |   |   |           |  |
|   |  |   |             |             |   |  |   |   |           |  |

| <b>EU_INSTRUCTION_CONTROLS_B</b> |   |  |
|----------------------------------|---|--|
|                                  |   | instruction variations.                  |
| 0                                | <b>AccWrCtrl</b><br>AccWrCtrl. This field allows per instruction accumulator write control. |  |
|                                  | <b>Value</b>  | <b>Name</b>                              |
|                                  | 0   | Don't write to ACC <b>[Default]</b>      |
|                                  | 1   | Update ACC                               |
|                                  |   | <b>Description</b>                       |
|                                  |   | Write result to the ACC, and destination |

## EU\_INSTRUCTION\_CONTROLS

| EU_INSTRUCTION_CONTROLS                      |            |  |
|--|------------|--|
| Project:                                     | CHV, BSW   |  |
| Source:                                      | Eulsa      |  |
| Size (in bits):                              | 24         |  |
| Default Value:                               | 0x00000000 |  |
| DWord  | Bit        | Description  |
| 0  | 23:20      | <b>Controls B</b>  |
|  |            | Format: EU_INSTRUCTION_CONTROLS_B [CHV, BSW]                     |
|  | 19:16      | <b>Reserved</b>  |
|  |            | Exists If: (Property[Conditional Modifier]='false')              |
|  |            | Format: MBZ  |
|  | 19:16      | <b>CondModifier</b>  |
|  |            | Exists If: (Property[Conditional Modifier]='true')               |
|  |            | Format: CondModifier [CHV, BSW]                                  |
|  |            | Does not exist for send/sendc/math/branch/break-continue opcodes |
|  | 15:0       | <b>Controls A</b>  |
| Format: EU_INSTRUCTION_CONTROLS_A [CHV, BSW] |            |  |

## EU\_INSTRUCTION\_HEADER

| EU_INSTRUCTION_HEADER |            |  |
|-----------------------|------------|--|
| Project:              | CHV, BSW   |  |
| Source:               | Eulsa      |  |
| Size (in bits):       | 32         |  |
| Default Value:        | 0x00000000 |  |
| DWord                 | Bit        | Description  |
| 0                     | 31:8       | <b>Control</b><br>Format: EU_INSTRUCTION_CONTROLS [CHV, BSW] |
|                       | 7          | <b>Reserved</b><br>Format: MBZ                               |
|                       | 6:0        | <b>Opcode</b><br>Format: EU_OPCODE [CHV, BSW]                |

## EU\_INSTRUCTION\_ILLEGAL

| EU_INSTRUCTION_ILLEGAL |  |   |
|------------------------|--|---|
| Project:               | CHV, BSW                                       |   |
| Source:                | Eulsa  |   |
| Size (in bits):        | 128  |   |
| Default Value:         | 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |
| DWord                  | Bit  | Description   |
| 0..3                   | 127:7  | <b>Reserved</b><br>Format: _____ MBZ                |
|                        | 6:0  | <b>Opcode</b><br>Format: _____ EU_OPCODE [CHV, BSW] |

## EU\_INSTRUCTION\_MATH

| EU_INSTRUCTION_MATH |  |  |
|---------------------|--|--|
| Project:            | CHV, BSW                                       |  |
| Source:             | Eulsa  |  |
| Size (in bits):     | 128  |  |
| Default Value:      | 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord               | Bit  | Description  |
| 0..3                | 127:64   | <b>RegSource</b><br>Format: EU_INSTRUCTION_SOURCES_REG_REG [CHV, BSW]        |
|                     | 63:32  | <b>Operand Control</b><br>Format: EU_INSTRUCTION_OPERAND_CONTROLS [CHV, BSW] |
|                     | 31:28  | <b>Controls B</b><br>Format: EU_INSTRUCTION_CONTROLS_B [CHV, BSW]            |
|                     | 27:24  | <b>Function Control (FC)</b><br>Format: FC [CHV, BSW]                        |
|                     | 23:8   | <b>Controls A</b><br>Format: EU_INSTRUCTION_CONTROLS_A [CHV, BSW]            |
|                     | 7  | <b>Reserved</b><br>Format: MBZ   |
|                     | 6:0  | <b>Opcode</b><br>Format: EU_OPCODE [CHV, BSW]                                |



## EU\_INSTRUCTION\_NOP

| EU_INSTRUCTION_NOP |  |   |                      |     |
|--------------------|--|---|----------------------|-----|
| Project:           | CHV, BSW   |   |                      |     |
| Source:            | Eulsa  |   |                      |     |
| Size (in bits):    | 128  |   |                      |     |
| Default Value:     | 0x00000000, 0x00000000, 0x00000000, 0x00000000   |   |                      |     |
| DWord              | Bit  | Description   |                      |     |
| 0..3               | 127:31   | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table> |                      | MBZ |
|                    |  | MBZ   |                      |     |
|                    | 30   | <b>Reserved</b>   |                      |     |
|                    | 29:7   | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table> |                      | MBZ |
|                    | MBZ  |   |                      |     |
| 6:0                | <b>Opcode</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>EU_OPCODE [CHV, BSW]</td></tr></table> |   | EU_OPCODE [CHV, BSW] |     |
|                    | EU_OPCODE [CHV, BSW]   |   |                      |     |

## EU\_INSTRUCTION\_OPERAND\_CONTROLS

| EU_INSTRUCTION_OPERAND_CONTROLS   |   |   |
|---|---|---|
| Project:  | CHV, BSW  |   |
| Source:   | Eulsa   |   |
| Size (in bits):   | 32  |   |
| Default Value:  | 0x00000000  |   |
| DWord   | Bit   | Description   |
| 0   | 31:16   | <b>Destination Register Region</b>  |
|   |   | Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]== 'Align16')           |
|   |   | Format: EU_INSTRUCTION_OPERAND_DST_ALIGN16 [CHV, BSW]                               |
|   | 31:16   | <b>Destination Register Region</b>  |
|   |   | Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]== 'Align1')            |
|   |   | Format: EU_INSTRUCTION_OPERAND_DST_ALIGN1 [CHV, BSW]                                |
|   | 15  | <b>Reserved</b>   |
|   |   | Exists If: (([Destination Register Region][Destination Addressing Mode]== 'Direct') |
|   |   | Format: MBZ   |
|   | 15  | <b>Destination Address Immediate[9:9]</b>   |
| Exists If: (([Destination Register Region][Destination Addressing Mode]== 'Indirect') |   |   |
| Format: U1  |   |   |
| 14:11   | <b>Src0.SrcType</b>   |   |
|   | Exists If: (([Src0.RegFile]!= 'IMM')  |   |
|   | Format: SrcType [CHV, BSW]  |   |
| 14:11   | <b>Src0.SrcType</b>   |   |
|   | Exists If: (([Src0.RegFile]= 'IMM')   |   |
|   | Format: SrcImmType [CHV, BSW]   |   |
| 10:9  | <b>Src0.RegFile</b>   |   |
|   | Format: RegFile [CHV, BSW]  |   |
| 8:5   | <b>Destination Data Type</b>  |   |
|   | Format: DstType [CHV, BSW]<br>This field specifies the numeric data type of the destination operand dst. The bits of the destination operand are interpreted as the identified numeric data type, rather than coerced into a type implied by the operator. For a send instruction, this field applies to the CurrDst the current destination operand. |   |
| 4:3   | <b>Destination Register File</b>  |   |
|   | Format: RegFile [CHV, BSW]  |   |

| EU_INSTRUCTION_OPERAND_CONTROLS |     |   |                         |   |
|---------------------------------|-----|---|-------------------------|---|
|                                 |     | <b>Value</b>  | <b>Name</b>             | <b>Description</b>  |
|                                 |     | 11b   | Reserved                | Note that it is obvious that immediate cannot be a destination operand. |
|                                 | 2   | <b>MaskCtrl</b><br>Mask Control (formerly Write Enable Control). This field determines if the the per channel write enables are used to generate the final write enable. This field should be normally "0". |                         |   |
|                                 |     | <b>Value</b>  | <b>Name</b>             | <b>Description</b>  |
|                                 |     | 0   | Normal <b>[Default]</b> |   |
|                                 |     | 1   | Write all channels      | Except channels killed with predication control                         |
|                                 |     | <b>Programming Notes</b>  |                         |   |
|                                 |     | MaskCtrl = NoMask skips the check for PcIP[n] == ExIP before enabling a channel, as described in the Evaluate Write Enable section.   |                         |   |
|                                 | 1:0 | <b>Flag Register Number/Subregister Number</b>  |                         |   |

## EU\_INSTRUCTION\_OPERAND\_DST\_ALIGN1

| EU_INSTRUCTION_OPERAND_DST_ALIGN1 |   |  |  |                       |  |  |         |                          |
|-----------------------------------|---|--|--|-----------------------|--|--|---------|--------------------------|
| Project:                          | CHV, BSW  |  |  |                       |  |  |         |                          |
| Source:                           | Eulsa   |  |  |                       |  |  |         |                          |
| Size (in bits):                   | 16  |  |  |                       |  |  |         |                          |
| Default Value:                    | 0x00000000  |  |  |                       |  |  |         |                          |
| DWord                             | Bit   | Description  |  |                       |  |  |         |                          |
| 0                                 | 15  | <p><b>Destination Addressing Mode</b></p> <table border="1"> <tr> <td>Format:</td> <td>AddrMode [CHV, BSW]</td> </tr> </table> <p>For a send instruction, this field applies to PostDst - the post destination operand. Addressing mode for CurrDst (current destination operand) is fixed as Direct. (See Instruction Reference chapter for CurrDst and PostDst.)</p> | Format:                                  | AddrMode [CHV, BSW]   |  |  |         |                          |
|                                   | Format:   | AddrMode [CHV, BSW]  |  |                       |  |  |         |                          |
|                                   | 14:13   | <p><b>Destination Horizontal Stride</b></p> <table border="1"> <tr> <td>Format:</td> <td>HorzStride [CHV, BSW]</td> </tr> </table> <p>For a send instruction, this field applies to CurrDst. PostDst only uses the register number.</p>  | Format:                                  | HorzStride [CHV, BSW] |  |  |         |                          |
|                                   | Format:   | HorzStride [CHV, BSW]  |  |                       |  |  |         |                          |
|                                   | 12:9  | <p><b>Destination Address Subregister Number</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Exists If:</td> <td>([Destination Addressing Mode]='Indirect')</td> </tr> <tr> <td>Format:</td> <td>AddrSubRegNum [CHV, BSW]</td> </tr> </table> <p>For a send instruction, this field applies to PostDst</p>                          | Project:                                 | CHV, BSW              | Exists If:                                 | ([Destination Addressing Mode]='Indirect') | Format: | AddrSubRegNum [CHV, BSW] |
|                                   | Project:  | CHV, BSW   |  |                       |  |  |         |                          |
| Exists If:                        | ([Destination Addressing Mode]='Indirect')  |  |  |                       |  |  |         |                          |
| Format:                           | AddrSubRegNum [CHV, BSW]  |  |  |                       |  |  |         |                          |
| 12:5                              | <p><b>Destination Register Number</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>([Destination Addressing Mode]='Direct')</td> </tr> <tr> <td>Format:</td> <td>DstRegNum [CHV, BSW]</td> </tr> </table> <p>For a send instruction, this field applies to PostDst.</p>                                  | Exists If:   | ([Destination Addressing Mode]='Direct') | Format:               | DstRegNum [CHV, BSW]                       |  |         |                          |
| Exists If:                        | ([Destination Addressing Mode]='Direct')  |  |  |                       |  |  |         |                          |
| Format:                           | DstRegNum [CHV, BSW]  |  |  |                       |  |  |         |                          |
| 8:0                               | <p><b>Destination Address Immediate</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Exists If:</td> <td>([Destination Addressing Mode]='Indirect')</td> </tr> <tr> <td>Format:</td> <td>S8</td> </tr> </table> <p>For a send instruction, this field applies to PostDst.</p> | Project:   | CHV, BSW                                 | Exists If:            | ([Destination Addressing Mode]='Indirect') | Format:                                    | S8      |                          |
| Project:                          | CHV, BSW  |  |  |                       |  |  |         |                          |
| Exists If:                        | ([Destination Addressing Mode]='Indirect')  |  |  |                       |  |  |         |                          |
| Format:                           | S8  |  |  |                       |  |  |         |                          |
| 4:0                               | <p><b>Destination Subregister Number</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>([Destination Addressing Mode]='Direct')</td> </tr> <tr> <td>Format:</td> <td>DstSubRegNum [CHV, BSW]</td> </tr> </table> <p>For a send instruction, this field applies to CurrDst.</p>                            | Exists If:   | ([Destination Addressing Mode]='Direct') | Format:               | DstSubRegNum [CHV, BSW]                    |  |         |                          |
| Exists If:                        | ([Destination Addressing Mode]='Direct')  |  |  |                       |  |  |         |                          |
| Format:                           | DstSubRegNum [CHV, BSW]   |  |  |                       |  |  |         |                          |

|  |  |  |
|--|--|--|
| <b>EU_INSTRUCTION_OPERAND_DST_ALIGN1</b> |  |  |
|  |  |  |

## EU\_INSTRUCTION\_OPERAND\_DST\_ALIGN16

| EU_INSTRUCTION_OPERAND_DST_ALIGN16 |  |  |   |                     |   |                      |                          |
|------------------------------------|--|--|---|---------------------|---|----------------------|--------------------------|
| Project:                           | CHV, BSW   |  |   |                     |   |                      |                          |
| Source:                            | Eulsa  |  |   |                     |   |                      |                          |
| Size (in bits):                    | 16   |  |   |                     |   |                      |                          |
| Default Value:                     | 0x00000000   |  |   |                     |   |                      |                          |
| DWord                              | Bit  | Description  |   |                     |   |                      |                          |
| 0                                  | 15   | <p><b>Destination Addressing Mode</b></p> <table border="1"> <tr> <td>Format:</td> <td>AddrMode [CHV, BSW]</td> </tr> </table> <p>For a send instruction, this field applies to PostDst - the post destination operand. Addressing mode for CurrDst (current destination operand) is fixed as Direct. (See Instruction Reference chapter for CurrDst and PostDst.)</p> | Format:                                     | AddrMode [CHV, BSW] |   |                      |                          |
|                                    | Format:  | AddrMode [CHV, BSW]  |   |                     |   |                      |                          |
|                                    | 14:13  | <p><b>Reserved</b></p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>01b</td> <td>See Programming Note</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>Although Dst.HorzStride is a don't care for Align16, HW needs this to be programmed as ?01?.</p>                     | Value                                       | Name                | 01b   | See Programming Note |                          |
|                                    | Value  | Name   |   |                     |   |                      |                          |
|                                    | 01b  | See Programming Note   |   |                     |   |                      |                          |
| 12:9                               | <p><b>Destination Address Subregister Number</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Exists If:</td> <td>(([Destination Addressing Mode])=='Indirect')</td> </tr> <tr> <td>Format:</td> <td>AddrSubRegNum [CHV, BSW]</td> </tr> </table> <p>For a send instruction, this field applies to PostDst</p> | Project:   | CHV, BSW                                    | Exists If:          | (([Destination Addressing Mode])=='Indirect') | Format:              | AddrSubRegNum [CHV, BSW] |
| Project:                           | CHV, BSW   |  |   |                     |   |                      |                          |
| Exists If:                         | (([Destination Addressing Mode])=='Indirect')  |  |   |                     |   |                      |                          |
| Format:                            | AddrSubRegNum [CHV, BSW]   |  |   |                     |   |                      |                          |
| 12:5                               | <p><b>Destination Register Number</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>(([Destination Addressing Mode])=='Direct')</td> </tr> <tr> <td>Format:</td> <td>DstRegNum [CHV, BSW]</td> </tr> </table> <p>For a send instruction, this field applies to PostDst.</p>  | Exists If:   | (([Destination Addressing Mode])=='Direct') | Format:             | DstRegNum [CHV, BSW]                          |                      |                          |
| Exists If:                         | (([Destination Addressing Mode])=='Direct')  |  |   |                     |   |                      |                          |
| Format:                            | DstRegNum [CHV, BSW]   |  |   |                     |   |                      |                          |
| 8:4                                | <p><b>Destination Address Immediate[8:4]</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Exists If:</td> <td>(([Destination Addressing Mode])=='Indirect')</td> </tr> <tr> <td>Format:</td> <td>S8[8:4]</td> </tr> </table> <p>For a send instruction, this field applies to PostDst</p>                      | Project:   | CHV, BSW                                    | Exists If:          | (([Destination Addressing Mode])=='Indirect') | Format:              | S8[8:4]                  |
| Project:                           | CHV, BSW   |  |   |                     |   |                      |                          |
| Exists If:                         | (([Destination Addressing Mode])=='Indirect')  |  |   |                     |   |                      |                          |
| Format:                            | S8[8:4]  |  |   |                     |   |                      |                          |
| 4                                  | <p><b>Destination Subregister Number</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>(([Destination Addressing Mode])=='Direct')</td> </tr> </table>   | Exists If:   | (([Destination Addressing Mode])=='Direct') |                     |   |                      |                          |
| Exists If:                         | (([Destination Addressing Mode])=='Direct')  |  |   |                     |   |                      |                          |

| <b>EU_INSTRUCTION_OPERAND_DST_ALIGN16</b>                 |   |         |                   |   |  |
|---|---|---------|-------------------|---|--|
|   | <table border="1"> <tr> <td>Format:</td> <td>DstSubRegNum[4:4]</td> </tr> <tr> <td colspan="2">For a send instruction, this field applies to CurrDst.</td> </tr> </table>                                     | Format: | DstSubRegNum[4:4] | For a send instruction, this field applies to CurrDst.    |  |
| Format:   | DstSubRegNum[4:4]   |         |                   |   |  |
| For a send instruction, this field applies to CurrDst.    |   |         |                   |   |  |
| 3:0   | <p><b>Destination Channel Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>ChanEn[4]</td> </tr> <tr> <td colspan="2">For a send instruction, this field applies to the CurrDst</td> </tr> </table> | Format: | ChanEn[4]         | For a send instruction, this field applies to the CurrDst |  |
| Format:   | ChanEn[4]   |         |                   |   |  |
| For a send instruction, this field applies to the CurrDst |   |         |                   |   |  |

## EU\_INSTRUCTION\_OPERAND\_SEND\_MSG

| EU_INSTRUCTION_OPERAND_SEND_MSG  |                          |   |             |         |  |          |       |      |   |                          |   |     |
|--|--------------------------|---|-------------|---------|--|----------|-------|------|---|--------------------------|---|-----|
| Project:   | CHV, BSW                 |   |             |         |  |          |       |      |   |                          |   |     |
| Source:  | Eulsa                    |   |             |         |  |          |       |      |   |                          |   |     |
| Size (in bits):  | 32                       |   |             |         |  |          |       |      |   |                          |   |     |
| Default Value:   | 0x00000000               |   |             |         |  |          |       |      |   |                          |   |     |
| DWord  | Bit                      | Description   |             |         |  |          |       |      |   |                          |   |     |
| 0  | 31                       | <p><b>EOT</b></p> <table border="1"> <thead> <tr> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>This field controls the termination of the thread. For a send instruction, if this field is set, EU will terminate the thread and also set the EOT bit in the message sideband. This field only applies to the send instruction. It is not present for other instructions.</td> <td>CHV, BSW</td> </tr> </tbody> </table><br><table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Thread is not terminated</td> </tr> <tr> <td>1</td> <td>EOT</td> </tr> </tbody> </table> | Description | Project | This field controls the termination of the thread. For a send instruction, if this field is set, EU will terminate the thread and also set the EOT bit in the message sideband. This field only applies to the send instruction. It is not present for other instructions. | CHV, BSW | Value | Name | 0 | Thread is not terminated | 1 | EOT |
| Description  | Project                  |   |             |         |  |          |       |      |   |                          |   |     |
| This field controls the termination of the thread. For a send instruction, if this field is set, EU will terminate the thread and also set the EOT bit in the message sideband. This field only applies to the send instruction. It is not present for other instructions. | CHV, BSW                 |   |             |         |  |          |       |      |   |                          |   |     |
| Value  | Name                     |   |             |         |  |          |       |      |   |                          |   |     |
| 0  | Thread is not terminated |   |             |         |  |          |       |      |   |                          |   |     |
| 1  | EOT                      |   |             |         |  |          |       |      |   |                          |   |     |



## EU\_INSTRUCTION\_OPERAND\_SRC\_REG\_ALIGN1

| EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN1 |            |  |
|---------------------------------------|------------|--|
| Project:                              | CHV, BSW   |  |
| Source:                               | Eulsa      |  |
| Size (in bits):                       | 25         |  |
| Default Value:                        | 0x00000000 |  |
| DWord                                 | Bit        | Description  |
| 0                                     | 24:21      | <b>Source Vertical Stride</b><br>Format: VertStride [CHV, BSW]   |
|                                       | 20:18      | <b>Source Width</b><br>Format: Width [CHV, BSW]  |
|                                       | 17:16      | <b>Source Horizontal Stride</b><br>Format: HorzStride [CHV, BSW]   |
|                                       | 15         | <b>Source Addressing Mode</b><br>Format: AddrMode [CHV, BSW]   |
|                                       | 14:13      | <b>Reserved</b><br>Exists If: (Property[Source Modifier] == 'false')<br>Format: MBZ  |
|                                       | 14:13      | <b>Source Modifier</b><br>Exists If: (Property[Source Modifier] == 'true')<br>Format: SrcMod [CHV, BSW]  |
|                                       | 12:9       | <b>Source Address Subregister Number</b><br>Project: CHV, BSW<br>Exists If: ([Source Addressing Mode] == 'Indirect')<br>Format: AddrSubRegNum [CHV, BSW] |
|                                       | 12:5       | <b>Source Register Number</b><br>Exists If: ([Source Addressing Mode] == 'Direct')<br>Format: SrcRegNum [CHV, BSW]                                       |
|                                       | 8:0        | <b>Source Address Immediate [8:0]</b><br>Project: CHV, BSW<br>Exists If: ([Source Addressing Mode] == 'Indirect')<br>Format: S9[8:0]                     |
|                                       | 4:0        | <b>Source Subregister Number</b><br>Exists If: ([Source Addressing Mode] == 'Direct')<br>Format: SrcSubRegNum [CHV, BSW]                                 |

## EU\_INSTRUCTION\_OPERAND\_SRC\_REG\_ALIGN16

| EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16 |            |  |
|--|------------|--|
| Project:                               | CHV, BSW   |  |
| Source:                                | Eulsa      |  |
| Size (in bits):                        | 25         |  |
| Default Value:                         | 0x00000000 |  |
| DWord                                  | Bit        | Description  |
| 0                                      | 24:21      | <b>Source Vertical Stride</b><br>Format: VertStride [CHV, BSW]   |
|  | 20         | <b>Reserved</b><br>Format: MBZ   |
|  | 19:16      | <b>Source Channel Select[7:4]</b><br>Format: ChanSel[4][7:4]   |
|  | 15         | <b>Source Addressing Mode</b><br>Format: AddrMode [CHV, BSW]   |
|  | 14:13      | <b>Reserved</b><br>Exists If: (Property[Source Modifier] == 'false')<br>Format: MBZ  |
|  | 14:13      | <b>Source Modifier</b><br>Exists If: (Property[Source Modifier] == 'true')<br>Format: SrcMod [CHV, BSW]  |
|  | 12:9       | <b>Source Address Subregister Number</b><br>Project: CHV, BSW<br>Exists If: ([Source Addressing Mode] == 'Indirect')<br>Format: AddrSubRegNum [CHV, BSW] |
|  | 12:5       | <b>Source Register Number</b><br>Exists If: ([Source Addressing Mode] == 'Direct')<br>Format: SrcRegNum [CHV, BSW]                                       |
|  | 8:4        | <b>Source Address Immediate[8:4]</b><br>Project: CHV, BSW<br>Exists If: ([Source Addressing Mode] == 'Indirect')<br>Format: S9[8:4]                      |
|  | 4          | <b>Source Subregister Number[4:4]</b><br>Exists If: ([Source Addressing Mode] == 'Direct')<br>Format: SrcSubRegNum[4:4]                                  |

| <b>EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16</b> |                 |   |         |                 |
|---|-----------------|---|---------|-----------------|
|   | 3:0             | <b>Source Channel Select[3:0]</b>   |         |                 |
|   |                 | <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>ChanSel[4][3:0]</td> </tr> </table> | Format: | ChanSel[4][3:0] |
| Format:                                       | ChanSel[4][3:0] |   |         |                 |

## EU\_INSTRUCTION\_OPERAND\_SRC\_REG\_THREE\_SRC

| EU_INSTRUCTION_OPERAND_SRC_REG_THREE_SRC |  |                                      |
|--|--|--------------------------------------|
| Project:                                 | CHV, BSW                               |                                      |
| Source:                                  | Eulsa                                  |                                      |
| Size (in bits):                          | 21                                     |                                      |
| Default Value:                           | 0x00000000                             |                                      |
| DWord                                    | Bit                                    | Description                          |
| 0  | 20                                     | <b>Source Subregister Number [1]</b> |
|  |  | Project: CHV, BSW                    |
|  | Format: SrcSubRegNum[1]                |                                      |
|  | 19:12                                  | <b>Source Register Number</b>        |
|  |  | Format: SrcRegNum [CHV, BSW]         |
| 11:9                                     | <b>Source Subregister Number [4:2]</b> |                                      |
|  | Format: SrcSubRegNum[4:2]              |                                      |
| 8:1                                      | <b>Source Swizzle</b>                  |                                      |
|  | Format: ChanSel[4]                     |                                      |
| 0  | <b>Source Replicate Control</b>        |                                      |
|  | Format: RepCtrl [CHV, BSW]             |                                      |

## EU\_INSTRUCTION\_SEND

| EU_INSTRUCTION_SEND |  |  |       |      |     |          |
|---------------------|--|--|-------|------|-----|----------|
| Project:            | CHV, BSW                                       |  |       |      |     |          |
| Source:             | Eulsa  |  |       |      |     |          |
| Size (in bits):     | 128  |  |       |      |     |          |
| Default Value:      | 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |       |      |     |          |
| DWord               | Bit  | Description  |       |      |     |          |
| 0..3                | 127:96   | <b>Message</b><br>Format: EU_INSTRUCTION_OPERAND_SEND_MSG [CHV, BSW]   |       |      |     |          |
|                     | 95   | <b>Reserved</b><br>Format: MBZ   |       |      |     |          |
|                     | 94:91  | <b>Src1.SrcType</b><br>Project: CHV, BSW<br>Format: SrcType [CHV, BSW]   |       |      |     |          |
|                     |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>11b</td> <td>Reserved</td> </tr> </tbody> </table>                              | Value | Name | 11b | Reserved |
|                     | Value  | Name   |       |      |     |          |
|                     | 11b  | Reserved   |       |      |     |          |
|                     | 90:89  | <b>Src1.RegFile</b><br>Project: CHV, BSW<br>Format: RegFile [CHV, BSW]   |       |      |     |          |
|                     | 88:64  | <b>Source 0</b><br>Project: CHV, BSW<br>Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]='Align16')<br>Format: EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16 [CHV, BSW] |       |      |     |          |
|                     | 88:64  | <b>Source 0</b><br>Project: CHV, BSW<br>Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]='Align1')<br>Format: EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN1 [CHV, BSW]   |       |      |     |          |
|                     | 63:32  | <b>Operand Control</b><br>Format: EU_INSTRUCTION_OPERAND_CONTROLS [CHV, BSW]   |       |      |     |          |
|                     | 31:28  | <b>Controls B</b><br>Format: EU_INSTRUCTION_CONTROLS_B [CHV, BSW]  |       |      |     |          |
|                     | 27:24  | <b>Shared Function ID (SFID)</b><br>Format: SFID [CHV, BSW]  |       |      |     |          |
| 23:8                | <b>Controls A</b>                              |  |       |      |     |          |

| <b>EU_INSTRUCTION_SEND</b> |                 |                                      |
|----------------------------|-----------------|--------------------------------------|
|                            | Format:         | EU_INSTRUCTION_CONTROLS_A [CHV, BSW] |
| 7                          | <b>Reserved</b> |                                      |
|                            | Format:         | MBZ                                  |
| 6:0                        | <b>Opcode</b>   |                                      |
|                            | Format:         | EU_OPCODE [CHV, BSW]                 |

## EU\_INSTRUCTION\_SOURCES\_IMM32

| EU_INSTRUCTION_SOURCES_IMM32 |                        |  |
|------------------------------|------------------------|--|
| Project:                     | CHV, BSW               |  |
| Source:                      | Eulsa                  |  |
| Size (in bits):              | 64                     |  |
| Default Value:               | 0x00000000, 0x00000000 |  |
| Single source, immediate     |                        |  |
| DWord                        | Bit                    | Description  |
| 0..1                         | 63:32                  | <b>Source 0 Immediate</b>  |
|                              | 31:25                  | <b>Reserved</b>  |
|                              |                        | Format:  |
|                              | 24:0                   | <b>Source 0</b>  |
| Exists If:                   |                        | (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]='Align16') AND (Structure[EU_INSTRUCTION_OPERAND_CONTROLS][Src0.RegFile]!='IMM') |
| Format:                      |                        | EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16 [CHV, BSW]  |
| 24:0                         | <b>Source 0</b>        |  |
|                              | Exists If:             | (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]='Align1') AND (Structure[EU_INSTRUCTION_OPERAND_CONTROLS][Src0.RegFile]!='IMM')  |
|                              | Format:                | EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN1 [CHV, BSW]   |

## EU\_INSTRUCTION\_SOURCES\_REG

| EU_INSTRUCTION_SOURCES_REG   |                        |   |
|--|------------------------|---|
| Project:   | CHV, BSW               |   |
| Source:  | Eulsa                  |   |
| Size (in bits):  | 64                     |   |
| Default Value:   | 0x00000000, 0x00000000 |   |
| Single source, register  |                        |   |
| DWord  | Bit                    | Description   |
| 0..1   | 63:25                  | <b>Reserved</b>   |
|  |                        | Format: MBZ   |
|  | 24:0                   | <b>Source 0</b>   |
|  |                        | Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode] = 'Align16') AND (Structure[EU_INSTRUCTION_OPERAND_CONTROLS][Src0.RegFile] != 'IMM') |
|  |                        | Format: EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16 [CHV, BSW]   |
|  | 24:0                   | <b>Source 0</b>   |
| Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode] = 'Align1') AND (Structure[EU_INSTRUCTION_OPERAND_CONTROLS][Src0.RegFile] != 'IMM') |                        |   |
| Format: EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN1 [CHV, BSW]   |                        |   |



## EU\_INSTRUCTION\_SOURCES\_REG\_IMM

| EU_INSTRUCTION_SOURCES_REG_IMM  |                        |  |   |     |          |     |          |  |
|---|------------------------|--|---|-----|----------|-----|----------|--|
| Project:  | CHV, BSW               |  |   |     |          |     |          |  |
| Source:   | Eulsa                  |  |   |     |          |     |          |  |
| Size (in bits):   | 64                     |  |   |     |          |     |          |  |
| Default Value:  | 0x00000000, 0x00000000 |  |   |     |          |     |          |  |
| Dual source, register and immediate   |                        |  |   |     |          |     |          |  |
| DWord   | Bit                    | Description  |   |     |          |     |          |  |
| 0..1  | 63:32                  | <b>Source 1 Immediate</b>  |   |     |          |     |          |  |
|   | 31                     | <b>Reserved</b>  |   |     |          |     |          |  |
|   |                        | Exists If:   | ([Source 0][Source Addressing Mode]='Direct')   |     |          |     |          |  |
|   |                        | Format:  | MBZ   |     |          |     |          |  |
|   | 31                     | <b>Source 0 Address Immediate [9] (Sign Bit)</b>   |   |     |          |     |          |  |
|   |                        | Exists If:   | ([Source 0][Source Addressing Mode]='Indirect') |     |          |     |          |  |
|   |                        | Format:  | S9[9]   |     |          |     |          |  |
|   | 30:27                  | <b>Src1.SrcType</b>  |   |     |          |     |          |  |
|   |                        | Format:  | SrcImmType [CHV, BSW]                           |     |          |     |          |  |
|   | 26:25                  | <b>Src1.RegFile</b>  |   |     |          |     |          |  |
| Format:   |                        | RegFile [CHV, BSW]   |   |     |          |     |          |  |
| <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td>Reserved</td> </tr> <tr> <td>01b</td> <td>Reserved</td> </tr> </tbody> </table> |                        | Value  | Name  | 00b | Reserved | 01b | Reserved |  |
| Value   |                        | Name   |   |     |          |     |          |  |
| 00b   |                        | Reserved   |   |     |          |     |          |  |
| 01b   | Reserved               |  |   |     |          |     |          |  |
|   |                        |  |   |     |          |     |          |  |
|   |                        |  |   |     |          |     |          |  |
| 24:0  | <b>Source 0</b>        |  |   |     |          |     |          |  |
|   | Exists If:             | (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]='Align16') AND (Structure[EU_INSTRUCTION_OPERAND_CONTROLS][Src0.RegFile]!='IMM') |   |     |          |     |          |  |
|   | Format:                | EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16 [CHV, BSW]  |   |     |          |     |          |  |
| 24:0  | <b>Source 0</b>        |  |   |     |          |     |          |  |
|   | Exists If:             | (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]='Align1') AND (Structure[EU_INSTRUCTION_OPERAND_CONTROLS][Src0.RegFile]!='IMM')  |   |     |          |     |          |  |
|   | Format:                | EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN1 [CHV, BSW]   |   |     |          |     |          |  |

## EU\_INSTRUCTION\_SOURCES\_REG\_REG

| EU_INSTRUCTION_SOURCES_REG_REG |                        |  |   |       |      |
|--------------------------------|------------------------|--|---|-------|------|
| Project:                       | CHV, BSW               |  |   |       |      |
| Source:                        | Eulsa                  |  |   |       |      |
| Size (in bits):                | 64                     |  |   |       |      |
| Default Value:                 | 0x00000000, 0x00000000 |  |   |       |      |
| Dual source, both registers    |                        |  |   |       |      |
| DWord                          | Bit                    | Description  |   |       |      |
| 0..1                           | 63:58                  | <b>Reserved</b><br>Format: MBZ   |   |       |      |
|                                | 57                     | <b>Reserved</b><br>Exists If: ([Source 1][Source Addressing Mode]== 'Direct')<br>Format: MBZ   |   |       |      |
|                                | 57                     | <b>Source 1 Address Immediate [9] (Sign Bit)</b><br>Exists If: ([Source 1][Source Addressing Mode]== 'Indirect')<br>Format: S9[9]  |   |       |      |
|                                | 56:32                  | <b>Source 1</b><br>Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]== 'Align16')<br>Format: EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16 [CHV, BSW]  |   |       |      |
|                                | 56:32                  | <b>Source 1</b><br>Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]== 'Align1')<br>Format: EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN1 [CHV, BSW]  |   |       |      |
|                                | 31                     | <b>Reserved</b><br>Exists If: ([Source 0][Source Addressing Mode]== 'Direct')<br>Format: MBZ   |   |       |      |
|                                | 31                     | <b>Source 0 Address Immediate [9] (Sign Bit)</b><br>Exists If: ([Source 0][Source Addressing Mode]== 'Indirect')<br>Format: S9[9]  |   |       |      |
|                                | 30:27                  | <b>Src1.SrcType</b><br>Format: SrcType [CHV, BSW]<br>This field specifies the numeric data type of the source operand src1. The bits of a source operand are interpreted as the identified numeric data type, rather than coerced into a type implied by the operator. Depending on RegFile field of the source operand, there are two different encoding for this field. If a source is a register operand, this field follows the Source Register Type Encoding. If a source is an immediate operand, this field follows the Source Immediate Type Encoding. |   |       |      |
|                                |                        |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> </tbody> </table> | Value | Name |
|                                | Value                  | Name   |   |       |      |

| <b>EU_INSTRUCTION_SOURCES_REG_REG</b> |   |     |          |
|---------------------------------------|---|-----|----------|
|                                       | <table border="1" style="width: 100%;"> <tr> <td style="width: 40%;">11b</td> <td>Reserved</td> </tr> </table>  | 11b | Reserved |
| 11b                                   | Reserved  |     |          |
|                                       | <b>Programming Notes</b>  |     |          |
|                                       | Both source operands, src0 and src1, support immediate types, but only one immediate is allowed for a given instruction and it must be the last operand.  |     |          |
|                                       | Halfbyte integer vector (v) type can only be used in instructions in packed-word execution mode. Therefore, in a two-source instruction where src1 is of type :v, src0 must be of type :b, :ub, :w, or :uw. |     |          |
| 26:25                                 | <b>Src1.RegFile</b>   |     |          |
|                                       | Format: RegFile [CHV, BSW]  |     |          |
| 24:0                                  | <b>Source 0</b>   |     |          |
|                                       | Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]='Align16') AND (Structure[EU_INSTRUCTION_OPERAND_CONTROLS][Src0.RegFile]!='IMM')   |     |          |
|                                       | Format: EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN16 [CHV, BSW]   |     |          |
| 24:0                                  | <b>Source 0</b>   |     |          |
|                                       | Exists If: (Structure[EU_INSTRUCTION_CONTROLS_A][AccessMode]='Align1') AND (Structure[EU_INSTRUCTION_OPERAND_CONTROLS][Src0.RegFile]!='IMM')  |     |          |
|                                       | Format: EU_INSTRUCTION_OPERAND_SRC_REG_ALIGN1 [CHV, BSW]  |     |          |

## ExtMsgDescpt

| <b>ExtMsgDescpt</b>   |  |   |          |          |         |     |                |   |     |
|---|--|---|----------|----------|---------|-----|----------------|---|-----|
| Project:  | CHV, BSW   |   |          |          |         |     |                |   |     |
| Source:   | Eulsa  |   |          |          |         |     |                |   |     |
| Size (in bits):   | 32   |   |          |          |         |     |                |   |     |
| Default Value:  | 0x00000000   |   |          |          |         |     |                |   |     |
| DWord   | Bit  | Description   |          |          |         |     |                |   |     |
| 0<br><br>Extended Message Descriptor Definition for SendS (Immediate) | 31:16  | <b>Extended Function Control</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>This field is intended to control the target function unit. Refer to the section on the specific target function unit for details on the contents of this field.</p> | Project: | CHV, BSW | Format: | U16 |                |   |     |
|   | Project:   | CHV, BSW  |          |          |         |     |                |   |     |
|   | Format:  | U16   |          |          |         |     |                |   |     |
|   | 15:12  | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project: | CHV, BSW | Format: | MBZ |                |   |     |
|   | Project:   | CHV, BSW  |          |          |         |     |                |   |     |
|   | Format:  | MBZ   |          |          |         |     |                |   |     |
|   | 11   | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project: | CHV, BSW | Format: | MBZ |                |   |     |
|   | Project:   | CHV, BSW  |          |          |         |     |                |   |     |
| Format:   | MBZ  |   |          |          |         |     |                |   |     |
| 10:6  | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project:  | CHV, BSW | Format:  | MBZ     |     |                |   |     |
| Project:  | CHV, BSW   |   |          |          |         |     |                |   |     |
| Format:   | MBZ  |   |          |          |         |     |                |   |     |
| 5   | <b>EOT</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Format:</td> <td>U1</td> </tr> </table> <p>This field, if set, indicates that this is the final message of the thread and the threads resources can be reclaimed.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>No Termination</td> </tr> <tr> <td style="text-align: center;">1</td> <td>EOT</td> </tr> </tbody> </table> | Format:   | U1       | Value    | Name    | 0   | No Termination | 1 | EOT |
| Format:   | U1   |   |          |          |         |     |                |   |     |
| Value   | Name   |   |          |          |         |     |                |   |     |
| 0   | No Termination   |   |          |          |         |     |                |   |     |
| 1   | EOT  |   |          |          |         |     |                |   |     |
| 4   | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Format:</td> <td>MBZ</td> </tr> </table>  | Format:   | MBZ      |          |         |     |                |   |     |
| Format:   | MBZ  |   |          |          |         |     |                |   |     |
| 3:0   | <b>Target Function ID</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Format:</td> <td>U4</td> </tr> </table> <p>If set, indicates that the message includes a header. Depending on the target shared function, this field may be restricted to either enabled or disabled. Refer to the specific shared function section for details.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> </tbody> </table>                            | Format:   | U4       | Value    | Name    |     |                |   |     |
| Format:   | U4   |   |          |          |         |     |                |   |     |
| Value   | Name   |   |          |          |         |     |                |   |     |

| <b>ExtMsgDescpt</b> |                             |
|---------------------|-----------------------------|
|                     | 0000b Null                  |
|                     | 0001b Reserved              |
|                     | 0010b SamplingEngine        |
|                     | 0011b MessageGateway        |
|                     | 0100b DataPortSamplerCache  |
|                     | 0101b DataPortRenderCache   |
|                     | 0110b URB                   |
|                     | 0111b ThreadSpawner         |
|                     | 1000b VideoMotionEstimation |
|                     | 1001b ConstantCache         |
|                     | 1010b-1111b Reserved        |

## ExtMsgDescptImmediate

| <b>ExtMsgDescptImmediate</b>  |  |   |       |      |   |                |   |     |
|---|--|---|-------|------|---|----------------|---|-----|
| Project:  | CHV, BSW   |   |       |      |   |                |   |     |
| Source:   | Eulsa  |   |       |      |   |                |   |     |
| Size (in bits):   | 32   |   |       |      |   |                |   |     |
| Default Value:  | 0x00000000   |   |       |      |   |                |   |     |
| DWord   | Bit  | Description   |       |      |   |                |   |     |
| 0<br><br>Extended Message Descriptor Definition for SendS (Immediate) | 31:16  | <b>Extended Function Control</b><br>Format: <span style="float: right;">U16</span><br>This field is intended to control the target function unit. Refer to the section on the specific target function unit for details on the contents of this field.  |       |      |   |                |   |     |
|   | 15:12  | <b>Reserved</b><br>Format: <span style="float: right;">MBZ</span>   |       |      |   |                |   |     |
|   | 11   | <b>Reserved</b><br>Project: <span style="float: right;">CHV, BSW</span><br>Format: <span style="float: right;">MBZ</span>   |       |      |   |                |   |     |
|   | 10   | <b>Reserved</b><br>Format: <span style="float: right;">MBZ</span>   |       |      |   |                |   |     |
|   | 9:6  | <b>Reserved</b><br>Project: <span style="float: right;">CHV, BSW</span><br>Format: <span style="float: right;">MBZ</span>   |       |      |   |                |   |     |
|   | 5  | <b>EOT</b><br>Format: <span style="float: right;">U1</span><br>This field, if set, indicates that this is the final message of the thread and the threads resources can be reclaimed.<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>No Termination</td> </tr> <tr> <td style="text-align: center;">1</td> <td>EOT</td> </tr> </tbody> </table> | Value | Name | 0 | No Termination | 1 | EOT |
|   | Value  | Name  |       |      |   |                |   |     |
|   | 0  | No Termination  |       |      |   |                |   |     |
| 1   | EOT  |   |       |      |   |                |   |     |
| 4   | <b>Reserved</b><br>Format: <span style="float: right;">MBZ</span>  |   |       |      |   |                |   |     |
| 3:0   | <b>Target Function ID</b><br>Format: <span style="float: right;">U4</span><br>If set, indicates that the message includes a header. Depending on the target shared function, this field may be restricted to either enabled or disabled. Refer to the specific shared function section for details.<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> </tbody> </table> | Value   | Name  |      |   |                |   |     |
| Value   | Name   |   |       |      |   |                |   |     |

| <b>ExtMsgDescptImmediate</b> |                             |
|------------------------------|-----------------------------|
|                              | 0000b Null                  |
|                              | 0001b Reserved              |
|                              | 0010b SamplingEngine        |
|                              | 0011b MessageGateway        |
|                              | 0100b DataPortSamplerCache  |
|                              | 0101b DataPortRenderCache   |
|                              | 0110b URB                   |
|                              | 0111b ThreadSpawner         |
|                              | 1000b VideoMotionEstimation |
|                              | 1001b ConstantCache         |
|                              | 1010b-1111b Reserved        |

## FFTID Message Header Control

| <b>MHC_FFTID - FFTID Message Header Control</b>   |            |                 |
|---|------------|-----------------|
| Project:  | CHV, BSW   |                 |
| Source:   | PRM        |                 |
| Size (in bits):   | 32         |                 |
| Default Value:  | 0x00000000 |                 |
| DWord   | Bit        | Description     |
| 0   | 31:8       | <b>Reserved</b> |
|   |            | Project: All    |
|   |            | Format: Ignore  |
|   | Ignored    |                 |
|   | 7:0        | <b>FFTID</b>    |
| Project: All  |            |                 |
| Format: U8  |            |                 |
| Fixed function thread ID, used to free up resources by the thread on thread completion. |            |                 |



## Filter\_Coefficient

| Filter_Coefficient |                     |   |         |                     |
|--------------------|---------------------|---|---------|---------------------|
| Project:           | CHV, BSW            |   |         |                     |
| Source:            | PRM                 |   |         |                     |
| Size (in bits):    | 8                   |   |         |                     |
| Default Value:     | 0x00000000          |   |         |                     |
| DWord              | Bit                 | Description   |         |                     |
| 0                  | 7:0                 | <b>Filter Coefficient</b><br><table border="1"> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> </table> Range : [-1 63/64, +1 63/64] | Format: | S1.6 2's Complement |
| Format:            | S1.6 2's Complement |   |         |                     |

## Filter\_Coefficients

| <b>Filter_Coefficients</b> |                        |  |
|----------------------------|------------------------|--|
| Project:                   | CHV, BSW               |  |
| Source:                    | PRM                    |  |
| Size (in bits):            | 64                     |  |
| Default Value:             | 0x00000000, 0x00000000 |  |
| DWord                      | Bit                    | Description  |
| 0                          | 63:56                  | <b>Filter Coefficient Offset 7</b><br>Format: <input type="text"/> Filter_Coefficient [CHV, BSW] |
|                            | 55:48                  | <b>Filter Coefficient Offset 6</b><br>Format: <input type="text"/> Filter_Coefficient [CHV, BSW] |
|                            | 47:40                  | <b>Filter Coefficient Offset 5</b><br>Format: <input type="text"/> Filter_Coefficient [CHV, BSW] |
|                            | 39:32                  | <b>Filter Coefficient Offset 4</b><br>Format: <input type="text"/> Filter_Coefficient [CHV, BSW] |
|                            | 31:24                  | <b>Filter Coefficient Offset 3</b><br>Format: <input type="text"/> Filter_Coefficient [CHV, BSW] |
|                            | 23:16                  | <b>Filter Coefficient Offset 2</b><br>Format: <input type="text"/> Filter_Coefficient [CHV, BSW] |
|                            | 15:8                   | <b>Filter Coefficient Offset 1</b><br>Format: <input type="text"/> Filter_Coefficient [CHV, BSW] |
|                            | 7:0                    | <b>Filter Coefficient Offset 0</b><br>Format: <input type="text"/> Filter_Coefficient [CHV, BSW] |

## FrameDeltaQp

| <b>FrameDeltaQp</b> |                        |   |
|---------------------|------------------------|---|
| Source:             | PRM                    |   |
| Size (in bits):     | 64                     |   |
| Default Value:      | 0x00000000, 0x00000000 |   |
| DWord               | Bit                    | Description   |
| 0..1                | 63:56                  | <b>FrameDeltaQp[7]</b><br>Format: <span style="float: right;">S7</span> |
|                     | 55:48                  | <b>FrameDeltaQp[6]</b><br>Format: <span style="float: right;">S7</span> |
|                     | 47:40                  | <b>FrameDeltaQp[5]</b><br>Format: <span style="float: right;">S7</span> |
|                     | 39:32                  | <b>FrameDeltaQp[4]</b><br>Format: <span style="float: right;">S7</span> |
|                     | 31:24                  | <b>FrameDeltaQp[3]</b><br>Format: <span style="float: right;">S7</span> |
|                     | 23:16                  | <b>FrameDeltaQp[2]</b><br>Format: <span style="float: right;">S7</span> |
|                     | 15:8                   | <b>FrameDeltaQp[1]</b><br>Format: <span style="float: right;">S7</span> |
|                     | 7:0                    | <b>FrameDeltaQp[0]</b><br>Format: <span style="float: right;">S7</span> |

## FrameDeltaQpRange

| <b>FrameDeltaQpRange</b> |                        |   |
|--------------------------|------------------------|---|
| Source:                  | PRM                    |   |
| Size (in bits):          | 64                     |   |
| Default Value:           | 0x00000000, 0x00000000 |   |
| DWord                    | Bit                    | Description                               |
| 0..1                     | 63:56                  | <b>FrameDeltaQpRange[7]</b><br>Format: U8 |
|                          | 55:48                  | <b>FrameDeltaQpRange[6]</b><br>Format: U8 |
|                          | 47:40                  | <b>FrameDeltaQpRange[5]</b><br>Format: U8 |
|                          | 39:32                  | <b>FrameDeltaQpRange[4]</b><br>Format: U8 |
|                          | 31:24                  | <b>FrameDeltaQpRange[3]</b><br>Format: U8 |
|                          | 23:16                  | <b>FrameDeltaQpRange[2]</b><br>Format: U8 |
|                          | 15:8                   | <b>FrameDeltaQpRange[1]</b><br>Format: U8 |
|                          | 7:0                    | <b>FrameDeltaQpRange[0]</b><br>Format: U8 |

## FunctionControl

| FunctionControl |            |                           |                                |                |
|-----------------|------------|---------------------------|--------------------------------|----------------|
| Project:        | CHV, BSW   |                           |                                |                |
| Source:         | Eulsa      |                           |                                |                |
| Size (in bits): | 6          |                           |                                |                |
| Default Value:  | 0x00000000 |                           |                                |                |
| DWord           | Bit        | Description               |                                |                |
| 0               | 5:4        | <b>Reserved</b>           |                                |                |
|                 | 3:0        | <b>Target Function ID</b> |                                |                |
|                 |            | <b>Value</b>              | <b>Name</b>                    | <b>Project</b> |
|                 |            | 0000b                     | Reserved                       |                |
|                 |            | 0001b                     | INV (Reciprocal)               |                |
|                 |            | 0010b                     | LOG                            |                |
|                 |            | 0011b                     | EXP                            |                |
|                 |            | 0100b                     | SQRT                           |                |
|                 |            | 0101b                     | RSQ                            |                |
|                 |            | 0110b                     | SIN                            |                |
|                 |            | 0111b                     | COS                            |                |
|                 |            | 1000b                     | Reserved                       |                |
|                 |            | 1001b                     | FDIV                           |                |
|                 |            | 1010b                     | POW                            |                |
|                 |            | 1011b                     | INT DIV Quotient and remainder |                |
|                 |            | 1100b                     | INT DIV Quotient only          |                |
|                 |            | 1101b                     | INT DIV Remainder only         |                |
| 1110b           | INVM       | CHV, BSW                  |                                |                |
| 1111b           | RSQRTM     | CHV, BSW                  |                                |                |

## GATHER\_CONSTANT\_ENTRY

| <b>GATHER_CONSTANT_ENTRY</b> |   |   |  |                           |         |
|------------------------------|---|---|--|---------------------------|---------|
| Project:                     | CHV, BSW  |   |  |                           |         |
| Source:                      | RenderCS  |   |  |                           |         |
| Size (in bits):              | 16  |   |  |                           |         |
| Default Value:               | 0x00000000  |   |  |                           |         |
| DWord                        | Bit   | Description   |  |                           |         |
| 0                            | 15:8  | <p><b>Constant Buffer Offset</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>Offset[7:0]ConstantBuffer</td> </tr> </table> <p>This field specifies the Offset in 128-bit units of the 128b entry fetched from the constant buffer for this entry (including when <b>On-Die Table Read Enable</b> is set).</p>   | Format:  | Offset[7:0]ConstantBuffer |         |
|                              | Format:   | Offset[7:0]ConstantBuffer   |  |                           |         |
|                              | 7:4   | <p><b>Channel Mask</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Mask:</td> <td>Mask[3:0]</td> </tr> <tr> <td>Format:</td> <td>ConstantBuffer</td> </tr> </table> <p>Each bit of this field correspond to the 4 channels of each entry fetched from memory. When the bit is a 1, the corresponding 32-bit value is loaded in FF's push constant buffer. When the bit is a 0, the corresponding 32-bit value is not loaded. If this field is zero it means the entry is not used.</p> | Mask:  | Mask[3:0]                 | Format: |
| Mask:                        | Mask[3:0]   |   |  |                           |         |
| Format:                      | ConstantBuffer  |   |  |                           |         |
| 3:0                          | <p><b>Binding Table Index Offset</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>Constant Buffer Index offset [3:0]Surface State for ConstantBuffer</td> </tr> </table> <p>This field specifies the Binding Table index offset from the <b>Constant Buffer Binding Table Block</b> starting point in the Binding Table. This value is added to the <b>Constant Buffer Binding Table Block</b> will result in the Binding Table Index pointing to the surface state containing the constant buffer to be referenced. If <b>?S Constant Buffer Dx9 Enable</b> is set then a value of '1' specifies that the fetch to the constant buffer should be offset by 4KB in order to address the upper 4K of the constant buffer. Any value greater than '1' is invalid when <b>VS Constant Buffer Dx9 Enable</b> is set.</p> | Format:   | Constant Buffer Index offset [3:0]Surface State for ConstantBuffer |                           |         |
| Format:                      | Constant Buffer Index offset [3:0]Surface State for ConstantBuffer  |   |  |                           |         |

## Hardware-Detected Error Bit Definitions

| Hardware-Detected Error Bit Definitions   |   |  |      |             |   |  |                            |
|---|---|--|------|-------------|---|--|----------------------------|
| Project:  | CHV, BSW  |  |      |             |   |  |                            |
| Source:   | RenderCS  |  |      |             |   |  |                            |
| Size (in bits):   | 32  |  |      |             |   |  |                            |
| Default Value:  | 0x00000000  |  |      |             |   |  |                            |
| DWord   | Bit   | Description  |      |             |   |  |                            |
| 0   | 31:3  | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>  |      | MBZ         |   |  |                            |
|   |   | MBZ  |      |             |   |  |                            |
|   | 2   | <b>Command Privilege Violation Error</b><br>Project: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>CHV, BSW</td></tr></table><br>This bit is set if a command classified as privileged is parsed in a non-privileged batch buffer. The command will be converted to a NOOP and parsing will continue. |      | CHV, BSW    |   |  |                            |
|   |   | CHV, BSW   |      |             |   |  |                            |
| 1   | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>   |  | MBZ  |             |   |  |                            |
|   | MBZ   |  |      |             |   |  |                            |
| 0   | <b>Instruction Error</b><br>This bit is set when the Renderer Instruction Parser detects an error while parsing an instruction. Instruction errors include: <ul style="list-style-type: none"> <li>Client ID value (Bits 31:29 of the Header) is not supported (only MI, 2D and 3D are supported).</li> <li>Defeatured MI Instruction Opcodes:</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 15%;">Name</th> <th style="width: 70%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td> </td> <td>Instruction Error detected</td> </tr> </tbody> </table> | Value  | Name | Description | 1 |  | Instruction Error detected |
| Value   | Name  | Description  |      |             |   |  |                            |
| 1   |   | Instruction Error detected   |      |             |   |  |                            |
| <b>Programming Notes</b>  |   |  |      |             |   |  |                            |
| This error indications cannot be cleared except by reset (i.e., it is a fatal error). |   |  |      |             |   |  |                            |











| <b>Hardware Status Page Layout</b>    |          |  |          |          |
|---------------------------------------|----------|--|----------|----------|
| 1..3                                  | 31:0     | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">Project:</td> <td>All</td> </tr> </table> <p>Must not be used.</p>   | Project: | All      |
| Project:                              | All      |  |          |          |
| 4                                     | 31:0     | <p><b>Ring Head Pointer Storage</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">Project:</td> <td>All</td> </tr> </table> <p>The contents of the Ring Buffer Head Pointer register (register DWord 1) are written to this location either as result of an MI_REPORT_HEAD instruction or as the result of an "automatic report" (see RINGBUF registers).</p> | Project: | All      |
| Project:                              | All      |  |          |          |
| 5..15                                 | 31:0     | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">Project:</td> <td>All</td> </tr> </table> <p>Must not be used.</p>   | Project: | All      |
| Project:                              | All      |  |          |          |
| 16..27                                | 31:0     | <p><b>Context Status DWords</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> </table>  | Project: | CHV, BSW |
| Project:                              | CHV, BSW |  |          |          |
| 28..30<br><b>Project:</b><br>CHV, BSW | 31:0     | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> </table> <p>Must not be used.</p>  | Project: | CHV, BSW |
| Project:                              | CHV, BSW |  |          |          |
| 31<br><b>Project:</b><br>CHV, BSW     | 31:0     | <p><b>Last Written Status Offset</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project: | CHV, BSW |
| Project:                              | CHV, BSW |  |          |          |
| 32..39<br><b>Project:</b><br>CHV, BSW | 31:0     | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project: | CHV, BSW |
| Project:                              | CHV, BSW |  |          |          |
| 40..46                                | 31:0     | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">Project:</td> <td>All</td> </tr> </table>  | Project: | All      |
| Project:                              | All      |  |          |          |
| 47                                    | 31:0     | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project: | CHV, BSW |
| Project:                              | CHV, BSW |  |          |          |
| 48..1023                              | 31:0     | <p><b>General Purpose</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">Project:</td> <td>All</td> </tr> </table> <p>These locations can be used for general purpose via the MI_STORE_DATA_INDEX or MI_STORE_DATA_IMM instructions.</p>   | Project: | All      |
| Project:                              | All      |  |          |          |

## Header Forbidden Message Descriptor Control Field

| <b>MDC_MHF - Header Forbidden Message Descriptor Control Field</b> |                     |   |             |
|--|---------------------|---|-------------|
| Project:   | CHV, BSW            |   |             |
| Source:  | PRM                 |   |             |
| Size (in bits):  | 1                   |   |             |
| Default Value:   | 0x00000000          |   |             |
| DWord  | Bit                 | Description                                     |             |
| 0  | 0                   | <b>Message Header Present</b>                   |             |
|  |                     | Project:  | All         |
|  |                     | Format:   | Enumeration |
|  |                     | Indicates the message forbids a message header. |             |
| Value  | Name                | Description                                     | Project     |
| 0h   | No <b>[Default]</b> | Message header is not present                   | All         |
| 1h   | Reserved            | Not used  | All         |

## Header Present Message Descriptor Control Field

| <b>MDC_MHP - Header Present Message Descriptor Control Field</b> |            |  |             |                               |     |
|--|------------|--|-------------|-------------------------------|-----|
| Project:   | CHV, BSW   |  |             |                               |     |
| Source:  | PRM        |  |             |                               |     |
| Size (in bits):  | 1          |  |             |                               |     |
| Default Value:   | 0x00000000 |  |             |                               |     |
| DWord  | Bit        | Description  |             |                               |     |
| 0  | 0          | <b>Message Header Present</b>                              |             |                               |     |
|  |            | Project:   | All         |                               |     |
|  |            | Format:  | Enumeration |                               |     |
|  |            | Specifies if the message uses the optional message header. |             |                               |     |
|  |            | Value  | Name        |                               |     |
|  |            | Description  | Project     |                               |     |
|  |            | 0h   | No          | Message header is not present | All |
|  |            | 1h   | Yes         | Message header is present     | All |

## Header Required Message Descriptor Control Field

| <b>MDC_MHR - Header Required Message Descriptor Control Field</b> |            |  |                      |                           |     |
|---|------------|--|----------------------|---------------------------|-----|
| Project:  | CHV, BSW   |  |                      |                           |     |
| Source:   | PRM        |  |                      |                           |     |
| Size (in bits):   | 1          |  |                      |                           |     |
| Default Value:  | 0x00000001 |  |                      |                           |     |
| DWord   | Bit        | Description                                      |                      |                           |     |
| 0   | 0          | <b>Message Header Present</b>                    |                      |                           |     |
|   |            | Project:   | All                  |                           |     |
|   |            | Format:  | Enumeration          |                           |     |
|   |            | Indicates the message requires a message header. |                      |                           |     |
|   |            | Value  | Name                 |                           |     |
|   |            | Description                                      | Project              |                           |     |
|   |            | 0h   | Reserved             | Not used                  | All |
|   |            | 1h   | Yes <b>[Default]</b> | Message header is present | All |

## HEVC\_ARBITRATION\_PRIORITY

| HEVC_ARBITRATION_PRIORITY  |                         |   |                         |      |     |                  |     |                         |     |                        |     |                 |
|--|-------------------------|---|-------------------------|------|-----|------------------|-----|-------------------------|-----|------------------------|-----|-----------------|
| Project:   | CHV, BSW                |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| Source:  | PRM                     |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| Size (in bits):  | 2                       |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| Default Value:   | 0x00000000              |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| This field controls the priority of arbitration used in the GAC/GAM pipeline for this surface. |                         |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| DWord  | Bit                     | Description   |                         |      |     |                  |     |                         |     |                        |     |                 |
| 0  | 1:0                     | <b>Priority</b>   |                         |      |     |                  |     |                         |     |                        |     |                 |
|  |                         | Format: U2  |                         |      |     |                  |     |                         |     |                        |     |                 |
|  |                         | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td>Highest priority</td> </tr> <tr> <td>01b</td> <td>Second highest priority</td> </tr> <tr> <td>10b</td> <td>Third highest priority</td> </tr> <tr> <td>11b</td> <td>Lowest priority</td> </tr> </tbody> </table> | Value                   | Name | 00b | Highest priority | 01b | Second highest priority | 10b | Third highest priority | 11b | Lowest priority |
|  |                         | Value   | Name                    |      |     |                  |     |                         |     |                        |     |                 |
|  |                         | 00b   | Highest priority        |      |     |                  |     |                         |     |                        |     |                 |
|  |                         | 01b   | Second highest priority |      |     |                  |     |                         |     |                        |     |                 |
| 10b  | Third highest priority  |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| 11b  | Lowest priority         |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| 00b  | Highest priority        |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| 01b  | Second highest priority |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| 10b  | Third highest priority  |   |                         |      |     |                  |     |                         |     |                        |     |                 |
| 11b  | Lowest priority         |   |                         |      |     |                  |     |                         |     |                        |     |                 |



## HW Generated BINDING\_TABLE\_STATE

| HW Generated BINDING_TABLE_STATE |            |   |
|----------------------------------|------------|---|
| Project:                         | CHV, BSW   |   |
| Source:                          | PRM        |   |
| Size (in bits):                  | 16         |   |
| Default Value:                   | 0x00000000 |   |
| DWord                            | Bit        | Description   |
| 0                                | 15:0       | <b>Surface State Pointer</b><br>Format: SurfaceStateOffset[21:6] [CHV, BSW] |

## Hword 1 Block Data Payload

| <b>MDP_HW1 - Hword 1 Block Data Payload</b> |   |  |          |     |         |      |
|---|---|--|----------|-----|---------|------|
| Project:                                    | CHV, BSW  |  |          |     |         |      |
| Source:                                     | PRM   |  |          |     |         |      |
| Size (in bits):                             | 256   |  |          |     |         |      |
| Default Value:                              | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |  |          |     |         |      |
| DWord                                       | Bit   | Description  |          |     |         |      |
| 0.0-0.7                                     | 255:0   | <p><b>Hword</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U256</td> </tr> </table> <p>Specifies the Hword data</p> | Project: | All | Format: | U256 |
| Project:                                    | All   |  |          |     |         |      |
| Format:                                     | U256  |  |          |     |         |      |

## Hword 2 Block Data Payload

| <b>MDP_HW2 - Hword 2 Block Data Payload</b> |  |  |
|---|--|--|
| Project:                                    | CHV, BSW   |  |
| Source:                                     | PRM  |  |
| Size (in bits):                             | 512  |  |
| Default Value:                              | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord                                       | Bit  | Description                            |
| 0.0-0.7                                     | 255:0  | <b>Hword0</b>                          |
|   |  | Project: All                           |
|   |  | Format: U256                           |
|   |  | Specifies the Hword data for element 0 |
| 1.0-1.7                                     | 255:0  | <b>Hword1</b>                          |
|   |  | Project: All                           |
|   |  | Format: U256                           |
|   |  | Specifies the Hword data for element 1 |

## Hword 4 Block Data Payload

| <b>MDP_HW4 - Hword 4 Block Data Payload</b> |  |   |          |     |         |      |
|---|--|---|----------|-----|---------|------|
| Project:                                    | CHV, BSW   |   |          |     |         |      |
| Source:                                     | PRM  |   |          |     |         |      |
| Size (in bits):                             | 1024   |   |          |     |         |      |
| Default Value:                              | 0x00000000, 0x00000000 |   |          |     |         |      |
| DWord                                       | Bit  | Description   |          |     |         |      |
| 0.0-0.7                                     | 255:0  | <p><b>Hword0</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U256</td> </tr> </table> <p>Specifies the Hword data for element 0</p> | Project: | All | Format: | U256 |
| Project:                                    | All  |   |          |     |         |      |
| Format:                                     | U256   |   |          |     |         |      |
| 1.0-1.7                                     | 255:0  | <p><b>Hword1</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U256</td> </tr> </table> <p>Specifies the Hword data for element 1</p> | Project: | All | Format: | U256 |
| Project:                                    | All  |   |          |     |         |      |
| Format:                                     | U256   |   |          |     |         |      |
| 2.0-2.7                                     | 255:0  | <p><b>Hword2</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U256</td> </tr> </table> <p>Specifies the Hword data for element 2</p> | Project: | All | Format: | U256 |
| Project:                                    | All  |   |          |     |         |      |
| Format:                                     | U256   |   |          |     |         |      |
| 3.0-3.7                                     | 255:0  | <p><b>Hword3</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U256</td> </tr> </table> <p>Specifies the Hword data for element 3</p> | Project: | All | Format: | U256 |
| Project:                                    | All  |   |          |     |         |      |
| Format:                                     | U256   |   |          |     |         |      |

## Hword 8 Block Data Payload

| MDP_HW8 - Hword 8 Block Data Payload |   |  |
|--------------------------------------|---|--|
| Project:                             | CHV, BSW  |  |
| Source:                              | PRM   |  |
| Size (in bits):                      | 2048  |  |
| Default Value:                       | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, |  |
| DWord                                | Bit   | Description                            |
| 0.0-0.7                              | 255:0   | <b>Hword0</b>                          |
|                                      |   | Project: All                           |
|                                      |   | Format: U256                           |
|                                      |   | Specifies the Hword data for element 0 |
| 1.0-1.7                              | 255:0   | <b>Hword1</b>                          |
|                                      |   | Project: All                           |
|                                      |   | Format: U256                           |
|                                      |   | Specifies the Hword data for element 1 |
| 2.0-2.7                              | 255:0   | <b>Hword2</b>                          |
|                                      |   | Project: All                           |
|                                      |   | Format: U256                           |
|                                      |   | Specifies the Hword data for element 2 |
| 3.0-3.7                              | 255:0   | <b>Hword3</b>                          |
|                                      |   | Project: All                           |
|                                      |   | Format: U256                           |
|                                      |   | Specifies the Hword data for element 3 |
| 4.0-4.7                              | 255:0   | <b>Hword4</b>                          |
|                                      |   | Project: All                           |

| <b>MDP_HW8 - Hword 8 Block Data Payload</b> |       |   |          |      |  |      |  |  |
|---|-------|---|----------|------|--|------|--|--|
|   |       | <table border="1"> <tr> <td>Format:</td> <td>U256</td> </tr> <tr> <td colspan="2">Specifies the Hword data for element 4</td> </tr> </table>  | Format:  | U256 | Specifies the Hword data for element 4 |      |  |  |
| Format:                                     | U256  |   |          |      |  |      |  |  |
| Specifies the Hword data for element 4      |       |   |          |      |  |      |  |  |
| 5.0-5.7                                     | 255:0 | <p><b>Hword5</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U256</td> </tr> <tr> <td colspan="2">Specifies the Hword data for element 5</td> </tr> </table> | Project: | All  | Format:                                | U256 | Specifies the Hword data for element 5 |  |
| Project:                                    | All   |   |          |      |  |      |  |  |
| Format:                                     | U256  |   |          |      |  |      |  |  |
| Specifies the Hword data for element 5      |       |   |          |      |  |      |  |  |
| 6.0-6.7                                     | 255:0 | <p><b>Hword6</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U256</td> </tr> <tr> <td colspan="2">Specifies the Hword data for element 6</td> </tr> </table> | Project: | All  | Format:                                | U256 | Specifies the Hword data for element 6 |  |
| Project:                                    | All   |   |          |      |  |      |  |  |
| Format:                                     | U256  |   |          |      |  |      |  |  |
| Specifies the Hword data for element 6      |       |   |          |      |  |      |  |  |
| 7.0-7.7                                     | 255:0 | <p><b>Hword7</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U256</td> </tr> <tr> <td colspan="2">Specifies the Hword data for element 7</td> </tr> </table> | Project: | All  | Format:                                | U256 | Specifies the Hword data for element 7 |  |
| Project:                                    | All   |   |          |      |  |      |  |  |
| Format:                                     | U256  |   |          |      |  |      |  |  |
| Specifies the Hword data for element 7      |       |   |          |      |  |      |  |  |

## Hword Channel Mode Message Header Control

| <b>MHC_A64_CMODE - Hword Channel Mode Message Header Control</b> |  |  |          |         |         |                      |
|--|--|--|----------|---------|---------|----------------------|
| Project:   | CHV, BSW   |  |          |         |         |                      |
| Source:  | PRM  |  |          |         |         |                      |
| Size (in bits):  | 32   |  |          |         |         |                      |
| Default Value:   | 0x00000000   |  |          |         |         |                      |
| DWord  | Bit  | Description  |          |         |         |                      |
| 0  | 31   | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDC_CMODE [CHV, BSW]</td> </tr> </table> <p>Specifies whether the read or write operation occurs on all 4 Dwords if any of those channel enables are set, or else only on the dwords whose corresponding channel enable is set.</p> | Project: | All     | Format: | MDC_CMODE [CHV, BSW] |
|  | Project:   | All  |          |         |         |                      |
| Format:  | MDC_CMODE [CHV, BSW]   |  |          |         |         |                      |
| 30:0   | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p> | Project:   | All      | Format: | Ignore  |                      |
| Project:   | All  |  |          |         |         |                      |
| Format:  | Ignore   |  |          |         |         |                      |

## Hword Register Blocks Message Descriptor Control Field

| <b>MDC_DB_HW - Hword Register Blocks Message Descriptor Control Field</b> |             |   |         |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
|---|-------------|---|---------|----------|-----|---------|-------------|-------|------|-------------|---------|-----|-----|------------------|-----|-----|-----|-------------------|-----|-----|-----|-------------------|-----|-----|-----|-------------------|-----|
| Project:  | CHV, BSW    |   |         |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| Source:   | PRM         |   |         |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| Size (in bits):   | 2           |   |         |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| Default Value:  | 0x00000000  |   |         |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| <b>DWord</b>  | <b>Bit</b>  | <b>Description</b>  |         |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| 0   | 1:0         | <b>Register Blocks</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enumeration</td> </tr> </table> <p>Specifies the number of Hword blocks to be read or written</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h</td> <td>HW1</td> <td>1 Hword register</td> <td>All</td> </tr> <tr> <td>01h</td> <td>HW2</td> <td>2 Hword registers</td> <td>All</td> </tr> <tr> <td>02h</td> <td>HW4</td> <td>4 Hword registers</td> <td>All</td> </tr> <tr> <td>03h</td> <td>HW8</td> <td>8 Hword registers</td> <td>All</td> </tr> </tbody> </table> |         | Project: | All | Format: | Enumeration | Value | Name | Description | Project | 00h | HW1 | 1 Hword register | All | 01h | HW2 | 2 Hword registers | All | 02h | HW4 | 4 Hword registers | All | 03h | HW8 | 8 Hword registers | All |
| Project:  | All         |   |         |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| Format:   | Enumeration |   |         |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| Value   | Name        | Description   | Project |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| 00h   | HW1         | 1 Hword register  | All     |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| 01h   | HW2         | 2 Hword registers   | All     |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| 02h   | HW4         | 4 Hword registers   | All     |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |
| 03h   | HW8         | 8 Hword registers   | All     |          |     |         |             |       |      |             |         |     |     |                  |     |     |     |                   |     |     |     |                   |     |     |     |                   |     |



## Ignored Message Header

| <b>MH_IGNORE - Ignored Message Header</b>  |   |   |          |     |         |        |
|--|---|---|----------|-----|---------|--------|
| Project:   | CHV, BSW  |   |          |     |         |        |
| Source:  | DataPort 0  |   |          |     |         |        |
| Size (in bits):  | 256   |   |          |     |         |        |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |   |          |     |         |        |
| Some messages require a message header or have an optional message header, but do not use any information in the header. |   |   |          |     |         |        |
| DWord  | Bit   | Description   |          |     |         |        |
| 0-7  | 255:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> Ignored | Project: | All | Format: | Ignore |
| Project:   | All   |   |          |     |         |        |
| Format:  | Ignore  |   |          |     |         |        |

## Inline Data Description for MFD\_AVC\_BSD\_Object

| Inline Data Description for MFD_AVC_BSD_Object  |  |   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
|---|--|---|--|--|-------------|------------------|---|------------------------|---|--|--------------|--|--|-----|----------|---------|
| Project:  | CHV, BSW   |   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| Source:   | VideoCS  |   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| Size (in bits):   | 96   |   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000   |   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| This structure includes all the required Slice Header parameters and error handling settings for AVC_BSD_OBJECT Command (DW3..DW5). |  |   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| DWord   | Bit  | Description   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| 0   | 31   | <p><b>Concealment Method</b></p> <p>This field specifies the method used for concealment when error is detected. If set, a copy from collocated macroblock location is performed from the concealment reference indicated by the ConCeal_Pic_Id field. If it is not set, a copy from the current picture is performed using Intra 16x16 Prediction method.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>Intra 16x16 Prediction</td> </tr> <tr> <td>1</td> <td></td> <td>Inter P Copy</td> </tr> </tbody> </table>   | Value  | Name   | Description | 0                |   | Intra 16x16 Prediction | 1 |  | Inter P Copy |  |  |     |          |         |
|   |  | Value   | Name   | Description  |             |                  |   |                        |   |  |              |  |  |     |          |         |
|   |  | 0   |  | Intra 16x16 Prediction   |             |                  |   |                        |   |  |              |  |  |     |          |         |
|   |  | 1   |  | Inter P Copy   |             |                  |   |                        |   |  |              |  |  |     |          |         |
|   | 30   | <p><b>Init Current MB Number</b></p> <p>When set, the current Slice_Start_MB_Num, Slice_MB_Start_Hor_Pos and Slice_MB_Start_Vert_Pos fields will be used to initialize the Current_MB_Number register. This effectively disables the concealment capability.</p>  |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
|   | 29   | <p><b>Intra PredMode (4x4/8x8 Luma) Error Control Bit</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table> <p>This field controls if AVC decoder will fix Intra Prediction Mode if the decoded value is incorrect according to MB position</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>AVC decoder will detect and fix IntraPredMode (4x4/8x8 Luma) Errors.</td> </tr> <tr> <td>1</td> <td></td> <td>AVC decoder will NOT detect IntraPredMode (4x4/8x8 Luma) Errors. The wrong IntraPredMode value will be retained.</td> </tr> </tbody> </table> | Project:   | CHV, BSW   | Value       | Name             | Description   | 0                      |   | AVC decoder will detect and fix IntraPredMode (4x4/8x8 Luma) Errors.       | 1            |  | AVC decoder will NOT detect IntraPredMode (4x4/8x8 Luma) Errors. The wrong IntraPredMode value will be retained. |     |          |         |
|   |  | Project:  | CHV, BSW   |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
|   |  | Value   | Name   | Description  |             |                  |   |                        |   |  |              |  |  |     |          |         |
|   |  | 0   |  | AVC decoder will detect and fix IntraPredMode (4x4/8x8 Luma) Errors. |             |                  |   |                        |   |  |              |  |  |     |          |         |
|   | 1  |   | AVC decoder will NOT detect IntraPredMode (4x4/8x8 Luma) Errors. The wrong IntraPredMode value will be retained. |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| 28:27   | <p><b>MB Error Concealment B Temporal Prediction mode</b></p> <p>These two bits control how the reference L0/L1 are overridden in B temporal slice.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td><b>[Default]</b></td> <td>Both Reference Indexes L0/L1 are forced to 0 during Concealment</td> </tr> <tr> <td>01b</td> <td></td> <td>Only Reference Index L1 is forced to 0; Reference Index L0 is forced to -1</td> </tr> <tr> <td>10b</td> <td></td> <td>Only Reference Index L0 is forced to 0; Reference Index L1 is forced to -1</td> </tr> <tr> <td>11b</td> <td>Reserved</td> <td>Invalid</td> </tr> </tbody> </table> | Value   | Name   | Description  | 00b         | <b>[Default]</b> | Both Reference Indexes L0/L1 are forced to 0 during Concealment | 01b                    |   | Only Reference Index L1 is forced to 0; Reference Index L0 is forced to -1 | 10b          |  | Only Reference Index L0 is forced to 0; Reference Index L1 is forced to -1                                       | 11b | Reserved | Invalid |
| Value   | Name   | Description   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| 00b   | <b>[Default]</b>   | Both Reference Indexes L0/L1 are forced to 0 during Concealment   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| 01b   |  | Only Reference Index L1 is forced to 0; Reference Index L0 is forced to -1  |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| 10b   |  | Only Reference Index L0 is forced to 0; Reference Index L1 is forced to -1  |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| 11b   | Reserved   | Invalid   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| 26  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>  | Project:  | CHV, BSW   |  |             |                  |   |                        |   |  |              |  |  |     |          |         |
| Project:  | CHV, BSW   |   |  |  |             |                  |   |                        |   |  |              |  |  |     |          |         |

## Inline Data Description for MFD\_AVC\_BSD\_Object

|           |   | Format:   | MBZ |           |       |             |    |                  |   |    |   |   |       |     |                        |
|-----------|---|---|-----|-----------|-------|-------------|----|------------------|---|----|---|---|-------|-----|------------------------|
| 25        | <p><b>MB Error Concealment B Temporal Motion Vectors Override Enable Flag</b><br/>                 During MB Error Concealment on B slice with Temporal Direct Prediction, motion vectors are forced to 0 to improve image quality. This bit can be set to preserve the original weight prediction.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Value</th> <th style="width: 15%;">Name</th> <th style="width: 75%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;"><b>[Default]</b></td> <td>Predicted Motion Vectors are used during MB Concealment</td> </tr> <tr> <td style="text-align: center;">1</td> <td></td> <td>Motion Vectors are Overridden to 0 during MB Concealment</td> </tr> </tbody> </table> |   |     | Value     | Name  | Description | 0  | <b>[Default]</b> | Predicted Motion Vectors are used during MB Concealment                     | 1  |   | Motion Vectors are Overridden to 0 during MB Concealment  |       |     |                        |
| Value     | Name  | Description   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 0         | <b>[Default]</b>  | Predicted Motion Vectors are used during MB Concealment   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 1         |   | Motion Vectors are Overridden to 0 during MB Concealment  |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 24        | <p><b>MB Error Concealment B Temporal Weight Prediction Disable Flag</b><br/>                 During MB Error Concealment on B slice with Temporal Direct Prediction, weight prediction is disabled to improve image quality. This bit can be set to preserve the original weight prediction.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Value</th> <th style="width: 15%;">Name</th> <th style="width: 75%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;"><b>[Default]</b></td> <td>Weight Prediction is Disabled during MB Concealment</td> </tr> <tr> <td style="text-align: center;">1</td> <td></td> <td>Weight Prediction will not be overridden during MB Concealment</td> </tr> </tbody> </table>     |   |     | Value     | Name  | Description | 0  | <b>[Default]</b> | Weight Prediction is Disabled during MB Concealment                         | 1  |   | Weight Prediction will not be overridden during MB Concealment  |       |     |                        |
| Value     | Name  | Description   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 0         | <b>[Default]</b>  | Weight Prediction is Disabled during MB Concealment   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 1         |   | Weight Prediction will not be overridden during MB Concealment  |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 23:22     | <p><b>Reserved</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 45%;">Format:</td> <td style="width: 55%;">MBZ</td> </tr> </table>   |   |     | Format:   | MBZ   |             |    |                  |   |    |   |   |       |     |                        |
| Format:   | MBZ   |   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 21:16     | <p><b>Concealment Picture ID</b><br/>                 This field identifies the picture in the reference list to be used for concealment. This field is only valid if <b>Concealment Method</b> is Inter P Copy.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Bit Filed</th> <th style="width: 10%;">Value</th> <th style="width: 80%;">Defenition</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">21</td> <td style="text-align: center;">0</td> <td>Frame Picture</td> </tr> <tr> <td style="text-align: center;">21</td> <td style="text-align: center;">1</td> <td>Field picture</td> </tr> <tr> <td style="text-align: center;">20:16</td> <td style="text-align: center;">All</td> <td>Frame Store Index[4:0]</td> </tr> </tbody> </table>                      |   |     | Bit Filed | Value | Defenition  | 21 | 0                | Frame Picture   | 21 | 1 | Field picture   | 20:16 | All | Frame Store Index[4:0] |
| Bit Filed | Value   | Defenition  |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 21        | 0   | Frame Picture   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 21        | 1   | Field picture   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 20:16     | All   | Frame Store Index[4:0]  |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 15        | <p><b>Reserved</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 45%;">Format:</td> <td style="width: 55%;">MBZ</td> </tr> </table>   |   |     | Format:   | MBZ   |             |    |                  |   |    |   |   |       |     |                        |
| Format:   | MBZ   |   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 14        | <p><b>BSD Premature Complete Error Handling</b><br/>                 BSD Premature Complete Error occurs in situation where the Slice decode is completed but there are still data in the bitstream.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Value</th> <th style="width: 15%;">Name</th> <th style="width: 75%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td></td> <td>Set the interrupt to the driver (provide MMIO registers for MB address R/W)</td> </tr> <tr> <td style="text-align: center;">0</td> <td></td> <td>Ignore the error and continue (masked the interrupt), assume the hardware automatically performs the error handling</td> </tr> </tbody> </table>   |   |     | Value     | Name  | Description | 1  |                  | Set the interrupt to the driver (provide MMIO registers for MB address R/W) | 0  |   | Ignore the error and continue (masked the interrupt), assume the hardware automatically performs the error handling |       |     |                        |
| Value     | Name  | Description   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 1         |   | Set the interrupt to the driver (provide MMIO registers for MB address R/W)   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 0         |   | Ignore the error and continue (masked the interrupt), assume the hardware automatically performs the error handling |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 13        | <p><b>Reserved</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 45%;">Format:</td> <td style="width: 55%;">MBZ</td> </tr> </table>   |   |     | Format:   | MBZ   |             |    |                  |   |    |   |   |       |     |                        |
| Format:   | MBZ   |   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |
| 12        | <p><b>MPR Error (MV out of range) Handling</b><br/>                 Software must follow the action for each Value as follow:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Value</th> <th style="width: 15%;">Name</th> <th style="width: 75%;">Description</th> </tr> </thead> <tbody> </tbody> </table>  |   |     | Value     | Name  | Description |    |                  |   |    |   |   |       |     |                        |
| Value     | Name  | Description   |     |           |       |             |    |                  |   |    |   |   |       |     |                        |

| Inline Data Description for MFD_AVC_BSD_Object |  |                  |  |
|--|--|------------------|--|
|  | 1  |                  | Set the interrupt to the driver (provide MMIO registers for MB address R/W)  |
|  | 0  |                  | Ignore the error and continue (masked the interrupt), assume the hardware automatically performs the error handling    |
| 11   | <b>Reserved</b>  |                  |  |
|  | Format:  |                  | MBZ  |
| 10   | <b>Entropy Error Handling</b>  |                  |  |
|  | Software must follow the action for each Value as follow:  |                  |  |
|  | <b>Value</b>   | <b>Name</b>      | <b>Description</b>   |
|  | 1  |                  | Set the interrupt to the driver (provide MMIO registers for MB address R/W).   |
|  | 0  |                  | Ignore the error and continue (masked the interrupt), assume the hardware automatically perform the error handling.    |
| 9  | <b>Reserved</b>  |                  |  |
|  | Format:  |                  | MBZ  |
| 8  | <b>MB Header Error Handling</b>  |                  |  |
|  | Software must follow the action for each Value as follow:  |                  |  |
|  | <b>Value</b>   | <b>Name</b>      | <b>Description</b>   |
|  | 1  |                  | Set the interrupt to the driver (provide MMIO registers for MB address R/W).   |
|  | 0  |                  | Ignore the error and continue (masked the interrupt), assume the hardware automatically perform the error concealment. |
| 7:6  | <b>MB Error Concealment B Spatial Prediction mode</b>  |                  |  |
|  | These two bits control how the reference L0/L1 are overridden in B spatial slice.  |                  |  |
|  | <b>Value</b>   | <b>Name</b>      | <b>Description</b>   |
|  | 00b  | <b>[Default]</b> | Both Reference Indexes L0/L1 are forced to 0 during Concealment  |
|  | 01b  |                  | Only Reference Index L1 is forced to 0; Reference Index L0 is forced to -1   |
|  | 10b  |                  | Only Reference Index L0 is forced to 0; Reference Index L1 is forced to -1   |
|  | 11b  | Reserved         | Invalid  |
| 5  | <b>Reserved</b>  |                  |  |
|  | Project:   |                  | CHV, BSW   |
|  | Format:  |                  | MBZ  |
| 4  | <b>MB Error Concealment B Spatial Motion Vectors Override Disable Flag</b>   |                  |  |
|  | During MB Error Concealment on B slice with Spatial Direct Prediction, motion vectors are forced to 0 to improve image quality. This bit can be set to use the predicted motion vectors instead. This bit does not affect normal decoded MB. |                  |  |
|  | <b>Value</b>   | <b>Name</b>      | <b>Description</b>   |
|  | 0  | <b>[Default]</b> | Motion Vectors are Overridden to 0 during MB Concealment   |
|  | 1  |                  | Predicted Motion Vectors are used during MB Concealment  |
| 3  | <b>MB Error Concealment B Spatial Weight Prediction Disable Flag</b>   |                  |  |
|  | During MB Error Concealment on B slice with Spatial Direct Prediction, weight prediction is  |                  |  |

| Inline Data Description for MFD_AVC_BSD_Object |  |   |                   |          |             |  |           |  |   |  |   |
|--|--|---|-------------------|----------|-------------|--|-----------|--|---|--|---|
|  |  | <p>disabled to improve image quality. This bit can be set to preserve the original weight prediction. This bit does not affect normal decoded MB.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>[Default]</td> <td>Weight Prediction is Disabled during MB Concealment.</td> </tr> <tr> <td>1</td> <td></td> <td>Weight Prediction will not be overridden during MB Concealment.</td> </tr> </tbody> </table>  | Value             | Name     | Description | 0  | [Default] | Weight Prediction is Disabled during MB Concealment.     | 1 |  | Weight Prediction will not be overridden during MB Concealment. |
| Value  | Name   | Description   |                   |          |             |  |           |  |   |  |   |
| 0  | [Default]  | Weight Prediction is Disabled during MB Concealment.  |                   |          |             |  |           |  |   |  |   |
| 1  |  | Weight Prediction will not be overridden during MB Concealment.   |                   |          |             |  |           |  |   |  |   |
| 2  | <b>Reserved</b>  | <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project:          | CHV, BSW | Format:     | MBZ  |           |  |   |  |   |
| Project:                                       | CHV, BSW   |   |                   |          |             |  |           |  |   |  |   |
| Format:  | MBZ  |   |                   |          |             |  |           |  |   |  |   |
| 1  | <b>MB Error Concealment P Slice Motion Vectors Override Disable Flag</b> | <p>During MB Error Concealment on P slice, motion vectors are forced to 0 to improve image quality. This bit can be set to use the predicted motion vectors instead. This bit does not affect normal decoded MB.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>[Default]</td> <td>Motion Vectors are Overridden to 0 during MB Concealment</td> </tr> <tr> <td>1</td> <td></td> <td>Predicted Motion Vectors are used during MB Concealment</td> </tr> </tbody> </table>   | Value             | Name     | Description | 0  | [Default] | Motion Vectors are Overridden to 0 during MB Concealment | 1 |  | Predicted Motion Vectors are used during MB Concealment         |
| Value  | Name   | Description   |                   |          |             |  |           |  |   |  |   |
| 0  | [Default]  | Motion Vectors are Overridden to 0 during MB Concealment  |                   |          |             |  |           |  |   |  |   |
| 1  |  | Predicted Motion Vectors are used during MB Concealment   |                   |          |             |  |           |  |   |  |   |
| 0  | <b>MB Error Concealment P Slice Weight Prediction Disable Flag</b>       | <p>During MB Error Concealment on P slice, weight prediction is disabled to improve image quality. This bit can be set to preserve the original weight prediction. This bit does not affect normal decoded MB.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>[Default]</td> <td>Weight Prediction is Disabled during MB Concealment.</td> </tr> <tr> <td>1</td> <td></td> <td>Weight Prediction will not be overridden during MB Concealment.</td> </tr> </tbody> </table> | Value             | Name     | Description | 0  | [Default] | Weight Prediction is Disabled during MB Concealment.     | 1 |  | Weight Prediction will not be overridden during MB Concealment. |
| Value  | Name   | Description   |                   |          |             |  |           |  |   |  |   |
| 0  | [Default]  | Weight Prediction is Disabled during MB Concealment.  |                   |          |             |  |           |  |   |  |   |
| 1  |  | Weight Prediction will not be overridden during MB Concealment.   |                   |          |             |  |           |  |   |  |   |
| 1  | 31:16  | <p><b>First MB Byte Offset of Slice Data or Slice Header</b></p> <table border="1"> <thead> <tr> <th colspan="2">Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td colspan="2">MFX supports only DXVA2 Long and Short Format.</td> <td>CHV, BSW</td> </tr> </tbody> </table>  | Programming Notes |          | Project     | MFX supports only DXVA2 Long and Short Format. |           | CHV, BSW   |   |  |   |
| Programming Notes                              |  | Project   |                   |          |             |  |           |  |   |  |   |
| MFX supports only DXVA2 Long and Short Format. |  | CHV, BSW  |                   |          |             |  |           |  |   |  |   |
|  | 15:8   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:           | MBZ      |             |  |           |  |   |  |   |
| Format:  | MBZ  |   |                   |          |             |  |           |  |   |  |   |
|  | 7  | <p><b>Fix Prev Mb Skipped</b></p> <p>Enables an alternative method for decoding mb_skipped, to cope with an encoder that codes a skipped MB as a direct MB with no coefficient.</p>   |                   |          |             |  |           |  |   |  |   |
|  | 6:5  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>Please note that the field MUST be set to '0' at this time.</p>  | Format:           | MBZ      |             |  |           |  |   |  |   |
| Format:  | MBZ  |   |                   |          |             |  |           |  |   |  |   |
|  | 4  | <p><b>Emulation Prevention Byte Present</b></p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td>H/W needs to perform Emulation Byte Removal</td> </tr> </tbody> </table>   | Value             | Name     | Description | 0  |           | H/W needs to perform Emulation Byte Removal              |   |  |   |
| Value  | Name   | Description   |                   |          |             |  |           |  |   |  |   |
| 0  |  | H/W needs to perform Emulation Byte Removal   |                   |          |             |  |           |  |   |  |   |

| Inline Data Description for MFD_AVC_BSD_Object |                        |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
|--|------------------------|---|---|------------|------------------------|-------------|------|-----------|---|------------|-------------------|---|----------------------------------|-------|-----|--------------------------|
|  | 1                      |   | H/W does not need to perform Emulation Byte Removal |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
|  | 3                      | <p><b>LastSlice Flag</b><br/>It is needed for both error concealment at the end of a picture (so, no more phantom). It is also needed to know to set the last MB in a picture correctly.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td>If the current Slice to be decoded is the very last slice of the current picture.</td> </tr> <tr> <td>0</td> <td></td> <td>If the current Slice to be decoded is any slice other than the very last slice of the current picture</td> </tr> </tbody> </table>   |   | Value      | Name                   | Description | 1    |           | If the current Slice to be decoded is the very last slice of the current picture. | 0          |                   | If the current Slice to be decoded is any slice other than the very last slice of the current picture |                                  |       |     |                          |
| Value  | Name                   | Description   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| 1  |                        | If the current Slice to be decoded is the very last slice of the current picture.   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| 0  |                        | If the current Slice to be decoded is any slice other than the very last slice of the current picture   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
|  | 2:0                    | <p><b>First Macroblock (MB)Bit Offset</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//AVC Long Format Only</td> </tr> <tr> <td>Format:</td> <td>U3</td> </tr> </table> <p>This field provides the bit offset of the first macroblock of the Slice in the first byte of the input compressed bitstream.</p>  |   | Exists If: | //AVC Long Format Only | Format:     | U3   |           |   |            |                   |   |                                  |       |     |                          |
| Exists If:                                     | //AVC Long Format Only |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| Format:  | U3                     |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| 2<br><b>Project:</b><br>CHV, BSW               | 31                     | <p><b>I Slice Concealment Mode</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table> <p>This field controls how AVC decoder handle MB concealment in I Slice</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Intra Concealment</td> </tr> <tr> <td>1</td> <td>Inter Concealment</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>If this field is set to "1" (Inter Concealment), driver must provide a valid reference picture (programmed using "Concealment Reference Picture" field) for concealment reference picture. In this mode, weight prediction is disabled and motion vectors are forced to 0 as well.</p> |   | Project:   | CHV, BSW               | Value       | Name | 0         | Intra Concealment   | 1          | Inter Concealment |   |                                  |       |     |                          |
| Project:                                       | CHV, BSW               |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| Value  | Name                   |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| 0  | Intra Concealment      |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| 1  | Inter Concealment      |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
|  | 30                     | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  |   | Project:   | CHV, BSW               | Format:     | MBZ  |           |   |            |                   |   |                                  |       |     |                          |
| Project:                                       | CHV, BSW               |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| Format:  | MBZ                    |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
|  | 29:24                  | <p><b>Concealment Reference Picture + Field Bit</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U6</td> </tr> </table> <p>This field provides the concealment reference picture for hardware to conceal in case driver wants to specify one concealment picture. This field matches with the DPB order sent to hardware. This field applies to all I/P/B slices</p> <table border="1"> <thead> <tr> <th>Bit Filed</th> <th>Value</th> <th>Defenition</th> </tr> </thead> <tbody> <tr> <td>29</td> <td>MBZ</td> <td>is reserved for future expansion</td> </tr> <tr> <td>28:25</td> <td>All</td> <td>Reference Picture Number</td> </tr> </tbody> </table>   |   | Project:   | CHV, BSW               | Format:     | U6   | Bit Filed | Value   | Defenition | 29                | MBZ   | is reserved for future expansion | 28:25 | All | Reference Picture Number |
| Project:                                       | CHV, BSW               |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| Format:  | U6                     |   |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| Bit Filed                                      | Value                  | Defenition  |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| 29   | MBZ                    | is reserved for future expansion  |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |
| 28:25  | All                    | Reference Picture Number  |   |            |                        |             |      |           |   |            |                   |   |                                  |       |     |                          |

## Inline Data Description for MFD\_AVC\_BSD\_Object

|       |  |                   |   |  |
|-------|--|-------------------|---|--|
|       |  | 24                | All   | Field Bit(if the current picture is a field picture [Frame picture must be 0]) |
| 23    | <b>P Slice Concealment Mode</b>  |                   |   |  |
|       | Project:   |                   | CHV, BSW  |  |
|       | This field controls how AVC decoder handle MB concealment in P Slice   |                   |   |  |
|       | <b>Value</b>   | <b>Name</b>       |   |  |
|       | 1  | Intra Concealment |   |  |
|       | 0  | Inter Concealment |   |  |
| 22:19 | <b>Reserved</b>  |                   |   |  |
|       | Project:   |                   | CHV, BSW  |  |
|       | Format:  |                   | MBZ   |  |
| 18:16 | <b>P Slice Inter Concealment Mode</b>  |                   |   |  |
|       | Project:   |                   | CHV, BSW  |  |
|       | This field controls how AVC decoder select reference picture for Concealment in P Slice.   |                   |   |  |
|       | <b>Value</b>   | <b>Name</b>       | <b>Description</b>  |  |
|       | 000b   |                   | Top of Reference List L0 (Use top entry of Reference List L0)   |  |
|       | 001b   |                   | Driver Specified Concealment Reference  |  |
|       | 010b   |                   | Predicted Reference (Use reference picture predicted using P-Skip Algorithm)                                      |  |
|       | 011b   |                   | Temporal Closest (Using POC to select the closest forward picture) [For L0: Closest POC smaller than current POC] |  |
|       | 100b   |                   | First Long Term Picture in Reference List L0 (If no long term picture available, use Temporal Closest Picture)    |  |
|       | 101b-111b  | Reserved          |   |  |
| 15    | <b>B Slice Concealment Mode</b>  |                   |   |  |
|       | Project:   |                   | CHV, BSW  |  |
|       | This field controls how AVC decoder handle MB concealment in B Slice   |                   |   |  |
|       | <b>Value</b>   | <b>Name</b>       |   |  |
|       | 1  | Intra Concealment |   |  |
|       | 0  | Inter Concealment |   |  |
| 14    | <b>Reserved</b>  |                   |   |  |
|       | Project:   |                   | CHV, BSW  |  |
|       | Format:  |                   | MBZ   |  |
| 13:12 | <b>B Slice Inter Direct Type Concealment Mode</b>  |                   |   |  |
|       | Project:   |                   | CHV, BSW  |  |
|       | AVC decoder can use Spatial or Temporal Direct for B Skip/Direct. This field determine can override the mode on how AVC decoder handles MB concealment in B slice. |                   |   |  |

| Inline Data Description for MFD_AVC_BSD_Object |   |   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|--|---|---|------|-------------|------|--|--|------|--|--|------|--|---|------|--|---|-----------|----------|--|--|
|  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td></td> <td>Use Default Direct Type (slice programmed direct type)</td> </tr> <tr> <td>01b</td> <td></td> <td>Forced to Spatial Direct Only</td> </tr> <tr> <td>10b</td> <td></td> <td>Forced to Temporal Direct Only</td> </tr> <tr> <td>11b</td> <td></td> <td>Spatial Direct without Temporal Component (MovingBlock information)</td> </tr> </tbody> </table>  | Value   | Name | Description | 00b  |  | Use Default Direct Type (slice programmed direct type)               | 01b  |  | Forced to Spatial Direct Only          | 10b  |  | Forced to Temporal Direct Only  | 11b  |  | Spatial Direct without Temporal Component (MovingBlock information)   |           |          |  |  |
| Value  | Name  | Description   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 00b  |   | Use Default Direct Type (slice programmed direct type)  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 01b  |   | Forced to Spatial Direct Only   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 10b  |   | Forced to Temporal Direct Only  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 11b  |   | Spatial Direct without Temporal Component (MovingBlock information)   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 11   | <b>Reserved</b>   |   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | Project:  | CHV, BSW  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | Format:   | MBZ   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 10:8   | <b>B Slice Spatial Inter Concealment Mode</b>   |   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | Project:  | CHV, BSW  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | This field controls how AVC decoder select reference picture for Spatial Inter Concealment in B Slice.  |   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>000b</td> <td></td> <td>Top of Reference List L0/L1 (Use top entry of Reference List L0/L1).</td> </tr> <tr> <td>001b</td> <td></td> <td>Driver Specified Concealment Reference</td> </tr> <tr> <td>011b</td> <td></td> <td>Temporal Closest (Using POC to select the closest forward picture) [For L0: Closest POC smaller than current POC] [For L1: Closest POC larger than current POC]</td> </tr> <tr> <td>100b</td> <td></td> <td>" First Long Term Picture in Reference List L0/L1 (If no long term picture available, use Temporal Closest Picture)</td> </tr> <tr> <td>101b-111b</td> <td>Reserved</td> <td></td> </tr> </tbody> </table>                      | Value   | Name | Description | 000b |  | Top of Reference List L0/L1 (Use top entry of Reference List L0/L1). | 001b |  | Driver Specified Concealment Reference | 011b |  | Temporal Closest (Using POC to select the closest forward picture) [For L0: Closest POC smaller than current POC] [For L1: Closest POC larger than current POC] | 100b |  | " First Long Term Picture in Reference List L0/L1 (If no long term picture available, use Temporal Closest Picture)   | 101b-111b | Reserved |  |  |
| Value  | Name  | Description   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 000b   |   | Top of Reference List L0/L1 (Use top entry of Reference List L0/L1).  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 001b   |   | Driver Specified Concealment Reference  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 011b   |   | Temporal Closest (Using POC to select the closest forward picture) [For L0: Closest POC smaller than current POC] [For L1: Closest POC larger than current POC]   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 100b   |   | " First Long Term Picture in Reference List L0/L1 (If no long term picture available, use Temporal Closest Picture)   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 101b-111b                                      | Reserved  |   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 7  | <b>Reserved</b>   |   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | Project:  | CHV, BSW  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | Format:   | MBZ   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 6:4  | <b>B Slice Temporal Inter Concealment Mode</b>  |   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | Project:  | CHV, BSW  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | This field controls how AVC decoder select reference picture for Temporal Inter Concealment in B Slice  |   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
|  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>000b</td> <td></td> <td>Top of Reference List L0/L1 (Use top entry of Reference List L0/L1)</td> </tr> <tr> <td>001b</td> <td></td> <td>Driver Specified Concealment Reference</td> </tr> <tr> <td>010b</td> <td></td> <td>Predicted Reference (Use reference picture predicted using B-Skip Algorithm)</td> </tr> <tr> <td>011b</td> <td></td> <td>" Temporal Closest (Using POC to select the closest forward picture) [For L0: Closest POC smaller than current POC] [For L1: Closest POC larger than current POC]</td> </tr> <tr> <td>100b</td> <td></td> <td>First Long Term Picture in Reference List L0/L1 (If no long term picture</td> </tr> </tbody> </table> | Value   | Name | Description | 000b |  | Top of Reference List L0/L1 (Use top entry of Reference List L0/L1)  | 001b |  | Driver Specified Concealment Reference | 010b |  | Predicted Reference (Use reference picture predicted using B-Skip Algorithm)  | 011b |  | " Temporal Closest (Using POC to select the closest forward picture) [For L0: Closest POC smaller than current POC] [For L1: Closest POC larger than current POC] | 100b      |          | First Long Term Picture in Reference List L0/L1 (If no long term picture |  |
| Value  | Name  | Description   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 000b   |   | Top of Reference List L0/L1 (Use top entry of Reference List L0/L1)   |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 001b   |   | Driver Specified Concealment Reference  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 010b   |   | Predicted Reference (Use reference picture predicted using B-Skip Algorithm)  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 011b   |   | " Temporal Closest (Using POC to select the closest forward picture) [For L0: Closest POC smaller than current POC] [For L1: Closest POC larger than current POC] |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |
| 100b   |   | First Long Term Picture in Reference List L0/L1 (If no long term picture  |      |             |      |  |  |      |  |  |      |  |   |      |  |   |           |          |  |  |



| Inline Data Description for MFD_AVC_BSD_Object |  |             |   |
|--|--|-------------|---|
|  |  |             | available, use Temporal Closest Picture)  |
|  | 101b-111b  | Reserved    |   |
| 3:2  | <b>Reserved</b>  |             |   |
|  | Project:   | CHV, BSW    |   |
|  | Format:  | MBZ         |   |
| 1  | <b>Intra 8x8/4x4 Prediction Error Concealment Control Bit</b>  |             |   |
|  | Project:   | CHV, BSW    |   |
|  | This field controls if AVC goes into MB concealment mode (next MB) when an error is detected on Intra8x8/4x4 Prediction Mode (these 2 modes have fixed coding so it may not affect the bitstream). |             |   |
|  | <b>Value</b>   | <b>Name</b> | <b>Description</b>  |
|  | 0  |             | AVC decoder will NOT go into MB concealment when Intra8x8/4x4 Prediction mode is incorrect. |
|  | 1  |             | AVC decoder will go into MB concealment when Intra8x8/4x4 Prediction mode is incorrect.     |
| 0  | <b>Intra Prediction Error Control Bit (applied to Intra16x16/Intra8x8/Intra4x4 Luma and Chroma)</b>  |             |   |
|  | Project:   | CHV, BSW    |   |
|  | This field controls if AVC decoder will fix Intra Prediction Mode if the decoded value is incorrect according to MB position.  |             |   |
|  | <b>Value</b>   | <b>Name</b> | <b>Description</b>  |
|  | 0  |             | AVC decoder will detect and fix Intra Prediction Mode Errors.                               |
|  | 1  |             | AVC decoder will retain the Intra Prediction value decoded from bitstream.                  |

## Inline Data Description - VP8 PAK OBJECT

| Inline Data Description - VP8 PAK OBJECT                            |   |  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
|---|---|--|--|------|--------------------------|------|----------|--|------|--|---------------------------------------|--------|----------|--|
| Project:  | CHV, BSW  |  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
| Source:   | VideoCS   |  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
| Size (in bits):   | 128   |  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000  |  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
| This structure corresponds to Dw3..6 of MFX_VP8_PAK_OBJECT Command. |   |  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
| DWord   | Bit   | Description  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
| 0   | 31:23   | <b>Reserved</b><br>Format: MBZ   |  |      |                          |      |          |  |      |  |                                       |        |          |  |
|   | 22:20   | <b>MV Format(Motion Vector Size)</b><br>Exists If: //IntraMbFlag = 0<br>This field specifies the size and format of the output motion vectors. <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>000b</td> <td>Intra MB</td> <td>No Motion vectors</td> </tr> <tr> <td>100b</td> <td>Inter Predict MB (Unpacked Motion Vector Mode)</td> <td>Sixteen Motion Vectors Per MacroBlock</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> This field MBZ, when the <b>IntraMbFlag = 1</b> . | Value  | Name | Description              | 000b | Intra MB | No Motion vectors  | 100b | Inter Predict MB (Unpacked Motion Vector Mode) | Sixteen Motion Vectors Per MacroBlock | Others | Reserved |  |
|   | Value   | Name   | Description  |      |                          |      |          |  |      |  |                                       |        |          |  |
|   | 000b  | Intra MB   | No Motion vectors  |      |                          |      |          |  |      |  |                                       |        |          |  |
|   | 100b  | Inter Predict MB (Unpacked Motion Vector Mode)   | Sixteen Motion Vectors Per MacroBlock  |      |                          |      |          |  |      |  |                                       |        |          |  |
|   | Others  | Reserved   |  |      |                          |      |          |  |      |  |                                       |        |          |  |
|   | 19:18   | <b>SegmentID</b><br>Format: U2<br>Segment number 0-3   |  |      |                          |      |          |  |      |  |                                       |        |          |  |
|   | 17  | <b>Enable Coeff Clamp</b><br><table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td>Magnitude of coefficients of the current MB is clamped based on the clamping matrix after quantization</td> </tr> <tr> <td>0</td> <td></td> <td>No Clamping</td> </tr> </tbody> </table>   | Value  | Name | Description              | 1    |          | Magnitude of coefficients of the current MB is clamped based on the clamping matrix after quantization | 0    |  | No Clamping                           |        |          |  |
|   | Value   | Name   | Description  |      |                          |      |          |  |      |  |                                       |        |          |  |
|   | 1   |  | Magnitude of coefficients of the current MB is clamped based on the clamping matrix after quantization |      |                          |      |          |  |      |  |                                       |        |          |  |
| 0   |   | No Clamping  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
| 16:14   | <b>Reserved</b><br>Format: MBZ  |  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
| 13  | <b>Intra MB Flag</b><br>This field specifies whether the current macroblock is an Intra (I) Macroblock. For Key pictures (IsKeyFrameFlag DW2, bit[5] of MFX_VP8_PIC_STATE), this field must be set to 1. <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>INTER (Inter MacroBlock)</td> </tr> </tbody> </table> | Value  | Name   | 0h   | INTER (Inter MacroBlock) |      |          |  |      |  |                                       |        |          |  |
| Value   | Name  |  |  |      |                          |      |          |  |      |  |                                       |        |          |  |
| 0h  | INTER (Inter MacroBlock)  |  |  |      |                          |      |          |  |      |  |                                       |        |          |  |

## Inline Data Description - VP8 PAK OBJECT

|       |  |  |   |
|-------|--|--|---|
|       |  | 1h   | INTRA (Intra MacroBlock)  |
|       |  | <b>Programming Notes</b>   |   |
|       |  | For I-picture MB (Intra MB Flag = 1), this field must be set to 1.   |   |
| 12:11 | <b>RefPicSelect</b>                    | This field specifies which reference pic (among Last Frame, Golden Frame and Alt Frame) is selected for the current macroblock when Intra MB Flag = 0 .  |   |
|       |  | <b>Value</b>   | <b>Name</b>   |
|       |  | 00b  | Last Frame  |
|       |  | 01b  | Golden Frame  |
|       |  | 10b  | Alt Frame   |
| 10:8  | <b>MB Type 3-Bits - Inter/Intra MB</b> | MB Type 3 Bits [10:8] specifies InterMB MV mode configurations: 16x16 or 2 16x8 or 4 8x8 or 16 4x4 when Intra MB Flag = 0 and bit [8] = IntraMB mode configurations: 4x4 or 16x16 when Intra MB Flag = 1 |   |
|       |  | <b>Value</b>   | <b>Name</b>   |
|       |  | <b>Description</b>   |   |
|       |  | 000b   | 16x16<br><b>Inter MB</b> Only DW 6 bits 3:0 are used to indicate MVMode, MVMode can't be split  |
|       |  | 001b   | 2 16x8 (mv_Top Bottom)<br><b>Inter MB [10:8]</b> Split MV is inferred. DW5 bits[3:0] are used for MVMode for first 16x8 partition, DW6 bits[3:0] are used for MVMode for second 16x8 partition.   |
|       |  | 010b   | 2 8 x16 (mv_left_right)<br><b>Inter MB [10:8]</b> Split MV is inferred. DW5 bits[3:0] are used for MVMode for first 8x16 partition, DW5 bits[11:8] are used for MVMode for second 8x16 partition.   |
|       |  | 011b   | 4 8x8 (mv_quarters)<br><b>Inter MB [10:8]</b> Split MV is inferred. DW5 bits[3:0] are used for MVMode for first 8x8 partition. DW5 bits[11:8] are used for MvMode for second 8x8 partition. DW6 bits[3:0] are used for MVMode for third 8x8 partition. DW6 bits[11:8] are used for MVMode for fourth 8x8 partition. |
|       |  | 100b   | 16 4x4 (mv_16)<br><b>Inter MB [10:8]</b> Split MV is inferred. There are 16 partitions. Each Sub-block uses 4 bits in DW6 and DW7.  |
|       |  | 0b   | 16x16<br><b>Intra MB [8]</b> Only DW5, bits[3:0] are used for Y mode. For B_PRED, "16 4x4" should be used which implies B_PRED mode.  |
|       |  | 1b   | 16 4x4<br><b>Intra MB [8]</b> All bits in DW5 and DW6 are used to represent B_PRED modes (Bmodes) in each sub-blocks.   |
| 7:6   | <b>Reserved</b>                        |  |   |
|       |  | Format:  | MBZ   |
| 5:4   | <b>MB UV Mode</b>                      |  |   |
|       |  | <b>Value</b>   | <b>Name</b>   |
|       |  | 0  | DC_PRED   |

| Inline Data Description - VP8 PAK OBJECT  |         |  |                          |        |   |        |   |         |
|---|---------|--|--------------------------|--------|---|--------|---|---------|
|   |         | <table border="1"> <tr> <td>1</td> <td>V_PRED</td> </tr> <tr> <td>2</td> <td>H_PRED</td> </tr> <tr> <td>3</td> <td>TM_PRED</td> </tr> </table>   | 1                        | V_PRED | 2   | H_PRED | 3 | TM_PRED |
| 1   | V_PRED  |  |                          |        |   |        |   |         |
| 2   | H_PRED  |  |                          |        |   |        |   |         |
| 3   | TM_PRED |  |                          |        |   |        |   |         |
|   | 3       | <b>Reserved</b><br>Format: _____ MBZ   |                          |        |   |        |   |         |
|   | 2       | <b>Skip MB Flag</b><br>This field is equivalent to mb_skip_flag in VP8 spec.<br><table border="1"> <tr> <td colspan="2" style="text-align: center;"><b>Programming Notes</b></td> </tr> <tr> <td colspan="2">By setting this field to 1, it forces an Inter MacroBlock to be encoded as a skipped MacroBlock</td> </tr> </table> | <b>Programming Notes</b> |        | By setting this field to 1, it forces an Inter MacroBlock to be encoded as a skipped MacroBlock |        |   |         |
| <b>Programming Notes</b>  |         |  |                          |        |   |        |   |         |
| By setting this field to 1, it forces an Inter MacroBlock to be encoded as a skipped MacroBlock |         |  |                          |        |   |        |   |         |
|   | 1:0     | <b>Reserved</b><br>Format: _____ MBZ   |                          |        |   |        |   |         |
| 1   | 31:24   | <b>Reserved</b><br>Format: _____ MBZ   |                          |        |   |        |   |         |
|   | 23:16   | <b>MbYCnt (Vertical Origin)</b><br>Format: _____ U8 Unit of MacroBlock<br>This field specifies the vertical origin of current macroblock in the destination picture in units of macroblocks.   |                          |        |   |        |   |         |
|   | 15:8    | <b>Reserved</b><br>Format: _____ MBZ   |                          |        |   |        |   |         |
|   | 7:0     | <b>MbXCnt (Horizontal Origin)</b><br>Format: _____ U8 Unit of MacroBlock<br>This field specifies the horizontal origin of current macroblock in the destination picture in units of macroblocks.   |                          |        |   |        |   |         |
| 2   | 31:28   | <b>B Mode for SubBlock7 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.   |                          |        |   |        |   |         |
|   | 27:24   | <b>B Mode for SubBlock6 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.   |                          |        |   |        |   |         |
|   | 23:20   | <b>B Mode for SubBlock5 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.   |                          |        |   |        |   |         |
|   | 19:16   | <b>B Mode for SubBlock4 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.   |                          |        |   |        |   |         |
|   | 15:12   | <b>B Mode for SubBlock3 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.   |                          |        |   |        |   |         |
|   | 11:8    | <b>B Mode for SubBlock2 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.   |                          |        |   |        |   |         |
|   | 7:4     | <b>B Mode for SubBlock1 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.   |                          |        |   |        |   |         |

| <b>Inline Data Description - VP8 PAK OBJECT</b> |       |   |
|---|-------|---|
|   | 3:0   | <b>B Mode for SubBlock0 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.  |
| 3   | 31:28 | <b>B Mode for SubBlock15 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table. |
|   | 27:24 | <b>B Mode for SubBlock14(Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.  |
|   | 23:20 | <b>B Mode for SubBlock13(Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.  |
|   | 19:16 | <b>B Mode for SubBlock12(Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.  |
|   | 15:12 | <b>B Mode for SubBlock11(Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.  |
|   | 11:8  | <b>B Mode for SubBlock10 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table. |
|   | 7:4   | <b>B Mode for SubBlock9 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.  |
|   | 3:0   | <b>B Mode for SubBlock8 (Y mode for the macroblock in non-B mode)</b><br>For Y-Mode and B-Mode Assignments refer to the assignment lists below this table.  |

## INTERFACE\_DESCRIPTOR\_DATA

| INTERFACE_DESCRIPTOR_DATA |   |   |                                    |                                   |             |     |        |   |    |             |
|---------------------------|---|---|------------------------------------|-----------------------------------|-------------|-----|--------|---|----|-------------|
| Project:                  | CHV, BSW  |   |                                    |                                   |             |     |        |   |    |             |
| Source:                   | RenderCS  |   |                                    |                                   |             |     |        |   |    |             |
| Size (in bits):           | 256   |   |                                    |                                   |             |     |        |   |    |             |
| Default Value:            | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000  |   |                                    |                                   |             |     |        |   |    |             |
| DWord                     | Bit   | Description   |                                    |                                   |             |     |        |   |    |             |
| 0                         | 31:6  | <p><b>Kernel Start Pointer</b></p> <table border="1"> <tr> <td>Format:</td> <td>InstructionBaseOffset[31:6]Kernel</td> </tr> </table> <p>Specifies the 64-byte aligned address offset of the first instruction in the kernel. This pointer is relative to the <b>Instruction Base Address</b>.</p>  | Format:                            | InstructionBaseOffset[31:6]Kernel |             |     |        |   |    |             |
|                           | Format:   | InstructionBaseOffset[31:6]Kernel   |                                    |                                   |             |     |        |   |    |             |
| 5:0                       | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:   | MBZ                                |                                   |             |     |        |   |    |             |
| Format:                   | MBZ   |   |                                    |                                   |             |     |        |   |    |             |
| 1                         | 31:16   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:                            | MBZ                               |             |     |        |   |    |             |
|                           | Format:   | MBZ   |                                    |                                   |             |     |        |   |    |             |
| 15:0                      | <p><b>Kernel Start Pointer High</b></p> <table border="1"> <tr> <td>Format:</td> <td>InstructionBaseOffset[47:32]Kernel</td> </tr> </table> <p>This field specifies the high 16 bits of starting address of the Kernel Pointer.</p>   | Format:   | InstructionBaseOffset[47:32]Kernel |                                   |             |     |        |   |    |             |
| Format:                   | InstructionBaseOffset[47:32]Kernel  |   |                                    |                                   |             |     |        |   |    |             |
| 2                         | 31:20   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project:                           | CHV, BSW                          | Format:     | MBZ |        |   |    |             |
|                           | Project:  | CHV, BSW  |                                    |                                   |             |     |        |   |    |             |
|                           | Format:   | MBZ   |                                    |                                   |             |     |        |   |    |             |
|                           | 19  | <p><b>Denorm Mode</b></p> <p>This field specifies how Float denormalized numbers are handles in the dispatched thread.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>Ftz</td> <td>Float denorms will be flushed to zero when appearing as inputs, denorms will never come out of instructions. Double precision float and half precision float numbers are not flushed to zero.</td> </tr> <tr> <td>1h</td> <td>SetByKernel</td> <td>Denorms will be handled in by kernel.</td> </tr> </tbody> </table> | Value                              | Name                              | Description | 0h  | Ftz    | Float denorms will be flushed to zero when appearing as inputs, denorms will never come out of instructions. Double precision float and half precision float numbers are not flushed to zero. | 1h | SetByKernel |
| Value                     | Name  | Description   |                                    |                                   |             |     |        |   |    |             |
| 0h                        | Ftz   | Float denorms will be flushed to zero when appearing as inputs, denorms will never come out of instructions. Double precision float and half precision float numbers are not flushed to zero.   |                                    |                                   |             |     |        |   |    |             |
| 1h                        | SetByKernel   | Denorms will be handled in by kernel.   |                                    |                                   |             |     |        |   |    |             |
| 18                        | <p><b>Single Program Flow</b></p> <p>Specifies whether the kernel program has a single program flow (SIMDn<sub>xm</sub> with m = 1) or multiple program flows (SIMDn<sub>xm</sub> with m &gt; 1).</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>Multiple</td> </tr> <tr> <td>1h</td> <td>Single</td> </tr> </tbody> </table> | Value   | Name                               | 0h                                | Multiple    | 1h  | Single |   |    |             |
| Value                     | Name  |   |                                    |                                   |             |     |        |   |    |             |
| 0h                        | Multiple  |   |                                    |                                   |             |     |        |   |    |             |
| 1h                        | Single  |   |                                    |                                   |             |     |        |   |    |             |
| 17                        | <p><b>Thread Priority</b></p>   |   |                                    |                                   |             |     |        |   |    |             |

| <b>INTERFACE_DESCRIPTOR_DATA</b>  |   |                                       |                                       |    |                 |    |               |
|---|---|---------------------------------------|---------------------------------------|----|-----------------|----|---------------|
|   | <p>Specifies the priority of the thread for dispatch.</p> <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>Normal Priority</td> </tr> <tr> <td>1h</td> <td>High Priority</td> </tr> </tbody> </table>                                   | Value                                 | Name                                  | 0h | Normal Priority | 1h | High Priority |
| Value   | Name  |                                       |                                       |    |                 |    |               |
| 0h  | Normal Priority   |                                       |                                       |    |                 |    |               |
| 1h  | High Priority   |                                       |                                       |    |                 |    |               |
| 16  | <p><b>Floating Point Mode</b><br/>Specifies the floating point mode used by the dispatched thread.</p> <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>IEEE-754</td> </tr> <tr> <td>1h</td> <td>Alternate</td> </tr> </tbody> </table> | Value                                 | Name                                  | 0h | IEEE-754        | 1h | Alternate     |
| Value   | Name  |                                       |                                       |    |                 |    |               |
| 0h  | IEEE-754  |                                       |                                       |    |                 |    |               |
| 1h  | Alternate   |                                       |                                       |    |                 |    |               |
| 15:14   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:                               | MBZ                                   |    |                 |    |               |
| Format:   | MBZ   |                                       |                                       |    |                 |    |               |
| 13  | <p><b>Illegal Opcode Exception Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>This bit gets loaded into EU CR0.1[12] (note the bit # difference). See <i>Exceptions and ISA Execution Environment</i>.</p>   | Format:                               | Enable                                |    |                 |    |               |
| Format:   | Enable  |                                       |                                       |    |                 |    |               |
| 12  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:                               | MBZ                                   |    |                 |    |               |
| Format:   | MBZ   |                                       |                                       |    |                 |    |               |
| 11  | <p><b>Mask Stack Exception Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>This bit gets loaded into EU CR0.1[11]. See <i>Exceptions and ISA Execution Environment</i>.</p>   | Format:                               | Enable                                |    |                 |    |               |
| Format:   | Enable  |                                       |                                       |    |                 |    |               |
| 10:8  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:                               | MBZ                                   |    |                 |    |               |
| Format:   | MBZ   |                                       |                                       |    |                 |    |               |
| 7   | <p><b>Software Exception Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>This bit gets loaded into EU CR0.1[13] (note the bit # difference). See <i>Exceptions and ISA Execution Environment</i>.</p>   | Format:                               | Enable                                |    |                 |    |               |
| Format:   | Enable  |                                       |                                       |    |                 |    |               |
| 6:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:                               | MBZ                                   |    |                 |    |               |
| Format:   | MBZ   |                                       |                                       |    |                 |    |               |
| 3   | <p>31:5 <b>Sampler State Pointer</b></p> <table border="1"> <tr> <td>Format:</td> <td>DynamicStateOffset[31:5]SAMPLER_STATE</td> </tr> </table> <p>Specifies the 32-byte aligned address offset of the sampler state table. This pointer is relative to the <b>Dynamic State Base Address</b>. <i>This field is ignored for child threads.</i></p>      | Format:                               | DynamicStateOffset[31:5]SAMPLER_STATE |    |                 |    |               |
|   | Format:   | DynamicStateOffset[31:5]SAMPLER_STATE |                                       |    |                 |    |               |
| <p>4:2 <b>Sampler Count</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3</td> </tr> </table> | Format:   | U3                                    |                                       |    |                 |    |               |
| Format:   | U3  |                                       |                                       |    |                 |    |               |

| <b>INTERFACE_DESCRIPTOR_DATA</b>  |   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
|---|---|----------|---|---------|----|-------|------------------|--------|-------------------------------|-------------------|---|----|--------------------------------|----|---------------------------------|
|   | <p>Specifies how many samplers (in multiples of 4) the kernel uses. Used only for prefetching the associated sampler state entries. <i>This field is ignored for child threads. If this field is not zero, sampler state is prefetched for the first instance of a root thread upon the startup of the media pipeline.</i></p> <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td>[0,4]</td> <td></td> </tr> <tr> <td>0h</td> <td>No samplers used</td> </tr> <tr> <td>1h</td> <td>Between 1 and 4 samplers used</td> </tr> <tr> <td>2h</td> <td>Between 5 and 8 samplers used</td> </tr> <tr> <td>3h</td> <td>Between 9 and 12 samplers used</td> </tr> <tr> <td>4h</td> <td>Between 13 and 16 samplers used</td> </tr> </tbody> </table>  | Value    | Name  | [0,4]   |    | 0h    | No samplers used | 1h     | Between 1 and 4 samplers used | 2h                | Between 5 and 8 samplers used   | 3h | Between 9 and 12 samplers used | 4h | Between 13 and 16 samplers used |
| Value   | Name  |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| [0,4]   |   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| 0h  | No samplers used  |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| 1h  | Between 1 and 4 samplers used   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| 2h  | Between 5 and 8 samplers used   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| 3h  | Between 9 and 12 samplers used  |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| 4h  | Between 13 and 16 samplers used   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
|   | <p>1:0 <b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:  | MBZ   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| Format:   | MBZ   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| 4   | <p>31:16 <b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:  | MBZ   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| Format:   | MBZ   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
|   | <p>15:5 <b>Binding Table Pointer</b></p> <table border="1"> <tr> <td>Format:</td> <td>SurfaceStateOffset[15:5]BINDING_TABLE_STATE*256</td> </tr> </table> <p>Specifies the 32-byte aligned address of the binding table. This pointer is relative to the <b>Surface State Base Address</b>. <i>This field is ignored for child threads.</i></p>   | Format:  | SurfaceStateOffset[15:5]BINDING_TABLE_STATE*256 |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| Format:   | SurfaceStateOffset[15:5]BINDING_TABLE_STATE*256   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
|   | <p>4:0 <b>Binding Table Entry Count</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U5</td> </tr> </table> <p>Specifies how many binding table entries the kernel uses. Used only for prefetching of the binding table entries and associated surface state. <i>This field is ignored for child threads. If this field is not zero, binding table and surface state are prefetched for the first instance of a root thread upon the startup of the media pipeline.</i></p> <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td>[0,31]</td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th style="text-align: center;">Programming Notes</th> </tr> </thead> <tbody> <tr> <td>The maximum number of prefetched binding table entries is limited to 31. For kernels using a large number of binding table entries, it may be wise to set this field to zero to avoid prefetching too many entries and thrashing the state cache.</td> </tr> </tbody> </table> | Project: | CHV, BSW  | Format: | U5 | Value | Name             | [0,31] |                               | Programming Notes | The maximum number of prefetched binding table entries is limited to 31. For kernels using a large number of binding table entries, it may be wise to set this field to zero to avoid prefetching too many entries and thrashing the state cache. |    |                                |    |                                 |
| Project:  | CHV, BSW  |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| Format:   | U5  |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| Value   | Name  |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| [0,31]  |   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| Programming Notes   |   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| The maximum number of prefetched binding table entries is limited to 31. For kernels using a large number of binding table entries, it may be wise to set this field to zero to avoid prefetching too many entries and thrashing the state cache. |   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| 5   | <p>31:16 <b>Constant/Indirect URB Entry Read Length</b></p> <table border="1"> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>Specifies the amount of URB data read and passed in the thread payload for the Constant or Indirect URB entry, in 8-DW register increments. A value 0 means that no Constant or Indirect</p>  | Format:  | U16   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |
| Format:   | U16   |          |   |         |    |       |                  |        |                               |                   |   |    |                                |    |                                 |



| <b>INTERFACE_DESCRIPTOR_DATA</b>        |  |   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
|---|--|---|---|--|--------|------|-------------|------------|-----------------------|--|-------------------------|----|------------------------|-----------------------|----|------------------------|-------------------------|-----|
|   |  | <p>URB Entry will be loaded. The Constant URB Entry Read Offset field will then be ignored. In GPGPU mode this describes how much data is delivered in a single dispatch. Multiple dispatches in a thread group will deliver constant data offset by this value. The total amount of constant data is (Constant URB Read Length * Number of Threads in GPGPU Thread Group + Cross-Thread Constant Data Read Length).</p> <p>If <b>Cross-Thread Constant Data Read Length</b> for Indirect is greater than 0, then this field must also be greater than 0. The allowed combinations are:</p> <table border="1"> <thead> <tr> <th>Constant/Indirect URB Entry Read Length</th> <th>Cross-Thread Constant Data Read Length</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>=0</td> <td>=0</td> <td>No Payload</td> </tr> <tr> <td>&gt;0</td> <td>=0</td> <td>Per-thread payload only</td> </tr> <tr> <td>&gt;0</td> <td>&gt;0</td> <td>Both kinds of payload</td> </tr> <tr> <td>=0</td> <td>&gt;0</td> <td>Only for CURBE payloads</td> </tr> </tbody> </table> | Constant/Indirect URB Entry Read Length | Cross-Thread Constant Data Read Length | Notes  | =0   | =0          | No Payload | >0                    | =0   | Per-thread payload only | >0 | >0                     | Both kinds of payload | =0 | >0                     | Only for CURBE payloads |     |
| Constant/Indirect URB Entry Read Length | Cross-Thread Constant Data Read Length | Notes   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| =0                                      | =0                                     | No Payload  |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| >0                                      | =0                                     | Per-thread payload only   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| >0                                      | >0                                     | Both kinds of payload   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| =0                                      | >0                                     | Only for CURBE payloads   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
|   |  | <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td>[0,63]</td> <td></td> </tr> </tbody> </table>  | Value                                   | Name                                   | [0,63] |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| Value                                   | Name                                   |   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| [0,63]                                  |  |   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| 15:0                                    | <b>Constant URB Entry Read Offset</b>  | <table border="1"> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>Specifies the offset (in 8-DW units) at which Constant URB data is to be read from the URB before being included in the thread payload.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>[0,1983]</td> <td></td> <td>Indicating [0,1983] 256-bit register increments. ROB has 64KB of storage; 2048 entries. However, lowest 64 entries are reserved for VFE/TS to store interface descriptor data. Hence, (URB Entry Read Offset + Read Length) shall not exceed 1984.</td> </tr> </tbody> </table>   | Format:                                 | U16                                    | Value  | Name | Description | [0,1983]   |                       | Indicating [0,1983] 256-bit register increments. ROB has 64KB of storage; 2048 entries. However, lowest 64 entries are reserved for VFE/TS to store interface descriptor data. Hence, (URB Entry Read Offset + Read Length) shall not exceed 1984. |                         |    |                        |                       |    |                        |                         |     |
| Format:                                 | U16                                    |   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| Value                                   | Name                                   | Description   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| [0,1983]                                |  | Indicating [0,1983] 256-bit register increments. ROB has 64KB of storage; 2048 entries. However, lowest 64 entries are reserved for VFE/TS to store interface descriptor data. Hence, (URB Entry Read Offset + Read Length) shall not exceed 1984.  |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| 6                                       | 31:24                                  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:                                 | MBZ                                    |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
|   | Format:                                | MBZ   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
|   | 23:22                                  | <p><b>Rounding Mode</b></p> <table border="1"> <tr> <td>Format:</td> <td>U2</td> </tr> </table> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td>RTNE <b>[Default]</b></td> <td>Round to Nearest Even</td> </tr> <tr> <td>01b</td> <td>RU</td> <td>Round toward +Infinity</td> </tr> <tr> <td>10b</td> <td>RD</td> <td>Round toward -Infinity</td> </tr> <tr> <td>11b</td> <td>RTZ</td> <td>Round toward Zero</td> </tr> </tbody> </table>  | Format:                                 | U2                                     | Value  | Name | Description | 00b        | RTNE <b>[Default]</b> | Round to Nearest Even  | 01b                     | RU | Round toward +Infinity | 10b                   | RD | Round toward -Infinity | 11b                     | RTZ |
| Format:                                 | U2                                     |   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| Value                                   | Name                                   | Description   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| 00b                                     | RTNE <b>[Default]</b>                  | Round to Nearest Even   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| 01b                                     | RU                                     | Round toward +Infinity  |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| 10b                                     | RD                                     | Round toward -Infinity  |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| 11b                                     | RTZ                                    | Round toward Zero   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |
| 21                                      | <b>Barrier Enable</b>                  |   |   |  |        |      |             |            |                       |  |                         |    |                        |                       |    |                        |                         |     |

| <b>INTERFACE_DESCRIPTOR_DATA</b>                       |   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
|--|---|----------|-----------------|---------|-----|-------|---|---------|------------|---|------------|---|------------|---|-------------|---|-------------|----|-------------|-------------------|---------|--|----------|
|  | <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>Enable</td> </tr> </table> <p>This field specifies whether the thread group requires a barrier. If not, it can be dispatched without allocating one.</p>  | Format:  | Enable          |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Format:  | Enable  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 20:16  | <p><b>Shared Local Memory Size</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U5</td> </tr> </table> <p>This field indicates how much shared local memory the thread group requires. The amount is specified in 4k blocks, but only powers of 2 are allowed: 0, 4k, 8k, 16k, 32k and 64k per half-slice.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 30%;">Value</th> <th>Name</th> </tr> </thead> <tbody> <tr><td>0</td><td>Encodes 0k</td></tr> <tr><td>1</td><td>Encodes 4k</td></tr> <tr><td>2</td><td>Encodes 8k</td></tr> <tr><td>4</td><td>Encodes 16k</td></tr> <tr><td>8</td><td>Encodes 32k</td></tr> <tr><td>16</td><td>Encodes 64k</td></tr> </tbody> </table> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="width: 70%;">Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>If SLMSize &gt; 0, then a barrier must also be allocated.</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Project: | CHV, BSW        | Format: | U5  | Value | Name  | 0       | Encodes 0k | 1 | Encodes 4k | 2 | Encodes 8k | 4 | Encodes 16k | 8 | Encodes 32k | 16 | Encodes 64k | Programming Notes | Project | If SLMSize > 0, then a barrier must also be allocated. | CHV, BSW |
| Project:   | CHV, BSW  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Format:  | U5  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Value  | Name  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 0  | Encodes 0k  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 1  | Encodes 4k  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 2  | Encodes 8k  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 4  | Encodes 16k   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 8  | Encodes 32k   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 16   | Encodes 64k   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Programming Notes                                      | Project   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| If SLMSize > 0, then a barrier must also be allocated. | CHV, BSW  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 15   | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project: | CHV, BSW        | Format: | MBZ |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Project:   | CHV, BSW  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Format:  | MBZ   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 14:10  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>MBZ</td> </tr> </table>  | Format:  | MBZ             |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Format:  | MBZ   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 9:0  | <p><b>Number of Threads in GPGPU Thread Group</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U10</td> </tr> </table> <p>Specifies the number of threads that are in this thread group. The minimum value is 1, while the maximum value is the number of threads in a subslice for local barriers. See vol1b Configurations for the number of threads per subslice for different products. The maximum value for global barriers is limited by the number of threads in the system, or by 511, whichever is lower. This field should not be set to 0 even if the barrier is disabled, since an accurate value is needed for proper pre-emption.</p>  | Project: | CHV, BSW        | Format: | U10 |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Project:   | CHV, BSW  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Format:  | U10   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 7  | <table border="1" style="width: 100%;"> <tr> <td style="width: 30px;">31:8</td> <td><b>Reserved</b></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 30px;">7:0</td> <td><b>Cross-Thread Constant Data Read Length</b></td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Specifies the amount of constant data in CURBE in 8-DW register increments which will be sent</p>  | 31:8     | <b>Reserved</b> | Format: | MBZ | 7:0   | <b>Cross-Thread Constant Data Read Length</b> | Format: | U8         |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 31:8   | <b>Reserved</b>   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Format:  | MBZ   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| 7:0  | <b>Cross-Thread Constant Data Read Length</b>   |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |
| Format:  | U8  |          |                 |         |     |       |   |         |            |   |            |   |            |   |             |   |             |    |             |                   |         |  |          |

| <b>INTERFACE_DESCRIPTOR_DATA</b> |              |  |
|----------------------------------|--------------|--|
|                                  |              | to every thread in the thread group in addition to the per thread ids specified by <b>Constant URB Entry Read Length</b> . |
|                                  | <b>Value</b> | <b>Name</b>  |
|                                  | [0,127]      |  |

## Invalidate After Read Message Descriptor Control Field

| <b>MDC_IAR - Invalidate After Read Message Descriptor Control Field</b> |            |   |          |     |         |     |
|---|------------|---|----------|-----|---------|-----|
| Project:  | CHV, BSW   |   |          |     |         |     |
| Source:   | PRM        |   |          |     |         |     |
| Size (in bits):   | 1          |   |          |     |         |     |
| Default Value:  | 0x00000000 |   |          |     |         |     |
| DWord   | Bit        | Description   |          |     |         |     |
| 0   | 0          | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> <p>Previously, this Enable field was intended to optimize scratch and spill/fill read messages, where the memory was only used by a single thread and did not need to be maintained after the thread completed. If enabled, it caused all lines in the L3 cache accessed by the message to be invalidated after the read occurred, regardless of whether the line contained modified data. It was intended as a performance hint indicating that the data would no longer be used to avoid writing back data to memory.</p> | Project: | All | Format: | MBZ |
| Project:  | All        |   |          |     |         |     |
| Format:   | MBZ        |   |          |     |         |     |

## JPEG

| <b>JPEG</b>     |   |   |         |     |
|-----------------|---|---|---------|-----|
| Project:        | CHV, BSW  |   |         |     |
| Source:         | VideoCS   |   |         |     |
| Size (in bits): | 16  |   |         |     |
| Default Value:  | 0x00000000  |   |         |     |
| DWord           | Bit   | Description   |         |     |
| 0               | 15:5  | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Format:</td> <td style="width: 20%;">MBZ</td> </tr> </table> | Format: | MBZ |
|                 | Format:   | MBZ   |         |     |
|                 | 4   | <b>Inconsistent VLD SE Error</b><br>This flag indicates an inconsistent SE coded in the bit-stream. Bit-stream does not match any entries in the hauffman table.                |         |     |
|                 | 3   | <b>Extra Block Error</b><br>This flag indicates extra block coded within an ECS data boundary.  |         |     |
|                 | 2   | <b>Missing block Error</b><br>This flag indicates one or more blocks are missing within an ECS data boundary.   |         |     |
|                 | 1   | <b>Extra ECS Error</b><br>This flag indicates extra ECS' coded in the bit-stream SCAN payload data.   |         |     |
| 0               | <b>Missing ECS Error</b><br>This flag indicates one or more ECS' are missing from the bit-stream SCAN payload data. |   |         |     |

## LOD Message Address Payload Control

| MACD_LOD - LOD Message Address Payload Control |  |   |          |         |         |                                  |         |       |      |             |        |  |                  |
|--|--|---|----------|---------|---------|----------------------------------|---------|-------|------|-------------|--------|--|------------------|
| Project:                                       | CHV, BSW   |   |          |         |         |                                  |         |       |      |             |        |  |                  |
| Source:  | PRM  |   |          |         |         |                                  |         |       |      |             |        |  |                  |
| Size (in bits):                                | 32   |   |          |         |         |                                  |         |       |      |             |        |  |                  |
| Default Value:                                 | 0x00000000   |   |          |         |         |                                  |         |       |      |             |        |  |                  |
| DWord  | Bit  | Description   |          |         |         |                                  |         |       |      |             |        |  |                  |
| 0  | 31:4   | <b>Reserved</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> <tr> <td colspan="2">Ignored</td> </tr> </table> | Project: | All     | Format: | MBZ                              | Ignored |       |      |             |        |  |                  |
|  | Project:   | All   |          |         |         |                                  |         |       |      |             |        |  |                  |
| Format:  | MBZ  |   |          |         |         |                                  |         |       |      |             |        |  |                  |
| Ignored  |  |   |          |         |         |                                  |         |       |      |             |        |  |                  |
| 3:0  | <b>LOD</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U4</td> </tr> <tr> <td colspan="2">Specifies the LOD for this slot.</td> </tr> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> <tr> <td>[0,14]</td> <td></td> <td>representing LOD</td> </tr> </table> | Project:  | All      | Format: | U4      | Specifies the LOD for this slot. |         | Value | Name | Description | [0,14] |  | representing LOD |
| Project:                                       | All  |   |          |         |         |                                  |         |       |      |             |        |  |                  |
| Format:  | U4   |   |          |         |         |                                  |         |       |      |             |        |  |                  |
| Specifies the LOD for this slot.               |  |   |          |         |         |                                  |         |       |      |             |        |  |                  |
| Value  | Name   | Description   |          |         |         |                                  |         |       |      |             |        |  |                  |
| [0,14]   |  | representing LOD  |          |         |         |                                  |         |       |      |             |        |  |                  |

## Lower Oword Block Data Payload

| <b>MDP_OW1L - Lower Oword Block Data Payload</b> |   |  |
|--|---|--|
| Project:   | CHV, BSW  |  |
| Source:  | PRM   |  |
| Size (in bits):                                  | 256   |  |
| Default Value:                                   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |  |
| DWord  | Bit   | Description                            |
| 0.0-0.3  | 127:0   | <b>Oword</b>                           |
|  |   | Project: All                           |
|  |   | Format: U128                           |
|  |   | Specifies the upper Oword data element |
| 0.4-0.7  | 127:0   | <b>Reserved</b>                        |
|  |   | Project: All                           |
|  |   | Format: Ignore                         |
|  |   | Ignored                                |

## MEDIA\_SURFACE\_STATE

| MEDIA_SURFACE_STATE   |  |   |          |   |                               |
|---|--|---|----------|---|-------------------------------|
| Project:  | CHV, BSW   |   |          |   |                               |
| Source:   | PRM  |   |          |   |                               |
| Exists If:  | //([MessageType] == 'Deinterlace') OR ([MessageType] == 'Sample_8x8')                          |   |          |   |                               |
| Size (in bits):   | 256  |   |          |   |                               |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |   |                               |
| This is the SURFACE_STATE used by only deinterlace, sample_8x8, and VME messages.   |  |   |          |   |                               |
| DWord   | Bit  | Description   |          |   |                               |
| 0   | 31:0   | <b>Reserved</b>   |          |   |                               |
|   |  | Project:  | CHV, BSW |   |                               |
|   |  | Format:   | MBZ      |   |                               |
| 1   | 31:18  | <b>Height</b>   |          |   |                               |
|   |  | Format:   | U14-1    |   |                               |
|   |  | This field specifies the height of the surface in units of pixels. For PLANAR surface formats, this field indicates the height of the Y (luma) plane.                             |          |   |                               |
|   |  | Value   | Name     | Description   | Exists If                     |
|   |  | [0,16383]   |          | representing heights [1,16384]  | [Surface Type] != FM_STRBUF_* |
|   |  | <b>Programming Notes</b>  |          |   |                               |
|   |  | Height (field value + 1) must be a multiple of 2 for PLANAR_420 surfaces.If Vertical Line Stride is 1, this field indicates the height of the field, not the height of the frame. |          |   |                               |
|   |  | 17:4  | 17:4     | <b>Width</b>  |                               |
|   |  |   |          | Format:   | U14-1                         |
|   |  |   |          | This field specifies the width of the surface in units of pixels. For PLANAR surface formats, this field indicates the width of the Y (luma) plane. |                               |
| Value   | Name   |   |          | Description   | Exists If                     |
| [0,16383]   |  |   |          | representing widths [1,16384]   | [Surface Type] != FM_STRBUF_* |
| <b>Programming Notes</b>  |  |   |          |   |                               |
| <ul style="list-style-type: none"> <li>The Width specified by this field multiplied by the pixel size in bytes must be less than or equal to the surface pitch (specified in bytes via the Surface Pitch field).</li> <li>Width (field value + 1) must be a multiple of 2 for PLANAR_420, PLANAR_422, and all YCRCB_* and Y16_UNORM surfaces, and must be a multiple of 4 for PLANAR_411 and Y8_UNORM_VA surfaces.</li> <li>For deinterlace messages, the Width (field value + 1) must be a multiple of 8.</li> </ul> |  |   |          |   |                               |



| <b>MEDIA_SURFACE_STATE</b>   |   |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
|--|---|----------------------------|----------|---------|---------------|-------------|-------------------|--|----------------------|-------------------|----------------------|---|----------|-----------|----------------------------|---|--------------|----------------------------|---|-------------------|-----------------|---|----------------|---------------------|
|  | <ul style="list-style-type: none"> <li>For Y8_UNORM_VA format width should be in multiple of 4, for Y16_UNORM_VA format width should be in multiple of 2, for Y1_UNORM format width should be in multiple of 32</li> <li>When Address Control = Mirror, the total width should be in multiple of 4bytes.</li> </ul> <p>Width (field value + 1) must be a multiple of 2 for PLANAR_420_16</p>  |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 3:2  | <p><b>Picture Structure</b><br/>Specifies the encoding of the current picture.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td>Frame Picture</td> </tr> <tr> <td>01b</td> <td>Top Field Picture</td> </tr> <tr> <td>10b</td> <td>Bottom Field Picture</td> </tr> <tr> <td>11b</td> <td>Invalid, not allowed</td> </tr> </tbody> </table>  | Value                      | Name     | 00b     | Frame Picture | 01b         | Top Field Picture | 10b  | Bottom Field Picture | 11b               | Invalid, not allowed |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| Value  | Name  |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 00b  | Frame Picture   |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 01b  | Top Field Picture   |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 10b  | Bottom Field Picture  |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 11b  | Invalid, not allowed  |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 1:0  | <p><b>Cr(V)/Cb(U) Pixel Offset V Direction</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Format:</td> <td>U0.2</td> </tr> </table> <table border="1"> <thead> <tr> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>Specifies the distance to the U/V values with respect to the even numbered Y channels in the V direction</td> <td>CHV, BSW</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>This field is ignored for all formats except PLANAR_420_8</td> <td>CHV, BSW</td> </tr> </tbody> </table>   | Default Value:             | 0        | Format: | U0.2          | Description | Project           | Specifies the distance to the U/V values with respect to the even numbered Y channels in the V direction | CHV, BSW             | Programming Notes | Project              | This field is ignored for all formats except PLANAR_420_8 | CHV, BSW |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| Default Value:   | 0   |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| Format:  | U0.2  |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| Description  | Project   |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| Specifies the distance to the U/V values with respect to the even numbered Y channels in the V direction | CHV, BSW  |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| Programming Notes  | Project   |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| This field is ignored for all formats except PLANAR_420_8  | CHV, BSW  |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 2  | <p>31:27 <b>Surface Format</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table> <p>Specifies the format of the surface. All of the Y and G channels will use table 0 and all of the Cr/Cb/R/B channels will use table 1.</p> <p>Note: Y8_UNORM_VA, Y16_UNORM and Y16_SNORM are used for all functions of sample_8x8 except AVS where rest of the formats are not used. These two formats are packed as 32bits in L1 though the individual pixels are either 8bpp or 16bpp respectively.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>PLANAR_420_8</td> <td></td> </tr> <tr> <td>5</td> <td>Y8_UNORM_VA</td> <td>Sample_8x8 only except AVS</td> </tr> <tr> <td>6</td> <td>Y16_SNORM</td> <td>Sample_8x8 only except AVS</td> </tr> <tr> <td>7</td> <td>Y16_UNORM_VA</td> <td>Sample_8x8 only except AVS</td> </tr> <tr> <td>8</td> <td>R10G10B10A2_UNORM</td> <td>Sample_8x8 only</td> </tr> <tr> <td>9</td> <td>R8G8B8A8_UNORM</td> <td>Sample_8x8 AVS only</td> </tr> </tbody> </table> | Project:                   | CHV, BSW | Value   | Name          | Description | 4                 | PLANAR_420_8   |                      | 5                 | Y8_UNORM_VA          | Sample_8x8 only except AVS                                | 6        | Y16_SNORM | Sample_8x8 only except AVS | 7 | Y16_UNORM_VA | Sample_8x8 only except AVS | 8 | R10G10B10A2_UNORM | Sample_8x8 only | 9 | R8G8B8A8_UNORM | Sample_8x8 AVS only |
| Project:   | CHV, BSW  |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| Value  | Name  | Description                |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 4  | PLANAR_420_8  |                            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 5  | Y8_UNORM_VA   | Sample_8x8 only except AVS |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 6  | Y16_SNORM   | Sample_8x8 only except AVS |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 7  | Y16_UNORM_VA  | Sample_8x8 only except AVS |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 8  | R10G10B10A2_UNORM   | Sample_8x8 only            |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |
| 9  | R8G8B8A8_UNORM  | Sample_8x8 AVS only        |          |         |               |             |                   |  |                      |                   |                      |   |          |           |                            |   |              |                            |   |                   |                 |   |                |                     |

| <b>MEDIA_SURFACE_STATE</b> |  |                  |   |
|----------------------------|--|------------------|---|
|                            | 11   | R8_UNORM (Cr/Cb) | Sample_8x8 AVS only   |
|                            | 12   | Y8_UNORM         | Sample_8x8 AVS only   |
|                            | 13   | A8Y8U8V8_UNORM   | Sample_8x8 AVS only   |
|                            | 14   | B8G8R8A8_UNORM   | Sample_8x8 AVS only   |
|                            | 15   | R16G16B16A16     | Sample_8x8 AVS only   |
|                            | 16   | Y1_UNORM         | Sample_8x8 only for boolean surfaces (1bit/pixel)                       |
|                            | Others   | Reserved         |   |
| 26                         | <b>Interleave Chroma</b>   |                  |   |
|                            | Project:   |                  | CHV, BSW  |
|                            | Format:  |                  | Enable  |
|                            | <b>Description</b>   |                  |   |
|                            | This field indicates that the chroma fields are interleaved in a single plane rather than stored as two separate planes. This field is only used for PLANAR surface formats.   |                  |   |
| 25:22                      | <b>Reserved</b>  |                  |   |
|                            | Project:   |                  | CHV, BSW  |
|                            | Format:  |                  | MBZ   |
| 21                         | <b>Address Control</b>   |                  |   |
|                            | Project:   |                  | CHV, BSW  |
|                            | <b>Value</b>   | <b>Name</b>      | <b>Description</b>  |
|                            | 0  | CLAMP            | Clamp   |
|                            | 1  | MIRROR           | Mirror  |
| 20:3                       | <b>Surface Pitch</b>   |                  |   |
|                            | Format:  |                  | U18-1 pitch in Bytes  |
|                            | This field specifies the surface pitch in (#Bytes - 1).  |                  |   |
|                            | <b>Value</b>   | <b>Name</b>      | <b>Description</b>  |
|                            | [0,262143]   |                  | For other linear surfaces: representing [1B, 256KB]                     |
|                            | [511, 262143]  |                  | For X-tiled surface: representing [512B, 256KB] = [1 tile, 512 tiles]   |
|                            | [127, 262143]  |                  | For Y-tiled surfaces: representing [128B, 256KB] = [1 tile, 2048 tiles] |
|                            | <b>Programming Notes</b>   |                  |   |
|                            | For tiled surfaces, the pitch must be a multiple of the tile width. If Half Pitch for Chroma is set, this field must be a multiple of two tile widths for tiled surfaces, or a multiple of 2 bytes for linear surfaces. The Surface Pitches of current picture and reference picture should be declared as the identical type in VDI mode with identical Height, Width and Format. |                  |   |
| 2                          | <b>Half Pitch for Chroma</b>   |                  |   |
|                            | Format:  |                  | Enable  |

| <b>MEDIA_SURFACE_STATE</b>   |  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
|--|--|-------------------------|--------------------|---|------|-------------|------------------|-------------|-----------------|--|-----|--|----------|-------------------|-----|---|-----------------|----------------|-----|----|-----------------|----------------|-----|-------------------|--|--|--|
|  | <p>This field indicates that the chroma plane(s) will use a pitch equal to half the value specified in the Surface Pitch field. This field is only used for PLANAR surface formats.</p> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">Must be Zero as this field is not used.</td> </tr> </table>  | Programming Notes       |                    | Must be Zero as this field is not used. |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| Programming Notes  |  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| Must be Zero as this field is not used.  |  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| 1:0  | <p><b>Tile Mode</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>U2 Enumerated Type</td> </tr> </table> <p>This field specifies the type of memory tiling (Linear, WMajor, XMmajor, or YMmajor) employed to tile this surface. See Memory Interface Functions for details on memory tiling and restrictions.</p> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 30%;">Name</th> <th style="width: 40%;">Description</th> <th style="width: 15%;">Project</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>TILEMODE_LINEAR</td> <td>Linear mode (no tiling)</td> <td>All</td> </tr> <tr> <td>1h</td> <td>Reserved</td> <td>Reserved</td> <td>All</td> </tr> <tr> <td>2h</td> <td>TILEMODE_XMAJOR</td> <td>X major tiling</td> <td>All</td> </tr> <tr> <td>3h</td> <td>TILEMODE_YMAJOR</td> <td>Y major tiling</td> <td>All</td> </tr> </tbody> </table> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2"> <ul style="list-style-type: none"> <li>Refer to <i>Memory Data Formats</i> for restrictions on TileMode direction for the various buffer types. (Of particular interest is the fact that YMAJOR tiling is not supported for display/overlay buffers).</li> <li>The corresponding cache(s) must be invalidated before a previously accessed surface is accessed again with an altered state of this field.</li> <li>Linear surfaces can be mapped to Main Memory (uncached) or System Memory (cacheable, snooped). Tiled (X/Y/W) surfaces can only be mapped to Main Memory.</li> </ul> </td> </tr> </table> | Format:                 | U2 Enumerated Type | Value                                   | Name | Description | Project          | 0h          | TILEMODE_LINEAR | Linear mode (no tiling)  | All | 1h   | Reserved | Reserved          | All | 2h  | TILEMODE_XMAJOR | X major tiling | All | 3h | TILEMODE_YMAJOR | Y major tiling | All | Programming Notes |  | <ul style="list-style-type: none"> <li>Refer to <i>Memory Data Formats</i> for restrictions on TileMode direction for the various buffer types. (Of particular interest is the fact that YMAJOR tiling is not supported for display/overlay buffers).</li> <li>The corresponding cache(s) must be invalidated before a previously accessed surface is accessed again with an altered state of this field.</li> <li>Linear surfaces can be mapped to Main Memory (uncached) or System Memory (cacheable, snooped). Tiled (X/Y/W) surfaces can only be mapped to Main Memory.</li> </ul> |  |
| Format:  | U2 Enumerated Type   |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| Value  | Name   | Description             | Project            |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| 0h   | TILEMODE_LINEAR  | Linear mode (no tiling) | All                |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| 1h   | Reserved   | Reserved                | All                |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| 2h   | TILEMODE_XMAJOR  | X major tiling          | All                |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| 3h   | TILEMODE_YMAJOR  | Y major tiling          | All                |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| Programming Notes  |  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| <ul style="list-style-type: none"> <li>Refer to <i>Memory Data Formats</i> for restrictions on TileMode direction for the various buffer types. (Of particular interest is the fact that YMAJOR tiling is not supported for display/overlay buffers).</li> <li>The corresponding cache(s) must be invalidated before a previously accessed surface is accessed again with an altered state of this field.</li> <li>Linear surfaces can be mapped to Main Memory (uncached) or System Memory (cacheable, snooped). Tiled (X/Y/W) surfaces can only be mapped to Main Memory.</li> </ul> |  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| 3  | <p>31:30 <b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> <p>29:16 <b>X Offset for U(Cb)</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>U14 Pixel Offset</td> </tr> </table> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <thead> <tr> <th style="width: 80%;">Description</th> <th style="width: 20%;">Project</th> </tr> </thead> <tbody> <tr> <td>For non planar surfaces this field specifies the horizontal offset in pixels from the Surface Base Address to the start (origin) of the surface.</td> <td></td> </tr> <tr> <td>For Planar surfaces this field specifies the horizontal offset in pixels from the Surface Base Address to the start (origin) of the U(Cb) plane or the interleaved UV plane if Interleave Chroma is enabled.</td> <td>CHV, BSW</td> </tr> </tbody> </table> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">For PLANAR_420 and PLANAR_422 surface formats, this field must indicate an even number of pixels.</td> </tr> </table> <p>15:14 <b>Reserved</b></p>   | Project:                | All                | Format:                                 | MBZ  | Format:     | U14 Pixel Offset | Description | Project         | For non planar surfaces this field specifies the horizontal offset in pixels from the Surface Base Address to the start (origin) of the surface. |     | For Planar surfaces this field specifies the horizontal offset in pixels from the Surface Base Address to the start (origin) of the U(Cb) plane or the interleaved UV plane if Interleave Chroma is enabled. | CHV, BSW | Programming Notes |     | For PLANAR_420 and PLANAR_422 surface formats, this field must indicate an even number of pixels. |                 |                |     |    |                 |                |     |                   |  |  |  |
| Project:   | All  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| Format:  | MBZ  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| Format:  | U14 Pixel Offset   |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| Description  | Project  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| For non planar surfaces this field specifies the horizontal offset in pixels from the Surface Base Address to the start (origin) of the surface.   |  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| For Planar surfaces this field specifies the horizontal offset in pixels from the Surface Base Address to the start (origin) of the U(Cb) plane or the interleaved UV plane if Interleave Chroma is enabled.   | CHV, BSW   |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| Programming Notes  |  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |
| For PLANAR_420 and PLANAR_422 surface formats, this field must indicate an even number of pixels.  |  |                         |                    |   |      |             |                  |             |                 |  |     |  |          |                   |     |   |                 |                |     |    |                 |                |     |                   |  |  |  |

| <b>MEDIA_SURFACE_STATE</b>   |  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
|--|--|------------|---|-------------|----------------|--|---|--|------------------|-------------------|---------|--|----------|-------------------|---|
|  | <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:    | MBZ   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Format:  | MBZ  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| 13:0   | <p><b>Y Offset for U(Cb)</b></p> <table border="1"> <tr> <td>Format:</td> <td>U14 Row Offset</td> </tr> </table> <table border="1"> <thead> <tr> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>For non planar surfaces this field specifies the vertical offset in pixels from the Surface Base Address to the start (origin) of the surface.</td> <td></td> </tr> <tr> <td>For Planar surfaces this field specifies the vertical offset in rows from the Surface Base Address to the start (origin) of the U(Cb) plane or the interleaved UV plane if Interleave Chroma is enabled.</td> <td>CHV, BSW</td> </tr> </tbody> </table>  | Format:    | U14 Row Offset  | Description | Project        | For non planar surfaces this field specifies the vertical offset in pixels from the Surface Base Address to the start (origin) of the surface. |   | For Planar surfaces this field specifies the vertical offset in rows from the Surface Base Address to the start (origin) of the U(Cb) plane or the interleaved UV plane if Interleave Chroma is enabled. | CHV, BSW         |                   |         |  |          |                   |   |
| Format:  | U14 Row Offset   |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Description  | Project  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| For non planar surfaces this field specifies the vertical offset in pixels from the Surface Base Address to the start (origin) of the surface.   |  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| For Planar surfaces this field specifies the vertical offset in rows from the Surface Base Address to the start (origin) of the U(Cb) plane or the interleaved UV plane if Interleave Chroma is enabled. | CHV, BSW   |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| 4  | <p>31:30 <b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> <p>29:16 <b>X Offset for V(Cr)</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>///<math>[(\text{Surface Format}] \text{ is one of planar}) \text{ AND } ([\text{Interleave Chroma}] == '0')</math></td> </tr> <tr> <td>Format:</td> <td>U14 Pixel Offset</td> </tr> </table> <table border="1"> <thead> <tr> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>This field specifies the horizontal offset in pixels from the Surface Base Address to the start (origin) of the V(Cr) plane.</td> <td>CHV, BSW</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th style="text-align: center;">Programming Notes</th> </tr> </thead> <tbody> <tr> <td>For PLANAR_420 and PLANAR_422 surface formats, this field must indicate an even number of pixels.</td> </tr> </tbody> </table> | Project:   | All   | Format:     | MBZ            | Exists If:   | /// $[(\text{Surface Format}] \text{ is one of planar}) \text{ AND } ([\text{Interleave Chroma}] == '0')$ | Format:  | U14 Pixel Offset | Description       | Project | This field specifies the horizontal offset in pixels from the Surface Base Address to the start (origin) of the V(Cr) plane. | CHV, BSW | Programming Notes | For PLANAR_420 and PLANAR_422 surface formats, this field must indicate an even number of pixels. |
| Project:   | All  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Format:  | MBZ  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Exists If:   | /// $[(\text{Surface Format}] \text{ is one of planar}) \text{ AND } ([\text{Interleave Chroma}] == '0')$  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Format:  | U14 Pixel Offset   |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Description  | Project  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| This field specifies the horizontal offset in pixels from the Surface Base Address to the start (origin) of the V(Cr) plane.   | CHV, BSW   |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Programming Notes  |  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| For PLANAR_420 and PLANAR_422 surface formats, this field must indicate an even number of pixels.  |  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| 15   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:    | MBZ   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Format:  | MBZ  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| 14:0   | <p><b>Y Offset for V(Cr)</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>///<math>[(\text{Surface Format}] \text{ is one of planar}) \text{ AND } ([\text{Interleave Chroma}] == '0')</math></td> </tr> <tr> <td>Format:</td> <td>U15 Row Offset</td> </tr> </table> <table border="1"> <thead> <tr> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>This field specifies the vertical offset in rows from the Surface Base Address to the start (origin) of the V(Cr) plane.</td> <td>CHV, BSW</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th style="text-align: center;">Programming Notes</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>This field must indicate a multiple of 4 (bit 0 &amp; 1 = 00).</td> <td>CHV, BSW</td> </tr> </tbody> </table>   | Exists If: | /// $[(\text{Surface Format}] \text{ is one of planar}) \text{ AND } ([\text{Interleave Chroma}] == '0')$ | Format:     | U15 Row Offset | Description  | Project   | This field specifies the vertical offset in rows from the Surface Base Address to the start (origin) of the V(Cr) plane.   | CHV, BSW         | Programming Notes | Project | This field must indicate a multiple of 4 (bit 0 & 1 = 00).   | CHV, BSW |                   |   |
| Exists If:   | /// $[(\text{Surface Format}] \text{ is one of planar}) \text{ AND } ([\text{Interleave Chroma}] == '0')$  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Format:  | U15 Row Offset   |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Description  | Project  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| This field specifies the vertical offset in rows from the Surface Base Address to the start (origin) of the V(Cr) plane.   | CHV, BSW   |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Programming Notes  | Project  |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| This field must indicate a multiple of 4 (bit 0 & 1 = 00).   | CHV, BSW   |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| 5  | <p>31 <b>Vertical Line Stride</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project:   | CHV, BSW  |             |                |  |   |  |                  |                   |         |  |          |                   |   |
| Project:   | CHV, BSW   |            |   |             |                |  |   |  |                  |                   |         |  |          |                   |   |

| <b>MEDIA_SURFACE_STATE</b>   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
|--|---|----------------|--|--|--|--|-----------------------------|---|--|---|--|----------------|--|----------|--|
|  | <table border="1"> <tr> <td>Format:</td> <td>U1 in lines to skip between logically adjacent lines</td> </tr> <tr> <td colspan="2">For Surfaces accessed via the sample_8x8 message: Specifies number of lines (0 or 1) to skip between logically adjacent lines - provides support of interleaved (field) surfaces as textures. For Other Surfaces: Vertical Line Stride must be zero.</td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>Workaround</b></td> </tr> <tr> <td colspan="2">All surfaces used by the sampler between sampler cache invalidates must have the same setting of this field in both RENDER_SURFACE_STATE and MEDIA_SURFACE_STATE.</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Project</b></td> </tr> <tr> <td colspan="2">CHV, BSW</td> </tr> </table> | Format:        | U1 in lines to skip between logically adjacent lines | For Surfaces accessed via the sample_8x8 message: Specifies number of lines (0 or 1) to skip between logically adjacent lines - provides support of interleaved (field) surfaces as textures. For Other Surfaces: Vertical Line Stride must be zero. |  | <b>Workaround</b>  |                             | All surfaces used by the sampler between sampler cache invalidates must have the same setting of this field in both RENDER_SURFACE_STATE and MEDIA_SURFACE_STATE. |  | <b>Project</b>  |  | CHV, BSW       |  |          |  |
| Format:  | U1 in lines to skip between logically adjacent lines  |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| For Surfaces accessed via the sample_8x8 message: Specifies number of lines (0 or 1) to skip between logically adjacent lines - provides support of interleaved (field) surfaces as textures. For Other Surfaces: Vertical Line Stride must be zero. |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| <b>Workaround</b>  |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| All surfaces used by the sampler between sampler cache invalidates must have the same setting of this field in both RENDER_SURFACE_STATE and MEDIA_SURFACE_STATE.  |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| <b>Project</b>   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| CHV, BSW   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| 30   | <p><b>Vertical Line Stride Offset</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U1 in lines of initial offset (when Vertical Line Stride == 1)</td> </tr> <tr> <td colspan="2">For Surfaces accessed via the sample_8x8 message: Specifies the offset of the initial line from the beginning of the buffer. For Other Surfaces: Vertical Line Stride Offset must be zero.</td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>Programming Notes</b></td> </tr> <tr> <td colspan="2">This field must be set to 0 if Vertical Line Stride is 0.</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Project</b></td> </tr> <tr> <td colspan="2">CHV, BSW</td> </tr> </table>   | Project:       | CHV, BSW   | Format:  | U1 in lines of initial offset (when Vertical Line Stride == 1) | For Surfaces accessed via the sample_8x8 message: Specifies the offset of the initial line from the beginning of the buffer. For Other Surfaces: Vertical Line Stride Offset must be zero. |                             | <b>Programming Notes</b>  |  | This field must be set to 0 if Vertical Line Stride is 0.   |  | <b>Project</b> |  | CHV, BSW |  |
| Project:   | CHV, BSW  |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| Format:  | U1 in lines of initial offset (when Vertical Line Stride == 1)  |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| For Surfaces accessed via the sample_8x8 message: Specifies the offset of the initial line from the beginning of the buffer. For Other Surfaces: Vertical Line Stride Offset must be zero.   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| <b>Programming Notes</b>   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| This field must be set to 0 if Vertical Line Stride is 0.  |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| <b>Project</b>   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| CHV, BSW   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| 29:24  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:        | MBZ  |  |  |  |                             |   |  |   |  |                |  |          |  |
| Format:  | MBZ   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| 23:20  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project:       | CHV, BSW   | Format:  | MBZ  |  |                             |   |  |   |  |                |  |          |  |
| Project:   | CHV, BSW  |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| Format:  | MBZ   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| 19:18  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project:       | CHV, BSW   | Format:  | MBZ  |  |                             |   |  |   |  |                |  |          |  |
| Project:   | CHV, BSW  |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| Format:  | MBZ   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| 17:7   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:        | MBZ  |  |  |  |                             |   |  |   |  |                |  |          |  |
| Format:  | MBZ   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| 6:0  | <p><b>Surface Memory Object Control State</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>0h DefaultVaueDesc</td> </tr> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MEMORY_OBJECT_CONTROL_STATE</td> </tr> <tr> <td colspan="2">This 7-bit field is used in various state commands and indirect state objects to define cacheability and other attributes related to memory objects.</td> </tr> </table>   | Default Value: | 0h DefaultVaueDesc                                   | Project:   | CHV, BSW   | Format:  | MEMORY_OBJECT_CONTROL_STATE | This 7-bit field is used in various state commands and indirect state objects to define cacheability and other attributes related to memory objects.              |  |   |  |                |  |          |  |
| Default Value:   | 0h DefaultVaueDesc  |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| Project:   | CHV, BSW  |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| Format:  | MEMORY_OBJECT_CONTROL_STATE   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| This 7-bit field is used in various state commands and indirect state objects to define cacheability and other attributes related to memory objects.   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| 6  | <p>31:0 <b>Surface Base Address</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>GraphicsAddress[31:0]</td> </tr> <tr> <td colspan="2">Specifies the low 32 bits of the byte-aligned base address of the surface.</td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>Programming Notes</b></td> </tr> <tr> <td colspan="2">For SURFTYPE_BUFFER render targets, this field specifies the base address of first element of the</td> </tr> </table>   | Project:       | CHV, BSW   | Format:  | GraphicsAddress[31:0]  | Specifies the low 32 bits of the byte-aligned base address of the surface.   |                             | <b>Programming Notes</b>  |  | For SURFTYPE_BUFFER render targets, this field specifies the base address of first element of the |  |                |  |          |  |
| Project:   | CHV, BSW  |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| Format:  | GraphicsAddress[31:0]   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| Specifies the low 32 bits of the byte-aligned base address of the surface.   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| <b>Programming Notes</b>   |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |
| For SURFTYPE_BUFFER render targets, this field specifies the base address of first element of the  |   |                |  |  |  |  |                             |   |  |   |  |                |  |          |  |

| <b>MEDIA_SURFACE_STATE</b> |  |   |          |          |         |
|----------------------------|--|---|----------|----------|---------|
|                            | <p>surface. The surface is interpreted as a simple array of that single element type. The address must be naturally-aligned to the element size (e.g., a buffer containing R32G32B32A32_FLOAT elements must be 16-byte aligned).For SURFTYPE_BUFFER non-rendertarget surfaces, this field specifies the base address of the first element of the surface, computed in software by adding the surface base address to the byte offset of the element in the buffer.Mipmapped, cube and 3D sampling engine surfaces are stored in a 'monolithic' (fixed) format, and only require a single address for the base texture.Linear render target surface base addresses must be element-size aligned, for non-YUV surface formats, or a multiple of 2 element-sizes for YUV surface formats. Other linear surfaces have no alignment requirements (byte alignment is sufficient.)Linear depth buffer surface base addresses must be 64-byte aligned. Note that while render targets (color) can be SURFTYPE_BUFFER, depth buffers cannot.Tiled surface base addresses must be 4KB-aligned. Note that only the offsets from Surface Base Address are tiled, Surface Base Address itself is not transformed using the tiling algorithm.For tiled surfaces, the actual start of the surface can be offset from the Surface Base Address by the X Offset and Y Offset fields.Certain message types used to access surfaces have more stringent alignment requirements. Please refer to the specific message documentation for additional restrictions.</p> |   |          |          |         |
| 7                          | 31:16  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td>MBZ</td> </tr> </table>  | Format:  | MBZ      |         |
|                            | Format:  | MBZ   |          |          |         |
|                            | 15:0   | <p><b>Surface Base Address High</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>GraphicsAddress[47:32]</td> </tr> </table> <p>Specifies the high 16 bits of the byte-aligned base address of the surface. Refer to Surface Base Address [31:0] for programming notes applying to this field.</p> | Project: | CHV, BSW | Format: |
| Project:                   | CHV, BSW   |   |          |          |         |
| Format:                    | GraphicsAddress[47:32]   |   |          |          |         |

## MEMORY\_OBJECT\_CONTROL\_STATE

| MEMORY_OBJECT_CONTROL_STATE |  |   |            |      |     |            |     |              |     |              |     |                  |
|-----------------------------|--|---|------------|------|-----|------------|-----|--------------|-----|--------------|-----|------------------|
| Project:                    | CHV, BSW   |   |            |      |     |            |     |              |     |              |     |                  |
| Source:                     | PRM  |   |            |      |     |            |     |              |     |              |     |                  |
| Size (in bits):             | 7  |   |            |      |     |            |     |              |     |              |     |                  |
| Default Value:              | 0x00000000   |   |            |      |     |            |     |              |     |              |     |                  |
| DWord                       | Bit  | Description   |            |      |     |            |     |              |     |              |     |                  |
| 0                           | 6:5  | <b>Memory Type</b><br>Defines the memory type used in caching accesses to target caches.  |            |      |     |            |     |              |     |              |     |                  |
|                             |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td>UC</td> </tr> <tr> <td>01b</td> <td>Reserved</td> </tr> <tr> <td>10b</td> <td>Reserved</td> </tr> <tr> <td>11b</td> <td>WB</td> </tr> </tbody> </table>                               | Value      | Name | 00b | UC         | 01b | Reserved     | 10b | Reserved     | 11b | WB               |
|                             |  | Value   | Name       |      |     |            |     |              |     |              |     |                  |
|                             |  | 00b   | UC         |      |     |            |     |              |     |              |     |                  |
|                             |  | 01b   | Reserved   |      |     |            |     |              |     |              |     |                  |
|                             | 10b  | Reserved  |            |      |     |            |     |              |     |              |     |                  |
|                             | 11b  | WB  |            |      |     |            |     |              |     |              |     |                  |
|                             | 4:3  | <b>Target Cache</b><br>Allows the control to target caching in the GFX pipeline for EU related surfaces.  |            |      |     |            |     |              |     |              |     |                  |
|                             |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>00b</td> <td>No Caching</td> </tr> <tr> <td>01b</td> <td>No Caching 1</td> </tr> <tr> <td>10b</td> <td>No Caching 2</td> </tr> <tr> <td>11b</td> <td>L3 Cache Allowed</td> </tr> </tbody> </table> | Value      | Name | 00b | No Caching | 01b | No Caching 1 | 10b | No Caching 2 | 11b | L3 Cache Allowed |
|                             |  | Value   | Name       |      |     |            |     |              |     |              |     |                  |
|                             |  | 00b   | No Caching |      |     |            |     |              |     |              |     |                  |
|                             | 01b  | No Caching 1  |            |      |     |            |     |              |     |              |     |                  |
| 10b                         | No Caching 2   |   |            |      |     |            |     |              |     |              |     |                  |
| 11b                         | L3 Cache Allowed   |   |            |      |     |            |     |              |     |              |     |                  |
| 2                           | <b>Reserved</b>  |   |            |      |     |            |     |              |     |              |     |                  |
| 1:0                         | <b>Reserved</b>  |   |            |      |     |            |     |              |     |              |     |                  |
|                             | <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> | Format:   | MBZ        |      |     |            |     |              |     |              |     |                  |
| Format:                     | MBZ  |   |            |      |     |            |     |              |     |              |     |                  |

## MemoryAddressAttributes

| MemoryAddressAttributes  |   |  |                                      |
|--|---|--|--------------------------------------|
| Project:   | CHV, BSW                                    |  |                                      |
| Source:  | PRM   |  |                                      |
| Size (in bits):  | 32  |  |                                      |
| Default Value:   | 0x00000000                                  |  |                                      |
| <p>This field controls the priority of arbitration used in the GAC/GAM pipeline for this surface. It defines the CHV, BSW 32-bit memory address attributes for the third DWord of the HCP command buffer address.</p>  |   |  |                                      |
| DWord  | Bit   | Description  |                                      |
| 0<br><b>Project:</b><br>CHV,<br>BSW  | 31:9  | <b>Reserved</b>                                    |                                      |
|  |   | Project:   | CHV, BSW                             |
|  |   | Format:  | MBZ                                  |
|  | 8:7   | <b>Base Address - Arbitration Priority Control</b> |                                      |
|  |   | Project:   | CHV, BSW                             |
|  |   | Format:  | HEVC_ARBITRATION_PRIORITY [CHV, BSW] |
|  | 6:5   | <b>Reserved</b>                                    |                                      |
|  |   | Project:   | CHV, BSW                             |
|  | 4:3   | <b>Base Address - Target Cache (TC)</b>            |                                      |
|  |   | Project:   | CHV, BSW                             |
| Format:  |   | U2   |                                      |
| This field allows the choice of LLC vs. eLLC for caching.  |   |  |                                      |
| <b>Value</b>   |   | <b>Name</b>  | <b>Description</b>                   |
| 00b  |   | eLLC Only  | Not snooped in GT                    |
| 01b  | LLC Only                                    |  |                                      |
| 10b  | LLC/eLLC Allowed                            |  |                                      |
| 11b  | L3, LLC, eLLC Allowed                       |  |                                      |
| 2  | <b>Reserved</b>                             |  |                                      |
|  | Project:                                    | CHV, BSW   |                                      |
| 1:0  | <b>Base Address - Age for QUADLRU (AGE)</b> |  |                                      |
|  | Project:                                    | CHV, BSW   |                                      |
|  | Format:                                     | U2   |                                      |
| <p>This field allows the selection of AGE parameter for a given surface in LLC. If a particular allocation is done at youngest age ("3") it tends to stay longer in the cache as compared to older age allocations ("2", "1", or "0"). This option is given to the driver to be able to decide which surfaces are more likely to generate HITS, hence need to be replaced least often in caches.</p> |   |  |                                      |



| <b>MemoryAddressAttributes</b> |                                     |
|--------------------------------|-------------------------------------|
|                                | This field is also used for eLLC.   |
| Value                          | Name                                |
| 00b                            | Good chance of generating hits      |
| 01b                            | Next good chance of generating hits |
| 10b                            | Decent chance of generating hits    |
| 11b                            | Poor chance of generating hits      |

## Merged Media Block Message Header

| <b>MH_MBM - Merged Media Block Message Header</b> |  |   |
|---|--|---|
| Project:  | CHV, BSW   |   |
| Source:   | DataPort 1   |   |
| Size (in bits):                                   | 256  |   |
| Default Value:                                    | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |
| DWord   | Bit  | Description   |
| 0   | 31:0   | <b>X Offset</b>   |
|   |  | Project: All  |
|   |  | Format: S31   |
|   |  | X offset (in bytes) of the upper left corner of the block into the surface.   |
| 1   | 31:0   | <b>Y Offset</b>   |
|   |  | Project: All  |
|   |  | Format: S31   |
|   |  | Y offset (in rows) of the upper left corner of the block into the surface.  |
| 2   | 31:0   | <b>Merged Media Block Message Control</b>   |
|   |  | Project: All  |
|   |  | Format: MHC_MBM_CONTROL [CHV, BSW]  |
|   |  | Specifies the Merged message subtype and additional input parameters.   |
| 3   | 31:0   | <b>Mask</b>   |
|   |  | Project: All  |
|   |  | Format: U32   |
|   |  | The Mask is ignored by the Merged Media Block message: all Dwords are always returned on reads, and always enabled to be written on writes. |
| 4   | 31:0   | <b>FFTID</b>  |
|   |  | Project: All  |
|   |  | Format: MHC_FFTID [CHV, BSW]  |
|   |  | Fixed Function Thread ID  |
| 5-7   | 95:0   | <b>Reserved</b>   |
|   |  | Project: All  |
|   |  | Format: Ignore  |
|   |  | Ignored   |

|   |  |  |
|---|--|--|
| <b>MH_MBM - Merged Media Block Message Header</b> |  |  |
|   |  |  |

## Merged Media Block Message Header Control

| <b>MHC_MBM_CONTROL - Merged Media Block Message Header Control</b>  |            |  |             |      |             |         |     |        |   |     |        |          |           |     |
|---|------------|--|-------------|------|-------------|---------|-----|--------|---|-----|--------|----------|-----------|-----|
| Project:  | CHV, BSW   |  |             |      |             |         |     |        |   |     |        |          |           |     |
| Source:   | PRM        |  |             |      |             |         |     |        |   |     |        |          |           |     |
| Size (in bits):   | 32         |  |             |      |             |         |     |        |   |     |        |          |           |     |
| Default Value:  | 0x00000000 |  |             |      |             |         |     |        |   |     |        |          |           |     |
| DWord   | Bit        | Description  |             |      |             |         |     |        |   |     |        |          |           |     |
| 0   | 31:30      | <b>Message Mode</b>  |             |      |             |         |     |        |   |     |        |          |           |     |
|   |            | Project:   | All         |      |             |         |     |        |   |     |        |          |           |     |
|   |            | Format:  | Enumeration |      |             |         |     |        |   |     |        |          |           |     |
| Specifies the Media Block Read message is Normal subtype.   |            |  |             |      |             |         |     |        |   |     |        |          |           |     |
|   |            | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h</td> <td>Normal</td> <td>The Block Height and Block Width fields are specified in this Dword. The Mask is ignored by a media block read message.</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Reserved.</td> <td>All</td> </tr> </tbody> </table> | Value       | Name | Description | Project | 00h | Normal | The Block Height and Block Width fields are specified in this Dword. The Mask is ignored by a media block read message. | All | Others | Reserved | Reserved. | All |
| Value   | Name       | Description  | Project     |      |             |         |     |        |   |     |        |          |           |     |
| 00h   | Normal     | The Block Height and Block Width fields are specified in this Dword. The Mask is ignored by a media block read message.  | All         |      |             |         |     |        |   |     |        |          |           |     |
| Others  | Reserved   | Reserved.  | All         |      |             |         |     |        |   |     |        |          |           |     |
| 29  |            | <b>Reserved</b>  |             |      |             |         |     |        |   |     |        |          |           |     |
|   |            | Project:   | All         |      |             |         |     |        |   |     |        |          |           |     |
|   |            | Format:  | Ignore      |      |             |         |     |        |   |     |        |          |           |     |
| Ignored   |            |  |             |      |             |         |     |        |   |     |        |          |           |     |
| 28:24   |            | <b>Sub-Register Offset</b>   |             |      |             |         |     |        |   |     |        |          |           |     |
|   |            | Project:   | All         |      |             |         |     |        |   |     |        |          |           |     |
|   |            | Format:  | U5          |      |             |         |     |        |   |     |        |          |           |     |
| Provides the sub-register offset in unit of bytes of a Merged Media Block Read message. This field is ignored (reserved) for a media block write message. Range = [0, 28]. Only a multiple of BasePitch, including 0, is valid.   |            |  |             |      |             |         |     |        |   |     |        |          |           |     |
| <b>Programming Notes</b>  |            |  |             |      |             |         |     |        |   |     |        |          |           |     |
| Sub-Register Offset and Register Pitch Control allow software to assembly multiple media block reads directly into a shared GRF register set. For example, if both are set to zero, the read data are written to GRF registers, aligning to the least significant bits of the first register, and the register pitch is equal to the next power-of-2 that is greater than or equal to the Block Width. If Register Pitch Control is non-zero, multiple media block read messages sharing the same Register Pitch Control but with different Sub-Register Offset can fill in the same set of GRF registers with media block data line interleaved. |            |  |             |      |             |         |     |        |   |     |        |          |           |     |
| <b>Restriction</b>  |            |  |             |      |             |         |     |        |   |     |        |          |           |     |
| For the Sampler Cache Data, this field must be zero.  |            |  |             |      |             |         |     |        |   |     |        |          |           |     |

## MHC\_MBM\_CONTROL - Merged Media Block Message Header Control

|          |   |  |          |              |         |        |
|----------|---|--|----------|--------------|---------|--------|
|          | <p>BasePitch is defined as the next the power-of-2 that is greater than or equal to the Block Width. Minimum BasePitch is 1 DWord.</p> <p>Sub-Register Offset must be aligned to BasePitch (therefore will be a multiple of DWords as well). When Register Pitch Control = 0, Sub-Register Offset must align to BasePitch*Block Height. ensuring the output fits in a single GRF register. In general (and specifically when Sub-Register Offset is greater than 0), when the resulting data will cross a GRF register boundary, the data must be placed symmetrically between GRF registers.</p> |  |          |              |         |        |
| 23:22    | <p><b>Reserved</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>   |  | Project: | All          | Format: | Ignore |
| Project: | All   |  |          |              |         |        |
| Format:  | Ignore  |  |          |              |         |        |
| 21:16    | <p><b>Block Height</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U6</td> </tr> </table> <p>Height in rows of block being accessed. Range = [0,63] representing 1 to 64 rows</p> <p style="text-align: center;"><b>Restriction</b></p> <p>If Block Width (bytes), then Maximum Block Height (rows) is constrained by (# Dwords width) * (# rows) &lt;= 64 Dwords.</p>   |  | Project: | All          | Format: | U6     |
| Project: | All   |  |          |              |         |        |
| Format:  | U6  |  |          |              |         |        |
| 15:10    | <p><b>Reserved</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>   |  | Project: | All          | Format: | Ignore |
| Project: | All   |  |          |              |         |        |
| Format:  | Ignore  |  |          |              |         |        |
| 9:8      | <p><b>Reserved</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Project:</td> <td>CHV, BSW*:A0</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table> <p>Restriction : Must be zero.</p>   |  | Project: | CHV, BSW*:A0 | Format: | MBZ    |
| Project: | CHV, BSW*:A0  |  |          |              |         |        |
| Format:  | MBZ   |  |          |              |         |        |
| 7:6      | <p><b>Reserved</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>   |  | Project: | All          | Format: | Ignore |
| Project: | All   |  |          |              |         |        |
| Format:  | Ignore  |  |          |              |         |        |
| 5:0      | <p><b>Block Width</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U6</td> </tr> </table> <p>Width in bytes of the block being accessed. Range = [0,31] representing 1 to 32 Bytes.</p>   |  | Project: | All          | Format: | U6     |
| Project: | All   |  |          |              |         |        |
| Format:  | U6  |  |          |              |         |        |

|  |  |  |
|--|--|--|
| <b>MHC_MBM_CONTROL - Merged Media Block Message Header Control</b> |  |  |
|  |  |  |

## Message Descriptor - Render Target Write

| Message Descriptor - Render Target Write                        |   |  |       |             |             |   |                  |     |   |                |     |
|---|---|--|-------|-------------|-------------|---|------------------|-----|---|----------------|-----|
| Project:  | CHV, BSW  |  |       |             |             |   |                  |     |   |                |     |
| Source:   | PRM   |  |       |             |             |   |                  |     |   |                |     |
| Size (in bits):   | 32  |  |       |             |             |   |                  |     |   |                |     |
| Default Value:  | 0x00000000  |  |       |             |             |   |                  |     |   |                |     |
| DWord   | Bit   | Description  |       |             |             |   |                  |     |   |                |     |
| 0   | 31  | <b>Reserved</b>  |       |             |             |   |                  |     |   |                |     |
|   |   | Format: MBZ  |       |             |             |   |                  |     |   |                |     |
|   | 30  | <b>Data Format</b>   |       |             |             |   |                  |     |   |                |     |
|   |   | Project: CHV, BSW  |       |             |             |   |                  |     |   |                |     |
|   |   | Format: U1   |       |             |             |   |                  |     |   |                |     |
|   |   | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Single Precision</td> <td>32b</td> </tr> <tr> <td>1</td> <td>Half Precision</td> <td>16b</td> </tr> </tbody> </table> | Value | Name        | Description | 0 | Single Precision | 32b | 1 | Half Precision | 16b |
|   |   | Value  | Name  | Description |             |   |                  |     |   |                |     |
|   | 0   | Single Precision   | 32b   |             |             |   |                  |     |   |                |     |
|   | 1   | Half Precision   | 16b   |             |             |   |                  |     |   |                |     |
|   | <b>Programming Notes</b>  |  |       |             |             |   |                  |     |   |                |     |
| This field is applicable for Render Target Write Messages ONLY. |   |  |       |             |             |   |                  |     |   |                |     |
| 29:14   | <b>Reserved</b>   |  |       |             |             |   |                  |     |   |                |     |
|   | Format: MBZ   |  |       |             |             |   |                  |     |   |                |     |
| 13  | <b>Reserved</b>   |  |       |             |             |   |                  |     |   |                |     |
|   | Project: CHV, BSW   |  |       |             |             |   |                  |     |   |                |     |
|   | Format: MBZ   |  |       |             |             |   |                  |     |   |                |     |
| 12  | <b>Last Render Target Select</b>  |  |       |             |             |   |                  |     |   |                |     |
|   | <p>This bit must be set on the last render target write message sent for each group of pixels. For single render target pixel shaders, this bit is set on all render target write messages. For multiple render target pixel shaders, this bit is set only on messages sent to the last render target. This bit must be zero for SIMD8 Image Write message.</p>   |  |       |             |             |   |                  |     |   |                |     |
|   | <p style="text-align: center;"><b>Programming Notes</b></p> <p>In general, when threads are not launched by 3D FF, this bit must be zero.</p>   |  |       |             |             |   |                  |     |   |                |     |
| 11  | <b>Slot Group Select</b>  |  |       |             |             |   |                  |     |   |                |     |
|   | <p>This field selects whether slots 15:0 or slots 31:16 are used for bypassed data. Bypassed data includes the antialias alpha, multisample coverage mask, and if the header is not present also includes the X/Y addresses and pixel enables. For 8- and 16-pixel dispatches, SLOTGRP_LO must be selected on every message. For 32-pixel dispatches, this field must be set correctly for each message based on which slots are currently being processed.</p> |  |       |             |             |   |                  |     |   |                |     |
|   | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> </tbody> </table>  | Value  | Name  | Description |             |   |                  |     |   |                |     |
| Value   | Name  | Description  |       |             |             |   |                  |     |   |                |     |

| <b>Message Descriptor - Render Target Write</b> |   |                  |  |
|---|---|------------------|--|
|   | 0   | SLOTGRP_LO       | choose bypassed data for slots 15:0  |
|   | 1   | SLOTGRP_HI       | choose bypassed data for slots 31:16   |
| <b>Programming Notes</b>                        |   |                  |  |
|   |   |                  | For SIMD8 Image Write message thsi field MBZ.  |
| 10:8  | <b>Message Type</b><br>This field specifies the type of render target message. For the SIMD8_DUALSRC_xx messages, the low bit indicates which slots to use for the pixel enables, X/Y addresses, and oMask. |                  |  |
|   | <b>Value</b>  | <b>Name</b>      | <b>Description</b>   |
|   | 000b  | SIMD16           | SIMD16 single source message   |
|   | 001b  | SIMD16_REPDATA   | SIMD16 single source message with replicated data  |
|   | 010b  | SIMD8_DUALSRC_LO | SIMD8 dual source message, use slots 7:0   |
|   | 011b  | SIMD8_DUALSRC_HI | SIMD8 dual source message, use slots 15:8  |
|   | 100b  | SIMD8_LO         | SIMD8 single source message, use slots 7:0   |
|   | 111b  | SIMD16_REPDATA   | It's only supported when accessing <i>Tiled Memory</i> . Using this Message Type to access linear ( <i>Untiled</i> ) memory is UNDEFINED.  |
| <b>Programming Notes</b>                        |   |                  | <b>Project</b>   |
|   |   |                  |  |
|   |   |                  | the above slots indicated are within the 16 slots selected by <b>Slot Group Select</b> . If SLOTGRP_HI is selected, the SIMD8 message types above reference slots 23:16 or 31:24 instead of 7:0 or 15:8, respectively. |
|   |   |                  | SIMD16_REPDATA message must not be used in SIMD8 pixel-shaders.  |
|   |   |                  | CHV,<br>BSW  |
| 7:0   | <b>Reserved</b>   |                  |  |
|   | Format:   | MBZ              |  |



## Message Descriptor - Sampling Engine

| Message Descriptor - Sampling Engine   |  |  |                    |                    |             |   |        |                    |   |        |                    |
|--|--|--|--------------------|--------------------|-------------|---|--------|--------------------|---|--------|--------------------|
| Project:   | CHV, BSW   |  |                    |                    |             |   |        |                    |   |        |                    |
| Source:  | PRM  |  |                    |                    |             |   |        |                    |   |        |                    |
| Size (in bits):  | 32   |  |                    |                    |             |   |        |                    |   |        |                    |
| Default Value:   | 0x00000000   |  |                    |                    |             |   |        |                    |   |        |                    |
| DWord  | Bit  | Description  |                    |                    |             |   |        |                    |   |        |                    |
| 0  | 31   | <b>EOT</b>   |                    |                    |             |   |        |                    |   |        |                    |
|  |  | Project: All   |                    |                    |             |   |        |                    |   |        |                    |
|  | 30   | <b>Return Format</b>   |                    |                    |             |   |        |                    |   |        |                    |
|  |  | Project: CHV, BSW  |                    |                    |             |   |        |                    |   |        |                    |
|  |  | Format: U1   |                    |                    |             |   |        |                    |   |        |                    |
|  |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>32-bit</td> <td>Return data is 32b</td> </tr> <tr> <td>1</td> <td>16-bit</td> <td>Return data is 16b</td> </tr> </tbody> </table> | Value              | Name               | Description | 0 | 32-bit | Return data is 32b | 1 | 16-bit | Return data is 16b |
|  |  | Value  | Name               | Description        |             |   |        |                    |   |        |                    |
|  |  | 0  | 32-bit             | Return data is 32b |             |   |        |                    |   |        |                    |
|  | 1  | 16-bit   | Return data is 16b |                    |             |   |        |                    |   |        |                    |
|  | <b>Programming Notes</b>   |  |                    |                    |             |   |        |                    |   |        |                    |
| This field must be set to 32-bit for messages with SIMD Mode of SIMD4x2 or SIMD32/64. This field must be set to 32 for resinfo, LOD and sampleinfo messages. |  |  |                    |                    |             |   |        |                    |   |        |                    |
| 29   | <b>Reserved</b>  |  |                    |                    |             |   |        |                    |   |        |                    |
|  | Project: CHV, BSW  |  |                    |                    |             |   |        |                    |   |        |                    |
| 28:25  | Format: MBZ  |  |                    |                    |             |   |        |                    |   |        |                    |
|  | <b>Message Length</b>  |  |                    |                    |             |   |        |                    |   |        |                    |
|  | Format: U4   |  |                    |                    |             |   |        |                    |   |        |                    |
|  | This field specifies the number of 256-bit GRF registers starting from (src) to be sent out on the request message payload.                |  |                    |                    |             |   |        |                    |   |        |                    |
|  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>[1,15]</td> <td></td> </tr> </tbody> </table> | Value  | Name               | [1,15]             |             |   |        |                    |   |        |                    |
| Value  | Name   |  |                    |                    |             |   |        |                    |   |        |                    |
| [1,15]   |  |  |                    |                    |             |   |        |                    |   |        |                    |
| <b>Programming Notes</b>   |  |  |                    |                    |             |   |        |                    |   |        |                    |
| A value of 0 is considered erroneous.  |  |  |                    |                    |             |   |        |                    |   |        |                    |
| 24:20  | <b>Response Length</b>   |  |                    |                    |             |   |        |                    |   |        |                    |
|  | Format: U5   |  |                    |                    |             |   |        |                    |   |        |                    |
|  | This field indicates the number of 256-bit registers expected in the message response.   |  |                    |                    |             |   |        |                    |   |        |                    |
| <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>[0,16]</td> <td></td> </tr> </tbody> </table>                   |  | Value  | Name               | [0,16]             |             |   |        |                    |   |        |                    |
| Value  | Name   |  |                    |                    |             |   |        |                    |   |        |                    |
| [0,16]   |  |  |                    |                    |             |   |        |                    |   |        |                    |

| <b>Message Descriptor - Sampling Engine</b>  |   |                   |        |  |      |         |  |                   |  |  |  |
|--|---|-------------------|--------|--|------|---------|--|-------------------|--|--|--|
|  | <table border="1" style="width: 100%;"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">A value 0 indicates that the request message does not expect any response. The largest response supported is 16 GRF registers.</td> </tr> </table>   | Programming Notes |        | A value 0 indicates that the request message does not expect any response. The largest response supported is 16 GRF registers. |      |         |  |                   |  |  |  |
| Programming Notes  |   |                   |        |  |      |         |  |                   |  |  |  |
| A value 0 indicates that the request message does not expect any response. The largest response supported is 16 GRF registers.   |   |                   |        |  |      |         |  |                   |  |  |  |
| 19   | <p><b>Header Present</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>Enable</td> </tr> </table> <p>Specifies whether the message includes a header phase. If the header is not present (this field is zero), all of the fields normally contained in the header are assumed to be 0.</p>  | Format:           | Enable |  |      |         |  |                   |  |  |  |
| Format:  | Enable  |                   |        |  |      |         |  |                   |  |  |  |
| 18:17  | <p><b>SIMD Mode[1:0]</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U2</td> </tr> </table> <p>Specifies the SIMD mode of the message being sent.</p>   | Format:           | U2     |  |      |         |  |                   |  |  |  |
| Format:  | U2  |                   |        |  |      |         |  |                   |  |  |  |
| 16:12  | <p><b>Message Type</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U5</td> </tr> </table> <p>Specifies the type of message being sent. For more details, please refer to <b>Message Format</b> section for the definition of these 5 bits.</p>  | Format:           | U5     |  |      |         |  |                   |  |  |  |
| Format:  | U5  |                   |        |  |      |         |  |                   |  |  |  |
| 11:8   | <p><b>Sampler Index</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U4</td> </tr> </table> <p>Specifies the index into the sampler state table. Ignored for ld, resinfo, sampleinfo, and cache_flush type messages.</p> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="width: 50%;">Value</th> <th style="width: 50%;">Name</th> </tr> </thead> <tbody> <tr> <td>[0,15]</td> <td></td> </tr> </tbody> </table> <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2"> <ul style="list-style-type: none"> <li>For the deinterlace message, this field must be a multiple of 2 (even).</li> <li>For the sample_8x8 message, this field must be a multiple of 4.</li> </ul> </td> </tr> </table> | Format:           | U4     | Value  | Name | [0,15]  |  | Programming Notes |  | <ul style="list-style-type: none"> <li>For the deinterlace message, this field must be a multiple of 2 (even).</li> <li>For the sample_8x8 message, this field must be a multiple of 4.</li> </ul> |  |
| Format:  | U4  |                   |        |  |      |         |  |                   |  |  |  |
| Value  | Name  |                   |        |  |      |         |  |                   |  |  |  |
| [0,15]   |   |                   |        |  |      |         |  |                   |  |  |  |
| Programming Notes  |   |                   |        |  |      |         |  |                   |  |  |  |
| <ul style="list-style-type: none"> <li>For the deinterlace message, this field must be a multiple of 2 (even).</li> <li>For the sample_8x8 message, this field must be a multiple of 4.</li> </ul> |   |                   |        |  |      |         |  |                   |  |  |  |
| 7:0  | <p><b>Binding Table Index</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U8</td> </tr> </table> <p>Specifies the index into the <b>binding table</b>. Ignored for cache_flush type messages. Values of 255 and 253 indicate stateless. 254 indicates SLM. 252 indicates bindless.</p> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="width: 50%;">Value</th> <th style="width: 50%;">Name</th> </tr> </thead> <tbody> <tr> <td>[0,255]</td> <td></td> </tr> </tbody> </table>   | Format:           | U8     | Value  | Name | [0,255] |  |                   |  |  |  |
| Format:  | U8  |                   |        |  |      |         |  |                   |  |  |  |
| Value  | Name  |                   |        |  |      |         |  |                   |  |  |  |
| [0,255]  |   |                   |        |  |      |         |  |                   |  |  |  |

## MFD\_MPEG2\_BSD\_OBJECT Inline Data Description

| MFD_MPEG2_BSD_OBJECT Inline Data Description              |  |   |  |                   |             |    |  |  |    |   |   |
|---|--|---|--|-------------------|-------------|----|--|--|----|---|---|
| Project:  | CHV, BSW   |   |  |                   |             |    |  |  |    |   |   |
| Source:   | VideoCS  |   |  |                   |             |    |  |  |    |   |   |
| Size (in bits):   | 64   |   |  |                   |             |    |  |  |    |   |   |
| Default Value:  | 0x00000000, 0x00000000   |   |  |                   |             |    |  |  |    |   |   |
| DW0..1 corresponds to DW3..4 of the MFD_MPEG2_BSD_OBJECT. |  |   |  |                   |             |    |  |  |    |   |   |
| DWord   | Bit  | Description   |  |                   |             |    |  |  |    |   |   |
| 0   | 31:24  | <p><b>Slice Horizontal Position</b></p> <table border="1"> <tr> <td>Format:</td> <td>U8 in Macroblocks</td> </tr> </table> <p>This field indicates the horizontal position of the first macroblock in the slice.</p>  | Format:  | U8 in Macroblocks |             |    |  |  |    |   |   |
|   | Format:  | U8 in Macroblocks   |  |                   |             |    |  |  |    |   |   |
|   | 23:16  | <p><b>Slice Vertical Position</b></p> <table border="1"> <tr> <td>Format:</td> <td>U8 in Macroblocks</td> </tr> </table> <p>This field indicates the vertical position of the first macroblock in the slice.</p>  | Format:  | U8 in Macroblocks |             |    |  |  |    |   |   |
|   | Format:  | U8 in Macroblocks   |  |                   |             |    |  |  |    |   |   |
| 15:8  | <p><b>Macroblock Count</b></p> <table border="1"> <tr> <td>Format:</td> <td>U8 in Macroblocks</td> </tr> </table> <p>This field indicates the number of macroblocks in the slice, including skipped macroblocks.</p>   | Format:   | U8 in Macroblocks  |                   |             |    |  |  |    |   |   |
| Format:   | U8 in Macroblocks  |   |  |                   |             |    |  |  |    |   |   |
| 7   | <p><b>Slice Concealment Override Bit</b></p> <p>This bit forces hardware to handle the current slice in Conceal or Deocode Mode. If this bit is set to one, VIN will force the current slice to do concealment or to decode from bitstream regardless if the slice boundary has errors or not.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1h</td> <td></td> <td>VIN will use driver-provided "Slice Concealment Type" regardless of valid slice boundary</td> </tr> <tr> <td>0h</td> <td></td> <td>Driver must program "Slice Concealment Type" to '0'. VIN will set "Slice Concealment Type" depending if the slice boundary has error or not</td> </tr> </tbody> </table> | Value   | Name   | Description       | 1h          |    | VIN will use driver-provided "Slice Concealment Type" regardless of valid slice boundary | 0h   |    | Driver must program "Slice Concealment Type" to '0'. VIN will set "Slice Concealment Type" depending if the slice boundary has error or not |   |
| Value   | Name   | Description   |  |                   |             |    |  |  |    |   |   |
| 1h  |  | VIN will use driver-provided "Slice Concealment Type" regardless of valid slice boundary  |  |                   |             |    |  |  |    |   |   |
| 0h  |  | Driver must program "Slice Concealment Type" to '0'. VIN will set "Slice Concealment Type" depending if the slice boundary has error or not   |  |                   |             |    |  |  |    |   |   |
| 6   |  | <p><b>Slice Concealment Type Bit</b></p> <p>This bit can be forced by driver ("Slice Concealment Override Bit") or set by VINunit depending on slice boundary errors.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1h</td> <td></td> <td>VMD will conceal all MBs of the slice regardless of bitstream. (If driver does not force the value of this bit, VIN will set this bit depending on slice boundary error. If the next slice position of the current slice is out-of-bound or the same or earlier than the current slice start position, VIN will set this bit for the next slice)</td> </tr> <tr> <td>0h</td> <td></td> <td>VMD will decode MBs from the bitstream until the bitstream is run-out. Then VMD will conceal the remaining MBs.</td> </tr> </tbody> </table> | Value  | Name              | Description | 1h |  | VMD will conceal all MBs of the slice regardless of bitstream. (If driver does not force the value of this bit, VIN will set this bit depending on slice boundary error. If the next slice position of the current slice is out-of-bound or the same or earlier than the current slice start position, VIN will set this bit for the next slice) | 0h |   | VMD will decode MBs from the bitstream until the bitstream is run-out. Then VMD will conceal the remaining MBs. |
|   | Value  | Name  | Description  |                   |             |    |  |  |    |   |   |
|   | 1h   |   | VMD will conceal all MBs of the slice regardless of bitstream. (If driver does not force the value of this bit, VIN will set this bit depending on slice boundary error. If the next slice position of the current slice is out-of-bound or the same or earlier than the current slice start position, VIN will set this bit for the next slice) |                   |             |    |  |  |    |   |   |
| 0h  |  | VMD will decode MBs from the bitstream until the bitstream is run-out. Then VMD will conceal the remaining MBs.   |  |                   |             |    |  |  |    |   |   |

| <b>MFD_MPEG2_BSD_OBJECT Inline Data Description</b>  |                   |  |                   |                   |   |    |  |   |    |  |  |
|--|-------------------|--|-------------------|-------------------|---|----|--|---|----|--|--|
|  |                   | <table border="1" style="width: 100%;"> <thead> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> </thead> <tbody> <tr> <td colspan="2">VIN can turn this bit from 0 to 1 internally if "Slice Concealment Disable Bit" is "0" and VIN detects slice boundary errors.</td> </tr> </tbody> </table>   | Programming Notes |                   | VIN can turn this bit from 0 to 1 internally if "Slice Concealment Disable Bit" is "0" and VIN detects slice boundary errors. |    |  |   |    |  |  |
| Programming Notes  |                   |  |                   |                   |   |    |  |   |    |  |  |
| VIN can turn this bit from 0 to 1 internally if "Slice Concealment Disable Bit" is "0" and VIN detects slice boundary errors.  |                   |  |                   |                   |   |    |  |   |    |  |  |
|  | 5                 | <p><b>Last Pic Slice</b><br/>This bit is added to support error concealment at the end of a picture.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1h</td> <td></td> <td>The current Slice is the last Slice of the entire picture</td> </tr> <tr> <td>0h</td> <td></td> <td>The current Slice is not the last Slice of current picture</td> </tr> </tbody> </table>  | Value             | Name              | Description   | 1h |  | The current Slice is the last Slice of the entire picture | 0h |  | The current Slice is not the last Slice of current picture |
| Value  | Name              | Description  |                   |                   |   |    |  |   |    |  |  |
| 1h   |                   | The current Slice is the last Slice of the entire picture  |                   |                   |   |    |  |   |    |  |  |
| 0h   |                   | The current Slice is not the last Slice of current picture   |                   |                   |   |    |  |   |    |  |  |
|  | 4                 | <b>Reserved</b>  |                   |                   |   |    |  |   |    |  |  |
|  | 3                 | <p><b>Is Last MB</b></p> <table border="1" style="width: 100%;"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1h</td> <td></td> <td>The current MB is the last MB in the current Slice</td> </tr> <tr> <td>0h</td> <td></td> <td>The current MB is not the last MB in the current Slice</td> </tr> </tbody> </table>   | Value             | Name              | Description   | 1h |  | The current MB is the last MB in the current Slice        | 0h |  | The current MB is not the last MB in the current Slice     |
| Value  | Name              | Description  |                   |                   |   |    |  |   |    |  |  |
| 1h   |                   | The current MB is the last MB in the current Slice   |                   |                   |   |    |  |   |    |  |  |
| 0h   |                   | The current MB is not the last MB in the current Slice   |                   |                   |   |    |  |   |    |  |  |
|  | 2:0               | <p><b>First Macroblock Bit Offset</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: right;">U3</td> </tr> </table> <p>This field provides the bit offset of the first macroblock in the first byte of the input bitstream.</p>  | Format:           | U3                |   |    |  |   |    |  |  |
| Format:  | U3                |  |                   |                   |   |    |  |   |    |  |  |
| 1  | 31:29             | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: right;">MBZ</td> </tr> </table>  | Format:           | MBZ               |   |    |  |   |    |  |  |
| Format:  | MBZ               |  |                   |                   |   |    |  |   |    |  |  |
|  | 28:24             | <p><b>Quantizer Scale Code</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: right;">U5</td> </tr> </table> <p>This field sets the quantizer scale code of the inverse quantizer. It remains in effect until changed by a decoded quantizer scale code in a macroblock. This field is decoded from the slice header by host software.</p>   | Format:           | U5                |   |    |  |   |    |  |  |
| Format:  | U5                |  |                   |                   |   |    |  |   |    |  |  |
|  | 23:17             | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: right;">MBZ</td> </tr> </table>  | Format:           | MBZ               |   |    |  |   |    |  |  |
| Format:  | MBZ               |  |                   |                   |   |    |  |   |    |  |  |
|  | 16:8              | <p><b>Next Slice Vertical Position</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: right;">U9 in macroblocks</td> </tr> </table> <p>This field indicates the vertical position (in macroblock units) of the first macroblock in the next slice.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> </thead> <tbody> <tr> <td colspan="2">This field is primarily used for error concealment. In the case that current slice is the last slice, this field should set to the height of the picture (field picture will be in height of field) (since y-direction is zero-based numbering).</td> </tr> </tbody> </table> | Format:           | U9 in macroblocks | Programming Notes   |    | This field is primarily used for error concealment. In the case that current slice is the last slice, this field should set to the height of the picture (field picture will be in height of field) (since y-direction is zero-based numbering). |   |    |  |  |
| Format:  | U9 in macroblocks |  |                   |                   |   |    |  |   |    |  |  |
| Programming Notes  |                   |  |                   |                   |   |    |  |   |    |  |  |
| This field is primarily used for error concealment. In the case that current slice is the last slice, this field should set to the height of the picture (field picture will be in height of field) (since y-direction is zero-based numbering). |                   |  |                   |                   |   |    |  |   |    |  |  |
|  | 7:0               | <p><b>Next Slice Horizontal Position</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: right;">U8 in macroblocks</td> </tr> </table> <p>This field indicates the horizontal position (in macroblock units) of the first macroblock in the</p>   | Format:           | U8 in macroblocks |   |    |  |   |    |  |  |
| Format:  | U8 in macroblocks |  |                   |                   |   |    |  |   |    |  |  |

| <b>MFD_MPEG2_BSD_OBJECT Inline Data Description</b>   |   |                          |   |
|---|---|--------------------------|---|
|   | <p>next slice.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center; background-color: #e6f2ff;"><b>Programming Notes</b></th> </tr> </thead> <tbody> <tr> <td> <p>This field is primarily used for error concealment. In the case that current slice is the last slice, this field should set 0.</p> </td> </tr> </tbody> </table> | <b>Programming Notes</b> | <p>This field is primarily used for error concealment. In the case that current slice is the last slice, this field should set 0.</p> |
| <b>Programming Notes</b>  |   |                          |   |
| <p>This field is primarily used for error concealment. In the case that current slice is the last slice, this field should set 0.</p> |   |                          |   |

## MPEG2

| <b>MPEG2</b>    |            |  |         |     |
|-----------------|------------|--|---------|-----|
| Project:        | CHV, BSW   |  |         |     |
| Source:         | VideoCS    |  |         |     |
| Size (in bits): | 16         |  |         |     |
| Default Value:  | 0x00000000 |  |         |     |
| DWord           | Bit        | Description  |         |     |
| 0               | 15:6       | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">MBZ</td> </tr> </table>                            | Format: | MBZ |
|                 | Format:    | MBZ  |         |     |
|                 | 5          | <b>Missing EOB Error</b><br>This flag indicates missing EOB SEs coded in the bit-stream. Missing EOBs are concealed to match CBP of the error MB.  |         |     |
|                 | 4          | <b>Inconsistent starting position Error - overlapping MBs</b><br>This flag indicates two slices overlapping one another by one or more MBs. Duplicate MBs decoded off the second slice shall be discarded. |         |     |
|                 | 3          | <b>Slice out-of-bound Error</b><br>This flag indicates a slice is running beyond the width of the picture. Out-of-bound MBs shall be discarded.  |         |     |
|                 | 2          | <b>Premature frame end Error</b><br>This flag indicates missing slices/MBs coded in the bit-stream of a frame. One or more MBs are concealed to reach end of picture.                                      |         |     |
|                 | 1          | <b>Inconsistent starting position Error - Missing MBs</b><br>This flag indicates one or more MBs are being concealed due to inconsistent MB starting and ending positions between slices.                  |         |     |
|                 | 0          | <b>MB Concealment Flag</b><br>. Each pulse from this flag indicates one MB is concealed by hardware.   |         |     |

## MPEG4-2\_Inline\_DMEM

| <b>MPEG4-2_Inline_DMEM</b> |   |  |
|----------------------------|---|--|
| Project:                   | CHV, BSW  |  |
| Source:                    | PRM   |  |
| Size (in bits):            | 1600  |  |
| Default Value:             | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |  |
| DWord                      | Bit   | Description  |
| 0                          | 31:3  | <b>Reserved</b><br>Format: MBZ   |
|                            | 2:0   | <b>hw_used_bits</b><br>Index into the first valid bit of the starting byte of the first macroblock of the frame. |
| 1                          | 31:1  | <b>Reserved</b><br>Format: MBZ   |
|                            | 0   | <b>hw_short_video_header</b><br>MPEG4-2 SE: short_video_header   |
| 2                          | 31:2  | <b>Reserved</b><br>Format: MBZ   |
|                            | 1:0   | <b>hw_shape</b><br>MPEG4-2 SE: video_object_layer_shape (rectangular support only)                               |
| 3                          | 31:16   | <b>Reserved</b><br>Format: MBZ   |
|                            | 15:0  | <b>hw_vop_time_incr_resolution_bits</b><br>MPEG4-2 SE: vop_time_increment_resolution                             |
| 4                          | 31:13   | <b>Reserved</b><br>Format: MBZ   |
|                            | 12:0  | <b>hw_width</b><br>MPEG4-2 SE: vop_width   |
| 5                          | 31:13   | <b>Reserved</b><br>Format: MBZ   |
|                            | 12:0  | <b>hw_height</b>   |

| <b>MPEG4-2_Inline_DMEM</b> |      |  |
|----------------------------|------|--|
|                            |      | MPEG4-2 SE: vop_height   |
| 6                          | 31:1 | <b>Reserved</b><br>Format: MBZ   |
|                            | 0    | <b>hw_interlaced</b><br>MPEG4-2 SE: interlaced   |
| 7                          | 31:1 | <b>Reserved</b><br>Format: MBZ   |
|                            | 0    | <b>hw_obmc_disable</b><br>MPEG4-2 SE: obmc_disable<br><b>Programming Notes</b><br>OBMC currently not supported; must be set to zero  |
| 8                          | 31:1 | <b>Reserved</b><br>Format: MBZ   |
|                            | 0    | <b>hw_sprite_enable</b><br>MPEG4-2 SE: sprint_enable   |
| 9                          | 31:6 | <b>Reserved</b><br>Format: MBZ   |
|                            | 5:0  | <b>hw_sprite_warping_points</b><br>MPEG4-2 SE: no_of_sprite_warping_points<br><b>Programming Notes</b><br>Only 0 and 1 supported     |
| 10                         | 31:2 | <b>Reserved</b><br>Format: MBZ   |
|                            | 1:0  | <b>hw_sprite_warping_accuracy</b><br>MPEG4-2 SE: sprite_warping_accuracy<br><b>Programming Notes</b><br>Only 1/2, 1/4, 1/8 supported |
| 11                         | 31:4 | <b>Reserved</b><br>Format: MBZ   |
|                            | 3:0  | <b>hw_quant_precision</b><br>MPEG4-2 SE: quant_precision<br><b>Programming Notes</b><br>Must be set to 5h for ASP/SP profiles        |
| 12                         | 31:1 | <b>Reserved</b><br>Format: MBZ   |
|                            | 0    | <b>hw_quant_type</b><br>MPEG4-2 SE: quant_type   |



| <b>MPEG4-2_Inline_DMEM</b> |       |  |
|----------------------------|-------|--|
| 13                         | 31:1  | <b>Reserved</b><br>Format: MBZ   |
|                            | 0     | <b>hw_quarter_sample</b><br>MPEG4-2 SE: quarter_sample   |
| 14                         | 31:1  | <b>Reserved</b><br>Format: MBZ   |
|                            | 0     | <b>hw_resync_marker_disable</b><br>MPEG4-2 SE: resync_marker_disable   |
| 15                         | 31:1  | <b>Reserved</b><br>Format: MBZ   |
|                            | 0     | <b>hw_data_partitioned</b><br>MPEG4-2 SE: data_partitioned<br><br><b>Programming Notes</b><br>Data partitioning currently not supported; must be set to zero |
| 16                         | 31:1  | <b>Reserved</b><br>Format: MBZ   |
|                            | 0     | <b>hw_reversible_vlc</b><br>MPEG4-2 SE: reversible_vlc   |
| 17                         | 31:7  | <b>Reserved</b><br>Format: MBZ   |
|                            | 6:0   | <b>hw_MacroBlockPerRow</b><br>Number of macroblocks per row, $\text{trunc}(\text{vop\_width} + 15 \gg 4)$  |
| 18                         | 31:7  | <b>Reserved</b><br>Format: MBZ   |
|                            | 6:0   | <b>hw_MacroBlockPerCol</b><br>Number of macroblocks per column, $\text{trunc}(\text{vop\_height} + 15 \gg 4)$  |
| 19                         | 31:15 | <b>Reserved</b><br>Format: MBZ   |
|                            | 14:0  | <b>hw_MacroBlockPerVOP</b><br>Number of macroblocks per VOP, $\text{MacroBlockPerRow} * \text{MacroBlockPerCol}$   |
| 20                         | 31:4  | <b>Reserved</b><br>Format: MBZ   |
|                            | 3:0   | <b>hw_length_of_MB_number_code</b><br>Length of macroblock number code (1-14) in Table 6-27 column one of the MPEG4-2 standard specification                 |
| 21                         | 31:0  | <b>hw_Tframe</b><br>Tframe calculation is described in section 7.7.2.2 Motion vector decoding in B-VOP in the MPEG4-2 standard specification                 |

| <b>MPEG4-2_Inline_DMEM</b> |      |  |
|----------------------------|------|--|
| 22                         | 31:0 | <b>hw_TRD</b><br>TRD calculation is described in section 7.7.2.2 Motion vector decoding in B-VOP in the MPEG4-2 standard specification |
| 23                         | 31:0 | <b>hw_TRB</b><br>TRB calculation is described in section 7.7.2.2 Motion vector decoding in B-VOP in the MPEG4-2 standard specification |
| 24                         | 31:2 | <b>Reserved</b><br>Format: MBZ   |
|                            | 1:0  | <b>hw_coding_type</b><br>MPEG4-2 SE: vop_coding_type   |
| 25                         | 31:1 | <b>Reserved</b><br>Format: MBZ   |
|                            | 0    | <b>hw_rounding_type</b><br>MPEG4-2 SE: rounding_type   |
| 26                         | 31:3 | <b>Reserved</b><br>Format: MBZ   |
|                            | 2:0  | <b>hw_intra_dc_vlc_thr</b><br>MPEG4-2 SE: intra_dc_vlc_thr   |
| 27                         | 31:1 | <b>Reserved</b><br>Format: MBZ   |
|                            | 0    | <b>hw_top_field_first</b><br>MPEG4-2 SE: top_field_first   |
| 28                         | 31:1 | <b>Reserved</b><br>Format: MBZ   |
|                            | 0    | <b>hw_alt_vertical_scan_flag</b><br>MPEG4-2 SE: alt_vertical_scan_flag   |
| 29                         | 31:0 | <b>hw_warping_mv_code_du[0]</b><br>MPEG4-2 SE: warping_mv_code(du[0])  |
| 30                         | 31:0 | <b>hw_warping_mv_code_du[1]</b><br>MPEG4-2 SE: warping_mv_code(du[1])  |
| 31                         | 31:0 | <b>hw_warping_mv_code_du[2]</b><br>MPEG4-2 SE: warping_mv_code(du[2])  |
| 32                         | 31:0 | <b>hw_warping_mv_code_du[3]</b><br>MPEG4-2 SE: warping_mv_code(du[3])  |
| 33                         | 31:0 | <b>hw_warping_mv_code_dv[0]</b><br>MPEG4-2 SE: warping_mv_code(dv[0])  |
| 34                         | 31:0 | <b>hw_warping_mv_code_dv[1]</b><br>MPEG4-2 SE: warping_mv_code(dv[1])  |
| 35                         | 31:0 | <b>hw_warping_mv_code_dv[2]</b>  |

| <b>MPEG4-2_Inline_DMEM</b> |      |  |
|----------------------------|------|--|
|                            |      | MPEG4-2 SE: warping_mv_code(dv[2])   |
| 36                         | 31:0 | <b>hw_warping_mv_code_dv[3]</b><br>MPEG4-2 SE: warping_mv_code(dv[3])  |
| 37                         | 31:5 | <b>Reserved</b><br>Format: MBZ   |
|                            | 4:0  | <b>hw_quant</b><br>MPEG4-2 SE: vop_quant for non-short header mode only<br>(see <b>hw_263_vop_quant</b> for short header mode)   |
| 38                         | 31:3 | <b>Reserved</b><br>Format: MBZ   |
|                            | 2:0  | <b>hw_fcode_forward</b><br>MPEG4-2 SE: vop_fcode_forward   |
| 39                         | 31:3 | <b>Reserved</b><br>Format: MBZ   |
|                            | 2:0  | <b>hw_fcode_backward</b><br>MPEG4-2 SE: vop_fcode_backward   |
| 40                         | 31:9 | <b>Reserved</b><br>Format: MBZ   |
|                            | 8:0  | <b>hw_quant_scale</b><br>MPEG4-2 SE: quant_scale   |
| 41                         | 31:8 | <b>Reserved</b><br>Format: MBZ   |
|                            | 7:0  | <b>hw_263_temporal_reference</b><br>MPEG4-2 SE: temporal_reference (short header format only)                                    |
| 42                         | 31:5 | <b>Reserved</b><br>Format: MBZ   |
|                            | 4:0  | <b>hw_263_vop_quant</b><br>MPEG4-2 SE: vop_quant (short header format only)  |
| 43                         | 31:5 | <b>Reserved</b><br>Format: MBZ   |
|                            | 4:0  | <b>hw_263_gob_number</b><br>MPEG4-2 SE: gob_number (short header format only)  |
| 44                         | 31:0 | <b>hw_263_num_gobs_in_vop</b><br>Derived from Table 6-29 in the MPEG4-2 standard specification (short header format only)        |
| 45                         | 31:0 | <b>hw_263_num_macroblocks_in_gob</b><br>Derived from Table 6-29 in the MPEG4-2 standard specification (short header format only) |
| 46                         | 31:1 | <b>Reserved</b><br>Format: MBZ   |

| <b>MPEG4-2_Inline_DMEM</b> |   |   |  |     |
|----------------------------|---|---|--|-----|
|                            | 0   | <b>hw_263_gob_header_empty</b><br>MPEG4-2 SE: gob_header_empty (short header format only)   |  |     |
| 47                         | 31:1  | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>               |  | MBZ |
|                            |   | MBZ   |  |     |
| 0                          | <b>hw_263_gob_frame_id</b><br>MPEG4-2 SE: gob_frame_id (short header format only) |   |  |     |
| 48                         | 31:9  | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>               |  | MBZ |
|                            |   | MBZ   |  |     |
| 8:0                        | <b>hw_263_quant_scale</b><br>MPEG4-2 SE: quant_scale (short header format only)   |   |  |     |
| 49                         | 31:0  | <b>hw_263_num_rows_in_gob</b><br>Refer to Table 6-29 in the MPEG4-2 standard specification,<br>vop_height/(16*num_gobs_in_vop) (short header format only) |  |     |

## MsgDescpt31

| <b>MsgDescpt31</b> |  |   |        |      |                     |
|--------------------|--|---|--------|------|---------------------|
| Source:            | Eulsa  |   |        |      |                     |
| Size (in bits):    | 29   |   |        |      |                     |
| Default Value:     | 0x00000000   |   |        |      |                     |
| DWord              | Bit  | Description   |        |      |                     |
| 0                  | 28:25  | <b>Message Length</b><br>This field specifies the number of 256-bit MRF registers starting from <curr_dest> to be sent out on the request message payload. Valid value ranges from 1 to 15. A value of 0 is considered erroneous.   |        |      |                     |
|                    |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1-15</td> <td>Number of MRF Registers</td> </tr> </tbody> </table> | Value  | Name | 1-15                |
|                    | Value  | Name  |        |      |                     |
|                    | 1-15   | Number of MRF Registers   |        |      |                     |
| 24:20              | <b>Response Length</b><br>This field indicates the number of 256-bit registers expected in the message response. The valid value ranges from 0 to 16. A value 0 indicates that the request message does not expect any response. The largest response supported is 16 GRF registers.   |   |        |      |                     |
|                    | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0-16</td> <td>Number of Registers</td> </tr> </tbody> </table>  | Value   | Name   | 0-16 | Number of Registers |
| Value              | Name   |   |        |      |                     |
| 0-16               | Number of Registers  |   |        |      |                     |
| 19                 | <b>Header Present</b>  |   |        |      |                     |
|                    | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Format:</td> <td style="text-align: center;">Enable</td> </tr> </table> <p>If set, indicates that the message includes a header. Depending on the target shared function, this field may be restricted to either enabled or disabled. Refer to the specific shared function section for details.</p> | Format:   | Enable |      |                     |
| Format:            | Enable   |   |        |      |                     |
| 18:0               | <b>Function Control</b><br>This field is intended to control the target function unit. Refer to the section on the specific target function unit for details on the contents of this field.  |   |        |      |                     |

## Normal Media Block Message Header

| <b>MH_MB - Normal Media Block Message Header</b>  |      |   |
|---|------|---|
| Project: CHV, BSW   |      |   |
| Source: DataPort 1  |      |   |
| Size (in bits): 256   |      |   |
| Default Value: 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |      |   |
| DWord   | Bit  | Description   |
| 0   | 31:0 | <b>X Offset</b>   |
|   |      | Project: All  |
|   |      | Format: S31   |
|   |      | X offset (in bytes) of the upper left corner of the block into the surface.   |
|   |      | <b>Programming Notes</b>  |
|   |      | Must be DWord aligned (Bits 1:0 MBZ) for the write form of the message.   |
| 1   | 31:0 | <b>Y Offset</b>   |
|   |      | Project: All  |
|   |      | Format: S31   |
|   |      | Y offset (in rows) of the upper left corner of the block into the surface.  |
| 2   | 31:0 | <b>Normal Media Block Message Control</b>   |
|   |      | Project: All  |
|   |      | Format: MHC_MB_CONTROL [CHV, BSW]   |
|   |      | Specifies the Normal message subtype and additional input parameters.   |
| 3   | 31:0 | <b>Mask</b>   |
|   |      | Project: All  |
|   |      | Format: U32   |
|   |      | The Mask is ignored by the Normal Media Block message: all Dwords are always returned on reads, and always enabled to be written on writes. |
| 4   | 31:0 | <b>FFTID</b>  |
|   |      | Project: All  |
|   |      | Format: MHC_FFTID [CHV, BSW]  |
|   |      | Fixed Function Thread ID  |
| 5-7   | 95:0 | <b>Reserved</b>   |
|   |      | Project: All  |
|   |      | Format: Ignore  |

| <b>MH_MB - Normal Media Block Message Header</b> |  |         |
|--|--|---------|
|  |  | Ignored |

## Normal Media Block Message Header Control

| <b>MHC_MB_CONTROL - Normal Media Block Message Header Control</b>  |            |  |             |      |             |         |     |        |   |     |        |          |           |
|--|------------|--|-------------|------|-------------|---------|-----|--------|---|-----|--------|----------|-----------|
| Project:   | CHV, BSW   |  |             |      |             |         |     |        |   |     |        |          |           |
| Source:  | PRM        |  |             |      |             |         |     |        |   |     |        |          |           |
| Size (in bits):  | 32         |  |             |      |             |         |     |        |   |     |        |          |           |
| Default Value:   | 0x00000000 |  |             |      |             |         |     |        |   |     |        |          |           |
| DWord  | Bit        | Description  |             |      |             |         |     |        |   |     |        |          |           |
| 0  | 31:30      | <b>Message Mode</b>  |             |      |             |         |     |        |   |     |        |          |           |
|  |            | Project:   | All         |      |             |         |     |        |   |     |        |          |           |
|  |            | Format:  | Enumeration |      |             |         |     |        |   |     |        |          |           |
|  |            | Specifies the interpretation of M0.3 (Pixel or Byte Mask). For the Sampler Cache Data Port, this field is ignored, behaving as if always set to NORMAL.  |             |      |             |         |     |        |   |     |        |          |           |
|  |            | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h</td> <td>Normal</td> <td>The Block Height and Block Width fields are specified in this Dword. The Mask is ignored by a media block read message and behaves as if it is set to all ones for a media block write message.</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Reserved.</td> <td>All</td> </tr> </tbody> </table> | Value       | Name | Description | Project | 00h | Normal | The Block Height and Block Width fields are specified in this Dword. The Mask is ignored by a media block read message and behaves as if it is set to all ones for a media block write message. | All | Others | Reserved | Reserved. |
| Value  | Name       | Description  | Project     |      |             |         |     |        |   |     |        |          |           |
| 00h  | Normal     | The Block Height and Block Width fields are specified in this Dword. The Mask is ignored by a media block read message and behaves as if it is set to all ones for a media block write message.  | All         |      |             |         |     |        |   |     |        |          |           |
| Others   | Reserved   | Reserved.  | All         |      |             |         |     |        |   |     |        |          |           |
| <b>Programming Notes</b>   |            | The Media Block Read message is Normal subtype when both Sub-Register Offset and Register Pitch Control are zero. The Media Block Read message is Merged subtype when either Sub-Register Offset or Register Pitch Control are non-zero.   |             |      |             |         |     |        |   |     |        |          |           |
| 29   |            | <b>Reserved</b>  |             |      |             |         |     |        |   |     |        |          |           |
|  |            | Project:   | All         |      |             |         |     |        |   |     |        |          |           |
|  |            | Format:  | Ignore      |      |             |         |     |        |   |     |        |          |           |
| Ignored  |            |  |             |      |             |         |     |        |   |     |        |          |           |
| 28:24  |            | <b>Sub-Register Offset</b>   |             |      |             |         |     |        |   |     |        |          |           |
|  |            | Project:   | All         |      |             |         |     |        |   |     |        |          |           |
|  |            | Format:  | MBZ         |      |             |         |     |        |   |     |        |          |           |
| The sub-register offset must be 0 for Normal Media Block Read message subtype. This field is ignored (reserved) for a media block write message. |            |  |             |      |             |         |     |        |   |     |        |          |           |
| 23:22  |            | <b>Reserved</b>  |             |      |             |         |     |        |   |     |        |          |           |
|  |            | Project:   | All         |      |             |         |     |        |   |     |        |          |           |
|  |            | Format:  | Ignore      |      |             |         |     |        |   |     |        |          |           |
| Ignored  |            |  |             |      |             |         |     |        |   |     |        |          |           |



## MHC\_MB\_CONTROL - Normal Media Block Message Header Control

|  |   |        |
|--|---|--------|
|  |   |        |
| 21:16  | <b>Block Height</b>   |        |
|  | Project:  | All    |
|  | Format:   | U6     |
|  | Height in rows of block being accessed. Range = [0,63] representing 1 to 64 rows  |        |
|  | <b>Restriction</b>  |        |
| If Block Width (bytes), then Maximum Block Height (rows) is constrained by (# Dwords width) * (# rows) <= 64 Dwords. |   |        |
| 15:10  | <b>Reserved</b>   |        |
|  | Project:  | All    |
|  | Format:   | Ignore |
|  | Ignored   |        |
| 9:8  | <b>Register Pitch Control</b>   |        |
|  | Project:  | All    |
|  | Format:   | MBZ    |
|  | The register pitch must be 0 for a Normal Media Block Read message. This field is ignored (reserved) for a media block write message.   |        |
| 7:6  | <b>Reserved</b>   |        |
|  | Project:  | All    |
|  | Format:   | Ignore |
|  | Ignored   |        |
| 5:0  | <b>Block Width</b>  |        |
|  | Project:  | All    |
|  | Format:   | U6     |
|  | Width in bytes of the block being accessed. For normal Media Block Writes, Range = [0,63] representing 1 to 64 Bytes. For normal Media Block Reads and for masked and merged Media Block messages, Range = [0,31] representing 1 to 32 Bytes. |        |
|  | <b>Programming Notes</b>  |        |
| Must be DWord aligned for the write form of the message.   |   |        |

## oMask Message Data Payload Register

| <b>MDPR_OMASK - oMask Message Data Payload Register</b> |   |  |               |
|---|---|--|---------------|
| Project:  | CHV, BSW  |  |               |
| Source:   | PRM   |  |               |
| Size (in bits):   | 256   |  |               |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |  |               |
| DWord   | Bit   | Description  |               |
| 0   | 31:16   | <b>oMask1</b>  |               |
|   |   | Project: All   |               |
|   |   | Format: U16  |               |
|   |   | oMask for Pixels [15:0] of Slot 1. Not used for Slot Group HI. |               |
| 15:0  | 15:0  | <b>oMask0</b>  |               |
|   |   | Project: All   |               |
|   |   | Format: U16  |               |
|   |   | oMask for Pixels [15:0] of Slot 0. Not used for Slot Group HI. |               |
| 1   | 31:16   | <b>oMask3</b>  |               |
|   |   | Project: All   |               |
|   |   | Format: U16  |               |
|   | 15:0  | 15:0   | <b>oMask2</b> |
|   |   |  | Project: All  |
|   |   |  | Format: U16   |
| 2   | 31:16   | <b>oMask5</b>  |               |
|   |   | Project: All   |               |
|   |   | Format: U16  |               |
|   | 15:0  | 15:0   | <b>oMask4</b> |
|   |   |  | Project: All  |
|   |   |  | Format: U16   |
|   |   | oMask for Pixels [15:0] of Slot 4. Not used for Slot Group HI. |               |

| MDPR_OMASK - oMask Message Data Payload Register |   |   |          |         |         |     |
|--|---|---|----------|---------|---------|-----|
| 3  | 31:16   | <p><b>oMask7</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 7. Not used for Slot Group HI.</p>             | Project: | All     | Format: | U16 |
|  | Project:  | All   |          |         |         |     |
| Format:  | U16   |   |          |         |         |     |
| 15:0   | <p><b>oMask6</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 6. Not used for Slot Group HI.</p>             | Project:  | All      | Format: | U16     |     |
| Project:   | All   |   |          |         |         |     |
| Format:  | U16   |   |          |         |         |     |
| 4  | 31:16   | <p><b>oMask9</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 9. Used only if Slot Group HI or SIMD16.</p>   | Project: | All     | Format: | U16 |
|  | Project:  | All   |          |         |         |     |
| Format:  | U16   |   |          |         |         |     |
| 15:0   | <p><b>oMask8</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 8. Used only if Slot Group HI or SIMD16.</p>   | Project:  | All      | Format: | U16     |     |
| Project:   | All   |   |          |         |         |     |
| Format:  | U16   |   |          |         |         |     |
| 5  | 31:16   | <p><b>oMask11</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 11. Used only if Slot Group HI or SIMD16.</p> | Project: | All     | Format: | U16 |
|  | Project:  | All   |          |         |         |     |
| Format:  | U16   |   |          |         |         |     |
| 15:0   | <p><b>oMask10</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 10. Used only if Slot Group HI or SIMD16.</p> | Project:  | All      | Format: | U16     |     |
| Project:   | All   |   |          |         |         |     |
| Format:  | U16   |   |          |         |         |     |
| 6  | 31:16   | <p><b>oMask13</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 13. Used only if Slot Group HI or SIMD16.</p> | Project: | All     | Format: | U16 |
|  | Project:  | All   |          |         |         |     |
| Format:  | U16   |   |          |         |         |     |
| 15:0   | <p><b>oMask12</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 12. Used only if Slot Group HI or SIMD16.</p> | Project:  | All      | Format: | U16     |     |
| Project:   | All   |   |          |         |         |     |
| Format:  | U16   |   |          |         |         |     |

| <b>MDPR_OMASK - oMask Message Data Payload Register</b> |  |  |          |         |         |     |
|---|--|--|----------|---------|---------|-----|
| 7   | 31:16  | <p><b>oMask15</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 15. Used only if Slot Group HI or SIMD16.</p> | Project: | All     | Format: | U16 |
|   | Project:   | All  |          |         |         |     |
| Format:   | U16  |  |          |         |         |     |
| 15:0  | <p><b>oMask14</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>oMask for Pixels [15:0] of Slot 14. Used only if Slot Group HI or SIMD16.</p> | Project:   | All      | Format: | U16     |     |
| Project:  | All  |  |          |         |         |     |
| Format:   | U16  |  |          |         |         |     |

## OM Replicated SIMD16 Render Target Data Payload

| <b>MDP_RTW_M16REP - OM Replicated SIMD16 Render Target Data Payload</b> |  |  |          |     |         |                       |
|---|--|--|----------|-----|---------|-----------------------|
| Project:  | All  |  |          |     |         |                       |
| Source:   | PRM  |  |          |     |         |                       |
| Size (in bits):   | 512  |  |          |     |         |                       |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |         |                       |
| <b>DWord</b>  | <b>Bit</b>   | <b>Description</b>   |          |     |         |                       |
| 0.0-0.7   | 255:0  | <b>oMask</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDPR_OMASK [CHV, BSW]</td> </tr> </table> Slots [15:0] oMask      | Project: | All | Format: | MDPR_OMASK [CHV, BSW] |
| Project:  | All  |  |          |     |         |                       |
| Format:   | MDPR_OMASK [CHV, BSW]  |  |          |     |         |                       |
| 1.0-1.7   | 255:0  | <b>RGBA</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDPR_RGBA [CHV, BSW]</td> </tr> </table> RGBA for all slots [15:0] | Project: | All | Format: | MDPR_RGBA [CHV, BSW]  |
| Project:  | All  |  |          |     |         |                       |
| Format:   | MDPR_RGBA [CHV, BSW]   |  |          |     |         |                       |

## OM S0A SIMD8 Render Target Data Payload

| MDP_RTW_MA8 - OM S0A SIMD8 Render Target Data Payload |   |   |          |     |         |                         |
|---|---|---|----------|-----|---------|-------------------------|
| Project:  | All   |   |          |     |         |                         |
| Source:   | PRM   |   |          |     |         |                         |
| Size (in bits):                                       | 1536  |   |          |     |         |                         |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |     |         |                         |
| DWord   | Bit   | Description   |          |     |         |                         |
| 0.0-0.7   | 255:0   | <b>Source 0 Alpha</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source 0 Alpha  | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |   |          |     |         |                         |
| 1.0-1.7   | 255:0   | <b>oMask</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDPR_OMASK [CHV, BSW]</td> </tr> </table> Slots [7:0] oMask. Upper half ignored. | Project: | All | Format: | MDPR_OMASK [CHV, BSW]   |
| Project:  | All   |   |          |     |         |                         |
| Format:   | MDPR_OMASK [CHV, BSW]   |   |          |     |         |                         |
| 2.0-2.7   | 255:0   | <b>Red</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Red                        | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |   |          |     |         |                         |
| 3.0-3.7   | 255:0   | <b>Green</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Green                    | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |   |          |     |         |                         |
| 4.0-4.7   | 255:0   | <b>Blue</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue                      | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |   |          |     |         |                         |

| MDP_RTW_MA8 - OM S0A SIMD8 Render Target Data Payload |       |                   |                         |
|---|-------|-------------------|-------------------------|
| 5.0-5.7   | 255:0 | <b>Alpha</b>      |                         |
|   |       | Project:          | All                     |
|   |       | Format:           | MDP_DW_SIMD8 [CHV, BSW] |
|   |       | Slots [7:0] Alpha |                         |





| MDP_RTW_MA16 - OM S0A SIMD16 Render Target Data Payload |                         |   |          |     |         |                         |
|---|-------------------------|---|----------|-----|---------|-------------------------|
| 4.0-4.7   | 255:0                   | <b>Red[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Red     | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 5.0-5.7   | 255:0                   | <b>Green[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Green   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 6.0-6.7   | 255:0                   | <b>Green[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Green | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 7.0-7.7   | 255:0                   | <b>Blue[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue     | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 8.0-8.7   | 255:0                   | <b>Blue[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Blue   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 9.0-9.7   | 255:0                   | <b>Alpha[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Alpha   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 10.0-10.7   | 255:0                   | <b>Alpha[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Alpha | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |

## OM SIMD8 Dual Source Render Target Data Payload

| <b>MDP_RTW_M8DS - OM SIMD8 Dual Source Render Target Data Payload</b> |  |  |
|---|--|--|
| Project:  | All  |  |
| Source:   | PRM  |  |
| Size (in bits):   | 2304   |  |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord   | Bit  | Description  |
| 0.0-0.7   | 255:0  | <b>oMask</b>   |
|   |  | Project: All   |
|   |  | Format: MDPR_OMASK [CHV, BSW]  |
|   |  | oMask for slots [7:0] and [15:8]. Operation selects upper or lower half. |
| 1.0-1.7   | 255:0  | <b>Src0 Red</b>  |
|   |  | Project: All   |
|   |  | Format: MDP_DW_SIMD8 [CHV, BSW]  |
|   |  | Slots[7:0] or [15:8] of Src0 Red   |
| 2.0-2.7   | 255:0  | <b>Src0 Green</b>  |
|   |  | Project: All   |
|   |  | Format: MDP_DW_SIMD8 [CHV, BSW]  |
|   |  | Slots[7:0] or [15:8] of Src0 Green                                       |
| 3.0-3.7   | 255:0  | <b>Src0 Blue</b>   |
|   |  | Project: All   |
|   |  | Format: MDP_DW_SIMD8 [CHV, BSW]  |
|   |  | Slots[7:0] or [15:8] of Src0 Blue  |

| MDP_RTW_M8DS - OM SIMD8 Dual Source Render Target Data Payload |       |                                    |
|--|-------|------------------------------------|
| 4.0-4.7  | 255:0 | <b>Src0 Alpha</b>                  |
|  |       | Project: All                       |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]    |
|  |       | Slots[7:0] or [15:8] of Src0 Alpha |
| 5.0-5.7  | 255:0 | <b>Src1 Red</b>                    |
|  |       | Project: All                       |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]    |
|  |       | Slots[7:0] or [15:8] of Src1 Red   |
| 6.0-6.7  | 255:0 | <b>Src1 Green</b>                  |
|  |       | Project: All                       |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]    |
|  |       | Slots[7:0] or [15:8] of Src1 Green |
| 7.0-7.7  | 255:0 | <b>Src1 Blue</b>                   |
|  |       | Project: All                       |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]    |
|  |       | Slots[7:0] or [15:8] of Src1 Blue  |
| 8.0-8.7  | 255:0 | <b>Src1 Alpha</b>                  |
|  |       | Project: All                       |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]    |
|  |       | Slots[7:0] or [15:8] of Src1 Alpha |

## OM SIMD8 Render Target Data Payload

| <b>MDP_RTW_M8 - OM SIMD8 Render Target Data Payload</b> |  |   |          |     |         |                         |
|---|--|---|----------|-----|---------|-------------------------|
| Project:  | All  |   |          |     |         |                         |
| Source:   | PRM  |   |          |     |         |                         |
| Size (in bits):   | 1280   |   |          |     |         |                         |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |     |         |                         |
| DWord   | Bit  | Description   |          |     |         |                         |
| 0.0-0.7   | 255:0  | <b>oMask</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDPR_OMASK [CHV, BSW]</td> </tr> </table> Slots [7:0] oMask. Upper half ignored. | Project: | All | Format: | MDPR_OMASK [CHV, BSW]   |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDPR_OMASK [CHV, BSW]  |   |          |     |         |                         |
| 1.0-1.7   | 255:0  | <b>Red</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Red                        | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |   |          |     |         |                         |
| 2.0-2.7   | 255:0  | <b>Green</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Green                    | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |   |          |     |         |                         |
| 3.0-3.7   | 255:0  | <b>Blue</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue                      | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |   |          |     |         |                         |
| 4.0-4.7   | 255:0  | <b>Alpha</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Alpha                    | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |   |          |     |         |                         |



| <b>MDP_RTW_M16 - OM SIMD16 Render Target Data Payload</b> |                         |   |          |                         |                    |                         |                    |  |
|---|-------------------------|---|----------|-------------------------|--------------------|-------------------------|--------------------|--|
|   |                         | <table border="1"> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots [15:8] Green</td> </tr> </table>   | Format:  | MDP_DW_SIMD8 [CHV, BSW] | Slots [15:8] Green |                         |                    |  |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |                         |                    |                         |                    |  |
| Slots [15:8] Green  |                         |   |          |                         |                    |                         |                    |  |
| 5.0-5.7   | 255:0                   | <p><b>Blue[7:0]</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots [7:0] Blue</td> </tr> </table>     | Project: | All                     | Format:            | MDP_DW_SIMD8 [CHV, BSW] | Slots [7:0] Blue   |  |
| Project:  | All                     |   |          |                         |                    |                         |                    |  |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |                         |                    |                         |                    |  |
| Slots [7:0] Blue  |                         |   |          |                         |                    |                         |                    |  |
| 6.0-6.7   | 255:0                   | <p><b>Blue[15:8]</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots [15:8] Blue</td> </tr> </table>   | Project: | All                     | Format:            | MDP_DW_SIMD8 [CHV, BSW] | Slots [15:8] Blue  |  |
| Project:  | All                     |   |          |                         |                    |                         |                    |  |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |                         |                    |                         |                    |  |
| Slots [15:8] Blue   |                         |   |          |                         |                    |                         |                    |  |
| 7.0-7.7   | 255:0                   | <p><b>Alpha[7:0]</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots [7:0] Alpha</td> </tr> </table>   | Project: | All                     | Format:            | MDP_DW_SIMD8 [CHV, BSW] | Slots [7:0] Alpha  |  |
| Project:  | All                     |   |          |                         |                    |                         |                    |  |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |                         |                    |                         |                    |  |
| Slots [7:0] Alpha   |                         |   |          |                         |                    |                         |                    |  |
| 8.0-8.7   | 255:0                   | <p><b>Alpha[15:8]</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots [15:8] Alpha</td> </tr> </table> | Project: | All                     | Format:            | MDP_DW_SIMD8 [CHV, BSW] | Slots [15:8] Alpha |  |
| Project:  | All                     |   |          |                         |                    |                         |                    |  |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |                         |                    |                         |                    |  |
| Slots [15:8] Alpha  |                         |   |          |                         |                    |                         |                    |  |

## Oword 1 Dual Block Data Payload

| <b>MDP_OWD1 - Oword 1 Dual Block Data Payload</b> |   |                           |
|---|---|---------------------------|
| Project:  | CHV, BSW  |                           |
| Source:   | PRM   |                           |
| Size (in bits):                                   | 256   |                           |
| Default Value:                                    | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |                           |
| DWord   | Bit   | Description               |
| 0.0-0.3   | 127:0   | <b>Oword Slot0</b>        |
|   |   | Project: All              |
|   |   | Format: U128              |
|   |   | Specifies the Slot 0 data |
| 0.4-0.7   | 127:0   | <b>Oword Slot1</b>        |
|   |   | Project: All              |
|   |   | Format: U128              |
|   |   | Specifies the Slot 1 data |

## Oword 2 Block Data Payload

| <b>MDP_OW2 - Oword 2 Block Data Payload</b> |   |  |
|---|---|--|
| Project:                                    | CHV, BSW  |  |
| Source:                                     | PRM   |  |
| Size (in bits):                             | 256   |  |
| Default Value:                              | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |  |
| DWord                                       | Bit   | Description                                  |
| 0.0-0.3                                     | 127:0   | <b>Oword0</b>                                |
|   |   | Project: All                                 |
|   |   | Format: U128                                 |
|   |   | Specifies the Oword data for block element 0 |
| 0.4-0.7                                     | 127:0   | <b>Oword1</b>                                |
|   |   | Project: All                                 |
|   |   | Format: U128                                 |
|   |   | Specifies the Oword data for block element 1 |



## Oword 4 Block Data Payload

| <b>MDP_OW4 - Oword 4 Block Data Payload</b>       |  |                            |
|---|--|----------------------------|
| Project:  | CHV, BSW   |                            |
| Source:   | PRM  |                            |
| Size (in bits):                                   | 512  |                            |
| Default Value:                                    | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |                            |
| DWord   | Bit  | Description                |
| 0.0-0.7   | 255:0  | <b>Data[1:0]</b>           |
|   |  | Project: All               |
|   |  | Format: MDCR_OW [CHV, BSW] |
| Specifies the Oword data for block elements [1:0] |  |                            |
| 1.0-1.7   | 255:0  | <b>Data[3:2]</b>           |
|   |  | Project: All               |
|   |  | Format: MDCR_OW [CHV, BSW] |
| Specifies the Oword data for block elements [3:2] |  |                            |

## Oword 4 Dual Block Data Payload

| <b>MDP_OWD4 - Oword 4 Dual Block Data Payload</b> |  |   |
|---|--|---|
| Project:  | CHV, BSW   |   |
| Source:   | PRM  |   |
| Size (in bits):                                   | 1024   |   |
| Default Value:                                    | 0x00000000, 0x00000000 |   |
| <b>DWord</b>                                      | <b>Bit</b>   | <b>Description</b>                            |
| 0.0-0.3   | 127:0  | <b>Oword0 Slot0</b>                           |
|   |  | Project: All                                  |
|   |  | Format: U128                                  |
|   |  | Specifies the Slot 0 data for block element 0 |
| 0.4-0.7   | 127:0  | <b>Oword0 Slot1</b>                           |
|   |  | Project: All                                  |
|   |  | Format: U128                                  |
|   |  | Specifies the Slot 1 data for block element 0 |
| 1.0-1.3   | 127:0  | <b>Oword1 Slot0</b>                           |
|   |  | Project: All                                  |
|   |  | Format: U128                                  |
|   |  | Specifies the Slot 0 data for block element 1 |
| 1.4-1.7   | 127:0  | <b>Oword1 Slot1</b>                           |
|   |  | Project: All                                  |
|   |  | Format: U128                                  |
|   |  | Specifies the Slot 1 data for block element 1 |
| 2.0-2.3   | 127:0  | <b>Oword2 Slot0</b>                           |
|   |  | Project: All                                  |
|   |  | Format: U128                                  |
|   |  | Specifies the Slot 0 data for block element 2 |
| 2.4-2.7   | 127:0  | <b>Oword2 Slot1</b>                           |
|   |  | Project: All                                  |

| <b>MDP_OWD4 - Oword 4 Dual Block Data Payload</b> |       |  |          |      |   |      |   |  |
|---|-------|--|----------|------|---|------|---|--|
|   |       | <table border="1"> <tr> <td>Format:</td> <td>U128</td> </tr> <tr> <td colspan="2">Specifies the Slot 1 data for block element 2</td> </tr> </table>  | Format:  | U128 | Specifies the Slot 1 data for block element 2 |      |   |  |
| Format:   | U128  |  |          |      |   |      |   |  |
| Specifies the Slot 1 data for block element 2     |       |  |          |      |   |      |   |  |
| 3.0-3.3   | 127:0 | <p><b>Oword3 Slot0</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U128</td> </tr> <tr> <td colspan="2">Specifies the Slot 0 data for block element 3</td> </tr> </table> | Project: | All  | Format:                                       | U128 | Specifies the Slot 0 data for block element 3 |  |
| Project:  | All   |  |          |      |   |      |   |  |
| Format:   | U128  |  |          |      |   |      |   |  |
| Specifies the Slot 0 data for block element 3     |       |  |          |      |   |      |   |  |
| 3.4-3.7   | 127:0 | <p><b>Oword3 Slot1</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U128</td> </tr> <tr> <td colspan="2">Specifies the Slot 1 data for block element 3</td> </tr> </table> | Project: | All  | Format:                                       | U128 | Specifies the Slot 1 data for block element 3 |  |
| Project:  | All   |  |          |      |   |      |   |  |
| Format:   | U128  |  |          |      |   |      |   |  |
| Specifies the Slot 1 data for block element 3     |       |  |          |      |   |      |   |  |

## Oword 8 Block Data Payload

| <b>MDP_OW8 - Oword 8 Block Data Payload</b>       |  |                            |
|---|--|----------------------------|
| Project:  | CHV, BSW   |                            |
| Source:   | PRM  |                            |
| Size (in bits):                                   | 1024   |                            |
| Default Value:                                    | 0x00000000, 0x00000000 |                            |
| DWord   | Bit  | Description                |
| 0.0-0.7   | 255:0  | <b>Data[1:0]</b>           |
|   |  | Project: All               |
|   |  | Format: MDCR_OW [CHV, BSW] |
| Specifies the Oword data for block elements [1:0] |  |                            |
| 1.0-1.7   | 255:0  | <b>Data[3:2]</b>           |
|   |  | Project: All               |
|   |  | Format: MDCR_OW [CHV, BSW] |
| Specifies the Oword data for block elements [3:2] |  |                            |
| 2.0-2.7   | 255:0  | <b>Data[5:4]</b>           |
|   |  | Project: All               |
|   |  | Format: MDCR_OW [CHV, BSW] |
| Specifies the Oword data for block elements [5:4] |  |                            |
| 3.0-3.7   | 255:0  | <b>Data[7:6]</b>           |
|   |  | Project: All               |
|   |  | Format: MDCR_OW [CHV, BSW] |
| Specifies the Oword data for block elements [7:6] |  |                            |

## Oword A64 SIMD4x2 Atomic CMPWR16B Message Data Payload

| <b>MDP_A64_AOP4X2_OW2 - Oword A64 SIMD4x2 Atomic CMPWR16B Message Data Payload</b> |  |  |         |      |
|--|--|--|---------|------|
| Project:   | CHV, BSW   |  |         |      |
| Source:  | PRM  |  |         |      |
| Size (in bits):  | 512  |  |         |      |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |         |      |
| DWord  | Bit  | Description  |         |      |
| 0.0-0.3  | 127:0  | <b>Src0 Slot0</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U128</td> </tr> </table> Specifies the Slot 0 Source 0 data | Format: | U128 |
| Format:  | U128   |  |         |      |
| 0.4-0.7  | 127:0  | <b>Src0 Slot1</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U128</td> </tr> </table> Specifies the Slot 1 Source 0 data | Format: | U128 |
| Format:  | U128   |  |         |      |
| 1.0-1.3  | 127:0  | <b>Src1 Slot0</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U128</td> </tr> </table> Specifies the Slot 0 Source 1 data | Format: | U128 |
| Format:  | U128   |  |         |      |
| 1.4-1.7  | 127:0  | <b>Src1 Slot1</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U128</td> </tr> </table> Specifies the Slot 1 Source 1 data | Format: | U128 |
| Format:  | U128   |  |         |      |

## Oword A64 SIMD4x2 Atomic Operation Return Data Message Data Payload

| <b>MDP_A64_AOP4X2_OW1 - Oword A64 SIMD4x2 Atomic Operation Return Data Message Data Payload</b> |  |  |         |      |
|---|--|--|---------|------|
| Project:  | CHV, BSW   |  |         |      |
| Source:   | PRM  |  |         |      |
| Size (in bits):   | 256  |  |         |      |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |         |      |
| <b>DWord</b>  | <b>Bit</b>   | <b>Description</b>   |         |      |
| 0.0-0.3   | 127:0  | <b>Oword0</b><br><table border="1"> <tr> <td>Format:</td> <td>U128</td> </tr> </table> Specifies the Slot 0 Return data | Format: | U128 |
| Format:   | U128   |  |         |      |
| 0.4-0.7   | 127:0  | <b>Oword1</b><br><table border="1"> <tr> <td>Format:</td> <td>U128</td> </tr> </table> Specifies the Slot1 Return data  | Format: | U128 |
| Format:   | U128   |  |         |      |



| MDP_A64_AOP8_OW2 - Oword A64 SIMD8 Atomic Operation<br>CMPWR16B Message Data Payload |       |  |
|--|-------|--|
| 4.0-4.7  | 255:0 | <b>Slot[1:0] Src1</b>                  |
|  |       | Project: All                           |
| 5.0-5.7  | 255:0 | Format: MDCR_OW [CHV, BSW]             |
|  |       | Specifies the Slot [1:0] Source 1 data |
| 6.0-6.7  | 255:0 | <b>Slot[3:2] Src1</b>                  |
|  |       | Project: All                           |
| 7.0-7.7  | 255:0 | Format: MDCR_OW [CHV, BSW]             |
|  |       | Specifies the Slot [3:2] Source 1 data |
| 4.0-4.7  | 255:0 | <b>Slot[5:4] Src1</b>                  |
|  |       | Project: All                           |
| 5.0-5.7  | 255:0 | Format: MDCR_OW [CHV, BSW]             |
|  |       | Specifies the Slot [5:4] Source 1 data |
| 6.0-6.7  | 255:0 | <b>Slot[7:6] Src1</b>                  |
|  |       | Project: All                           |
| 7.0-7.7  | 255:0 | Format: MDCR_OW [CHV, BSW]             |
|  |       | Specifies the Slot [7:6] Source 1 data |



## Oword Data Blocks Message Descriptor Control Field

| <b>MDC_DB_OW - Oword Data Blocks Message Descriptor Control Field</b> |          |  |             |
|---|----------|--|-------------|
| Project:  |          | CHV, BSW   |             |
| Source:   |          | PRM  |             |
| Size (in bits):   |          | 3  |             |
| Default Value:  |          | 0x00000000   |             |
| DWord   | Bit      | Description  |             |
| 0   | 2:0      | <b>Data Blocks</b>   |             |
|   |          | Project:   | All         |
|   |          | Format:  | Enumeration |
|   |          | Specifies the number of Oword blocks to be read or written                       |             |
| Value   | Name     | Description  | Project     |
| 00h   | OW1L     | 1 Oword, read into or written from the low 128 bits of the destination register  | All         |
| 01h   | OW1U     | 1 Oword, read into or written from the high 128 bits of the destination register | All         |
| 02h   | OW2      | 2 Owords   | All         |
| 03h   | OW4      | 4 Owords   | All         |
| 04h   | OW8      | 8 Owords   | All         |
| Others  | Reserved | Ignored  | All         |

## Oword Data Payload Register

| <b>MDCR_OW - Oword Data Payload Register</b> |   |  |
|--|---|--|
| Project:                                     | CHV, BSW  |  |
| Source:                                      | PRM   |  |
| Size (in bits):                              | 256   |  |
| Default Value:                               | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |  |
| DWord  | Bit   | Description  |
| 0.0-0.3                                      | 127:0   | <b>Oword0</b>                                      |
|  |   | Project: All                                       |
|  |   | Format: U128                                       |
|  |   | Specifies the slot 0 data in this payload register |
| 0.4-0.7                                      | 127:0   | <b>Oword1</b>                                      |
|  |   | Project: All                                       |
|  |   | Format: U128                                       |
|  |   | Specifies the slot 1 data in this payload register |

## Oword Dual Data Blocks Message Descriptor Control Field

| <b>MDC_DB_OWD - Oword Dual Data Blocks Message Descriptor Control Field</b> |             |  |         |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
|---|-------------|--|---------|----------|-----|---------|-------------|-------|------|-------------|---------|-----|------|----------------------------|-----|-----|------|-----------------------------|-----|--------|----------|---------|-----|
| Project:  | CHV, BSW    |  |         |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| Source:   | PRM         |  |         |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| Size (in bits):   | 2           |  |         |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| Default Value:  | 0x00000000  |  |         |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| DWord   | Bit         | Description  |         |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| 0   | 1:0         | <b>OW Dual Data Blocks</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enumeration</td> </tr> </table> <p>Specifies the number of Oword Blocks to be read or written</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h</td> <td>OWD1</td> <td>1 Hword register, 2 Owords</td> <td>All</td> </tr> <tr> <td>02h</td> <td>OWD4</td> <td>4 Hword registers, 8 Owords</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </tbody> </table> |         | Project: | All | Format: | Enumeration | Value | Name | Description | Project | 00h | OWD1 | 1 Hword register, 2 Owords | All | 02h | OWD4 | 4 Hword registers, 8 Owords | All | Others | Reserved | Ignored | All |
| Project:  | All         |  |         |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| Format:   | Enumeration |  |         |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| Value   | Name        | Description  | Project |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| 00h   | OWD1        | 1 Hword register, 2 Owords   | All     |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| 02h   | OWD4        | 4 Hword registers, 8 Owords  | All     |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |
| Others  | Reserved    | Ignored  | All     |          |     |         |             |       |      |             |         |     |      |                            |     |     |      |                             |     |        |          |         |     |

## PALETTE\_ENTRY

| <b>PALETTE_ENTRY</b> |  |  |         |    |
|----------------------|--|--|---------|----|
| Project:             | CHV, BSW   |  |         |    |
| Source:              | RenderCS   |  |         |    |
| Size (in bits):      | 32   |  |         |    |
| Default Value:       | 0x00000000   |  |         |    |
| DWord                | Bit  | Description  |         |    |
| 0                    | 31:24  | <p><b>Alpha</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">Format:</td> <td style="width: 20%;">U8</td> </tr> </table> <p>Alpha channel value for this entry in the texture color palette.</p> | Format: | U8 |
|                      | Format:  | U8   |         |    |
|                      | 23:16  | <p><b>Red</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">Format:</td> <td style="width: 20%;">U8</td> </tr> </table> <p>Red channel value for this entry in the texture color palette.</p>     | Format: | U8 |
|                      | Format:  | U8   |         |    |
| 15:8                 | <p><b>Green</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">Format:</td> <td style="width: 20%;">U8</td> </tr> </table> <p>Green channel value for this entry in the texture color palette.</p> | Format:  | U8      |    |
| Format:              | U8   |  |         |    |
| 7:0                  | <p><b>Blue</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">Format:</td> <td style="width: 20%;">U8</td> </tr> </table> <p>Blue channel value for this entry in the texture color palette.</p>   | Format:  | U8      |    |
| Format:              | U8   |  |         |    |

## Per Thread Scratch Space Message Header Control

| <b>MHC_PTSS - Per Thread Scratch Space Message Header Control</b> |   |  |          |         |         |        |         |  |
|---|---|--|----------|---------|---------|--------|---------|--|
| Project:  | CHV, BSW  |  |          |         |         |        |         |  |
| Source:   | PRM   |  |          |         |         |        |         |  |
| Size (in bits):   | 32  |  |          |         |         |        |         |  |
| Default Value:  | 0x00000000  |  |          |         |         |        |         |  |
| DWord   | Bit   | Description  |          |         |         |        |         |  |
| 0   | 31:4  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> <tr> <td colspan="2">Ignored</td> </tr> </table> | Project: | All     | Format: | Ignore | Ignored |  |
|   | Project:  | All  |          |         |         |        |         |  |
| Format:   | Ignore  |  |          |         |         |        |         |  |
| Ignored   |   |  |          |         |         |        |         |  |
| 3:0   | <p><b>Per Thread Scratch Space</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U4</td> </tr> </table> <p>Specifies the amount of scratch space allowed to be used by this thread for messages in which the Binding Table Index is Stateless model, otherwise this field is ignored. The data port will use this to bounds check scratch space messages. Value range = [0,11] represents [1KB, 2MB] in powers of two.</p> <p style="text-align: center;"><b>Programming Notes</b></p> <p>Writes out of bounds will be ignored. Reads out of bounds will return 0.</p> | Project:   | All      | Format: | U4      |        |         |  |
| Project:  | All   |  |          |         |         |        |         |  |
| Format:   | U4  |  |          |         |         |        |         |  |

## Pixel Masked Media Block Message Header

| MH_MBPM - Pixel Masked Media Block Message Header |   |   |
|---|---|---|
| Project:  | CHV, BSW  |   |
| Source:   | DataPort 1  |   |
| Size (in bits):                                   | 256   |   |
| Default Value:                                    | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |   |
| DWord   | Bit   | Description   |
| 0   | 31:0  | <b>X Offset</b>   |
|   |   | Project: All  |
|   |   | Format: S31   |
|   |   | X offset (in bytes) of the upper left corner of the block into the surface.   |
|   |   | <b>Programming Notes</b><br>When Message Mode is set to PIXEL_MASK, this field must be a multiple of 32.  |
| 1   | 31:0  | <b>Y Offset</b>   |
|   |   | Project: All  |
|   |   | Format: S31   |
|   |   | Y offset (in rows) of the upper left corner of the block into the surface.  |
|   |   | <b>Programming Notes</b><br>When Message Mode is set to PIXEL_MASK, this field must be a multiple of 4.   |
| 2   | 31:0  | <b>Media Block Message Control</b>  |
|   |   | Project: All  |
|   |   | Format: MHC_MBPM_CONTROL  |
|   |   | Specifies the message subtype is Pixel Masked.  |
| 3   | 31:0  | <b>Pixel Mask</b>   |
|   |   | Project: All  |
|   |   | Format: U32   |
|   |   | Specifies the Pixel Mask for writes when Message Mode field is PIXEL_MASK.  |
|   |   | <b>Programming Notes</b><br>The Pixel Mask applies to the 2x2 square tiles (UL, UR, LL, LR), which themselves tiled (UL, UR, LL, LR) and then repeated on the right for the remaining 16-bits to cover a 4 row 8 column area. |
| 4   | 31:0  | <b>FFTID</b>  |
|   |   | Project: All  |
|   |   | Format: MHC_FFTID [CHV, BSW]  |
|   |   | Fixed Function Thread ID  |

| <b>MH_MBPM - Pixel Masked Media Block Message Header</b> |      |                 |
|--|------|-----------------|
| 5-7  | 95:0 | <b>Reserved</b> |
|  |      | Project: All    |
|  |      | Format: Ignore  |
|  |      | Ignored         |

## Pixel Masked Media Block Message Header Control

| <b>MHC_MBPM_CONTROL - Pixel Masked Media Block Message Header Control</b> |                            |   |             |      |             |         |     |            |  |     |        |          |
|---|----------------------------|---|-------------|------|-------------|---------|-----|------------|--|-----|--------|----------|
| Project:  | CHV, BSW                   |   |             |      |             |         |     |            |  |     |        |          |
| Source:   | PRM                        |   |             |      |             |         |     |            |  |     |        |          |
| Size (in bits):   | 32                         |   |             |      |             |         |     |            |  |     |        |          |
| Default Value:  | 0x00000000                 |   |             |      |             |         |     |            |  |     |        |          |
| DWord   | Bit                        | Description   |             |      |             |         |     |            |  |     |        |          |
| 0   | 31:30                      | <b>Message Mode</b>   |             |      |             |         |     |            |  |     |        |          |
|   |                            | Project:  | All         |      |             |         |     |            |  |     |        |          |
|   |                            | Format:   | Enumeration |      |             |         |     |            |  |     |        |          |
|   |                            | Specifies the Media Block Write Message subtype is Pixel Masked.  |             |      |             |         |     |            |  |     |        |          |
|   |                            | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>01h</td> <td>PIXEL_MASK</td> <td>Use the Pixel Mask in the Message Header. The Block Height and Block Width are ignored and behave as if they are set to 4 rows and 32 bytes, respectively.</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Reserved.</td> <td>All</td> </tr> </tbody> </table> | Value       | Name | Description | Project | 01h | PIXEL_MASK | Use the Pixel Mask in the Message Header. The Block Height and Block Width are ignored and behave as if they are set to 4 rows and 32 bytes, respectively. | All | Others | Reserved |
| Value   | Name                       | Description   | Project     |      |             |         |     |            |  |     |        |          |
| 01h   | PIXEL_MASK                 | Use the Pixel Mask in the Message Header. The Block Height and Block Width are ignored and behave as if they are set to 4 rows and 32 bytes, respectively.  | All         |      |             |         |     |            |  |     |        |          |
| Others  | Reserved                   | Reserved.   | All         |      |             |         |     |            |  |     |        |          |
| 29  | <b>Reserved</b>            | Project:  | All         |      |             |         |     |            |  |     |        |          |
|   |                            | Format:   | Ignore      |      |             |         |     |            |  |     |        |          |
|   |                            | Ignored   |             |      |             |         |     |            |  |     |        |          |
| 28:24   | <b>Sub-Register Offset</b> | Project:  | All         |      |             |         |     |            |  |     |        |          |
|   |                            | Format:   | U5          |      |             |         |     |            |  |     |        |          |
|   |                            | This field is ignored (reserved) for a media block write message.   |             |      |             |         |     |            |  |     |        |          |
| 23:22   | <b>Reserved</b>            | Project:  | All         |      |             |         |     |            |  |     |        |          |
|   |                            | Format:   | Ignore      |      |             |         |     |            |  |     |        |          |
|   |                            | Ignored   |             |      |             |         |     |            |  |     |        |          |
| 21:16   | <b>Block Height</b>        | Project:  | All         |      |             |         |     |            |  |     |        |          |
|   |                            | Format:   | U6          |      |             |         |     |            |  |     |        |          |
|   |                            | This field is ignored (reserved) for a Pixel Masked media block write message.  |             |      |             |         |     |            |  |     |        |          |
| 15:10   | <b>Reserved</b>            |   |             |      |             |         |     |            |  |     |        |          |



| <b>MHC_MBPM_CONTROL - Pixel Masked Media Block Message Header Control</b>  |  |          |         |         |  |   |  |
|--|--|----------|---------|---------|--|---|--|
|  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> <tr> <td colspan="2">Ignored</td> </tr> </table>  | Project: | All     | Format: | Ignore   | Ignored   |  |
|  | Project:   | All      |         |         |  |   |  |
|  | Format:  | Ignore   |         |         |  |   |  |
|  | Ignored  |          |         |         |  |   |  |
|  | <p>9:8 <b>Register Pitch Control</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U2</td> </tr> <tr> <td colspan="2">This field is ignored (reserved) for a media block write message.</td> </tr> </table> | Project: | All     | Format: | U2   | This field is ignored (reserved) for a media block write message. |  |
|  | Project:   | All      |         |         |  |   |  |
|  | Format:  | U2       |         |         |  |   |  |
|  | This field is ignored (reserved) for a media block write message.  |          |         |         |  |   |  |
|  | <p>7:6 <b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> <tr> <td colspan="2">Ignored</td> </tr> </table>   | Project: | All     | Format: | Ignore   | Ignored   |  |
|  | Project:   | All      |         |         |  |   |  |
|  | Format:  | Ignore   |         |         |  |   |  |
|  | Ignored  |          |         |         |  |   |  |
| <p>5:0 <b>Block Width</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U6</td> </tr> <tr> <td colspan="2">This field is ignored (reserved) for a Pixel Masked media block write message.</td> </tr> </table> | Project:   | All      | Format: | U6      | This field is ignored (reserved) for a Pixel Masked media block write message. |   |  |
| Project:   | All  |          |         |         |  |   |  |
| Format:  | U6   |          |         |         |  |   |  |
| This field is ignored (reserved) for a Pixel Masked media block write message.   |  |          |         |         |  |   |  |

## Pixel Sample Mask Message Header Control

| <b>MHC_PSM - Pixel Sample Mask Message Header Control</b> |  |  |                |         |     |
|---|--|--|----------------|---------|-----|
| Project:  | CHV, BSW   |  |                |         |     |
| Source:   | PRM  |  |                |         |     |
| Size (in bits):   | 32   |  |                |         |     |
| Default Value:  | 0x0000FFFF   |  |                |         |     |
| DWord   | Bit  | Description  |                |         |     |
| 0   | 31:16  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p> | Format:        | Ignore  |     |
|   | Format:  | Ignore   |                |         |     |
| 15:0  | <p><b>Pixel Sample Mask</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td>0FFFFh Default</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>SIMD16 and SIMD8 messages. All 16 bits are used for SIMD16. For untyped SIMD8 messages, the low 8 bits of field are used. If the header is not delivered, this field defaults to all ones. This field is ignored for SIMD4x2 messages.</p> | Default Value:   | 0FFFFh Default | Format: | U16 |
| Default Value:  | 0FFFFh Default   |  |                |         |     |
| Format:   | U16  |  |                |         |     |

## Pixel Sample Mask Render Target Message Header Control

| MHC_RT_PSM - Pixel Sample Mask Render Target Message Header Control  |            |   |          |     |         |     |                   |  |  |  |
|--|------------|---|----------|-----|---------|-----|-------------------|--|--|--|
| Project:   | CHV, BSW   |   |          |     |         |     |                   |  |  |  |
| Source:  | PRM        |   |          |     |         |     |                   |  |  |  |
| Size (in bits):  | 32         |   |          |     |         |     |                   |  |  |  |
| Default Value:   | 0x00000000 |   |          |     |         |     |                   |  |  |  |
| DWord  | Bit        | Description   |          |     |         |     |                   |  |  |  |
| 0  | 31:16      | <b>Dispatched Pixel/Sample Enables</b> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>One bit per pixel (or sample within pixel) indicating which pixels/samples were originally enabled when the thread was dispatched. The Dispatched Pixel/Sample Enables must be unmodified from the ones sent when the pixel shader thread was initiated. If the Dispatched Pixel/Sample Enables are modified, behavior is undefined.</p> <table border="1"> <tr> <th colspan="2">Programming Notes</th> </tr> <tr> <td colspan="2">When operating in PER_SAMPLE mode these bits correspond to samples, not pixels. Each subspan slot (4 bits) corresponds to a specific sample location for the subspan. Note that in NUMSAMPLES_1 mode, a pixel and sample are synonymous. When operating in PER_PIXEL mode, this field is ignored, and instead the SampleEnableMask (obtained via bypass) are used to clear the Depth Scoreboard.</td> </tr> </table>  | Project: | All | Format: | U16 | Programming Notes |  | When operating in PER_SAMPLE mode these bits correspond to samples, not pixels. Each subspan slot (4 bits) corresponds to a specific sample location for the subspan. Note that in NUMSAMPLES_1 mode, a pixel and sample are synonymous. When operating in PER_PIXEL mode, this field is ignored, and instead the SampleEnableMask (obtained via bypass) are used to clear the Depth Scoreboard.   |  |
|  |            | Project:  | All      |     |         |     |                   |  |  |  |
| Format:  | U16        |   |          |     |         |     |                   |  |  |  |
| Programming Notes  |            |   |          |     |         |     |                   |  |  |  |
| When operating in PER_SAMPLE mode these bits correspond to samples, not pixels. Each subspan slot (4 bits) corresponds to a specific sample location for the subspan. Note that in NUMSAMPLES_1 mode, a pixel and sample are synonymous. When operating in PER_PIXEL mode, this field is ignored, and instead the SampleEnableMask (obtained via bypass) are used to clear the Depth Scoreboard.   |            |   |          |     |         |     |                   |  |  |  |
|  | 15:0       | <b>Pixel/Sample Enables</b> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>Specifies which pixels/samples are still lit based on kill instruction activity in the pixel shader. This mask is AND'd with the Dispatched Pixel/Sample Enables mask, and that is used to control actual accesses to the color buffer. Pixels/samples will be dropped on masked writes, and the GRF is not modified for masked reads.</p> <table border="1"> <tr> <th colspan="2">Programming Notes</th> </tr> <tr> <td colspan="2">When operating in PER_SAMPLE mode these bits correspond to samples, not pixels, as the PS is run per-sample. Each subspan slot (4 bits) corresponds to a specific sample location for the subspan. When operating in PER_PIXEL mode, these bits still correspond to pixels, as the PS is run per-pixel. Each pixels mask bit is replicated according to Number of Multisamples and combined with other masks to control writes to the multisample locations.</td> </tr> </table> | Project: | All | Format: | U16 | Programming Notes |  | When operating in PER_SAMPLE mode these bits correspond to samples, not pixels, as the PS is run per-sample. Each subspan slot (4 bits) corresponds to a specific sample location for the subspan. When operating in PER_PIXEL mode, these bits still correspond to pixels, as the PS is run per-pixel. Each pixels mask bit is replicated according to Number of Multisamples and combined with other masks to control writes to the multisample locations. |  |
|  |            | Project:  | All      |     |         |     |                   |  |  |  |
| Format:  | U16        |   |          |     |         |     |                   |  |  |  |
| Programming Notes  |            |   |          |     |         |     |                   |  |  |  |
| When operating in PER_SAMPLE mode these bits correspond to samples, not pixels, as the PS is run per-sample. Each subspan slot (4 bits) corresponds to a specific sample location for the subspan. When operating in PER_PIXEL mode, these bits still correspond to pixels, as the PS is run per-pixel. Each pixels mask bit is replicated according to Number of Multisamples and combined with other masks to control writes to the multisample locations. |            |   |          |     |         |     |                   |  |  |  |

## Power Clock State Format

| Power Clock State Format   |   |                   |
|--|---|-------------------|
| Project:   | CHV, BSW                                      |                   |
| Source:  | RenderCS                                      |                   |
| Size (in bits):  | 31  |                   |
| Default Value:   | 0x00000288                                    |                   |
| Known Uses   |   |                   |
| <ul style="list-style-type: none"> <li>• R_PWR_CLK_STATE - Render Power Clock State Register</li> <li>• PM_PWR_CLK_STATE - PM Power Clock State Request (Intended, in GT/GTI space, not yet in use)</li> <li>• PM_PWR_CLK_STATE (Intended, in GT/GTI space, not yet in use)</li> </ul> |   |                   |
| DWord  | Bit   | Description       |
| 0<br><b>Project:</b> CHV, BSW  | 30:19   | <b>RSVD</b>       |
|  |   | Project: CHV, BSW |
|  |   | Access: RO        |
|  |   | Format: MBZ       |
|  | Reserved (CSunit implements full 32b storage) |                   |
| 18   | <b>SCountEn</b>                               |                   |
|  | Project: CHV, BSW                             |                   |
|  | Access: R/W                                   |                   |
| <b>Programming Notes</b>   |   |                   |
| Not supported in CHV, BSW, . Must be zero (MBZ).   |   |                   |
| 17:15  | <b>SliceCount</b>                             |                   |
|  | Project: CHV, BSW                             |                   |
|  | Access: R/W                                   |                   |
| <b>Programming Notes</b>   |   |                   |
| Not supported in CHV, BSW, . Must be zero (MBZ).   |   |                   |
| 14:13  | <b>RSVD</b>                                   |                   |
|  | Project: CHV, BSW                             |                   |
|  | Access: RO                                    |                   |
| Reserved (CSunit implements full 32b storage)  |   |                   |
| 12   | <b>Spare</b>                                  |                   |
| Project: CHV, BSW  |   |                   |

| <b>Power Clock State Format</b> |                  |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
|---------------------------------|------------------|---|----------|----------|---------|-----|------------------------|------|-------------|-------|--|-------|-------|--|-------|-------|--|-------|-------|------------------|-------------------------------------|
|                                 |                  | <table border="1"> <tr> <td>Access:</td> <td>R/W</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> <tr> <td colspan="2">Spare bit for CHV, BSW</td> </tr> </table>  | Access:  | R/W      | Format: | MBZ | Spare bit for CHV, BSW |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Access:                         | R/W              |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Format:                         | MBZ              |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Spare bit for CHV, BSW          |                  |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
|                                 | 11               | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Access:</td> <td>R/W</td> </tr> </table>  | Project: | CHV, BSW | Access: | R/W |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Project:                        | CHV, BSW         |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Access:                         | R/W              |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
|                                 | 10:8             | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Access:</td> <td>R/W</td> </tr> </table>  | Project: | CHV, BSW | Access: | R/W |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Project:                        | CHV, BSW         |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Access:                         | R/W              |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
|                                 | 7:4              | <p><b>EUmax</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Access:</td> <td>R/W</td> </tr> </table> <p>Maximum number of EUs to power (per subslice if multiple subslices enabled). To specify an exact number of subslices, set EUmax equal to EUmin.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0010b</td> <td></td> <td>2 EUs</td> </tr> <tr> <td>0100b</td> <td></td> <td>4 EUs</td> </tr> <tr> <td>0110b</td> <td></td> <td>6 EUs</td> </tr> <tr> <td>1000b</td> <td><b>[Default]</b></td> <td>8 EUs</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>EUmin and EUmax need to be even and odd numbers are illegal.</p> | Project: | CHV, BSW | Access: | R/W | Value                  | Name | Description | 0010b |  | 2 EUs | 0100b |  | 4 EUs | 0110b |  | 6 EUs | 1000b | <b>[Default]</b> | 8 EUs                               |
| Project:                        | CHV, BSW         |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Access:                         | R/W              |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Value                           | Name             | Description   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| 0010b                           |                  | 2 EUs   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| 0100b                           |                  | 4 EUs   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| 0110b                           |                  | 6 EUs   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| 1000b                           | <b>[Default]</b> | 8 EUs   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
|                                 | 3:0              | <p><b>EUmin</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Access:</td> <td>R/W</td> </tr> </table> <p>Minimum number of EUs to power (per subslice if multiple subslices enabled).</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0010b</td> <td></td> <td>2 EUs</td> </tr> <tr> <td>0100b</td> <td></td> <td>4 EUs</td> </tr> <tr> <td>0110b</td> <td></td> <td>6 EUs</td> </tr> <tr> <td>1000b</td> <td><b>[Default]</b></td> <td>8 EUs (minimum for GPGPU workloads)</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>EUmin and EUmax need to be even and odd numbers are illegal.</p>                                      | Project: | CHV, BSW | Access: | R/W | Value                  | Name | Description | 0010b |  | 2 EUs | 0100b |  | 4 EUs | 0110b |  | 6 EUs | 1000b | <b>[Default]</b> | 8 EUs (minimum for GPGPU workloads) |
| Project:                        | CHV, BSW         |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Access:                         | R/W              |   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| Value                           | Name             | Description   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| 0010b                           |                  | 2 EUs   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| 0100b                           |                  | 4 EUs   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| 0110b                           |                  | 6 EUs   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |
| 1000b                           | <b>[Default]</b> | 8 EUs (minimum for GPGPU workloads)   |          |          |         |     |                        |      |             |       |  |       |       |  |       |       |  |       |       |                  |                                     |



## Qword A64 SIMD4x2 Atomic CMPWR Message Data Payload

| MDP_A64_AOP4X2_QW2 - Qword A64 SIMD4x2 Atomic CMPWR Message Data Payload |  |   |         |        |
|--|--|---|---------|--------|
| Project:   | CHV, BSW   |   |         |        |
| Source:  | PRM  |   |         |        |
| Size (in bits):  | 512  |   |         |        |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |         |        |
| DWord  | Bit  | Description   |         |        |
| 0.0-0.1  | 63:0   | <b>Src0 Slot0</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>U64</td> </tr> </table> Specifies the Slot 0 Source 0 data | Format: | U64    |
| Format:  | U64  |   |         |        |
| 0.2-0.3  | 63:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> Ignored                           | Format: | Ignore |
| Format:  | Ignore   |   |         |        |
| 0.4-0.5  | 63:0   | <b>Src0 Slot1</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>U64</td> </tr> </table> Specifies the Slot 1 Source 0 data | Format: | U64    |
| Format:  | U64  |   |         |        |
| 0.6-0.7  | 63:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> Ignored                           | Format: | Ignore |
| Format:  | Ignore   |   |         |        |
| 1.0-1.1  | 63:0   | <b>Src1 Slot0</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>U64</td> </tr> </table> Specifies the Slot 0 Source 1 data | Format: | U64    |
| Format:  | U64  |   |         |        |
| 1.2-1.3  | 63:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> Ignored                           | Format: | Ignore |
| Format:  | Ignore   |   |         |        |
| 1.4-1.5  | 63:0   | <b>Src1 Slot1</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>U64</td> </tr> </table> Specifies the Slot 1 Source 1 data | Format: | U64    |
| Format:  | U64  |   |         |        |
| 1.6-1.7  | 63:0   | <b>Reserved</b>   |         |        |

| <b>MDP_A64_AOP4X2_QW2 - Qword A64 SIMD4x2 Atomic CMPWR<br/>Message Data Payload</b> |  |         |        |
|---|--|---------|--------|
|   |  | Format: | Ignore |
|   |  | Ignored |        |



## Qword Data Payload Register

| <b>MDCR_QW - Qword Data Payload Register</b> |  |  |
|--|--|--|
| Project:                                     | CHV, BSW   |  |
| Source:                                      | PRM  |  |
| Size (in bits):                              | 256  |  |
| Default Value:                               | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord  | Bit  | Description  |
| 0.0-0.1                                      | 63:0   | <b>Qword0</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U64  |
|  |  | Specifies the slot 0 data in this payload register |
| 0.2-0.3                                      | 63:0   | <b>Qword1</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U64  |
|  |  | Specifies the slot 1 data in this payload register |
| 0.4-0.5                                      | 63:0   | <b>Qword2</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U64  |
|  |  | Specifies the slot 2 data in this payload register |
| 0.6-0.7                                      | 63:0   | <b>Qword3</b>                                      |
|  |  | Project: All                                       |
|  |  | Format: U64  |
|  |  | Specifies the slot 3 data in this payload register |

## Qword SIMD4x2 Atomic CMPWR8B Message Data Payload

| <b>MDP_AOP4X2_QW2 - Qword SIMD4x2 Atomic CMPWR8B Message Data Payload</b> |  |   |         |     |
|---|--|---|---------|-----|
| Project:  | CHV, BSW   |   |         |     |
| Source:   | PRM  |   |         |     |
| Size (in bits):   | 256  |   |         |     |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |         |     |
| DWord   | Bit  | Description   |         |     |
| 0-1   | 63:0   | <b>Src0 Slot0</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U64</td> </tr> </table> Specifies the Slot 0 Source 0 data | Format: | U64 |
| Format:   | U64  |   |         |     |
| 2-3   | 63:0   | <b>Src1 Slot0</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U64</td> </tr> </table> Specifies the Slot 0 Source 1 data | Format: | U64 |
| Format:   | U64  |   |         |     |
| 4-5   | 63:0   | <b>Src0 Slot1</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U64</td> </tr> </table> Specifies the Slot 1 Source 0 data | Format: | U64 |
| Format:   | U64  |   |         |     |
| 6-7   | 63:0   | <b>Src1 Slot1</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U64</td> </tr> </table> Specifies the Slot 1 Source 1 data | Format: | U64 |
| Format:   | U64  |   |         |     |

## Qword SIMD4x2 Atomic Operation Message Data Payload

| MDP_AOP4X2_QW1 - Qword SIMD4x2 Atomic Operation Message Data Payload |  |   |         |         |
|--|--|---|---------|---------|
| Project:   | CHV, BSW   |   |         |         |
| Source:  | PRM  |   |         |         |
| Size (in bits):  | 256  |   |         |         |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |         |         |
| DWord  | Bit  | Description   |         |         |
| 0-1  | 63:0   | <p><b>Qword0</b></p> <table border="1"> <tr> <td>Format:</td> <td>U64 S63</td> </tr> </table> <p>Specifies the Slot 0 Source or Return data</p> | Format: | U64 S63 |
| Format:  | U64 S63  |   |         |         |
| 2-3  | 63:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>                                   | Format: | Ignore  |
| Format:  | Ignore   |   |         |         |
| 4-5  | 63:0   | <p><b>Qword1</b></p> <table border="1"> <tr> <td>Format:</td> <td>U64 S63</td> </tr> </table> <p>Specifies the Slot 1 Source or Return data</p> | Format: | U64 S63 |
| Format:  | U64 S63  |   |         |         |
| 6-7  | 63:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>                                   | Format: | Ignore  |
| Format:  | Ignore   |   |         |         |



## Qword SIMD8 Atomic Operation CMPWR Message Data Payload

| MDP_A64_AOP8_QW2 - Qword SIMD8 Atomic Operation CMPWR Message Data Payload |  |   |          |     |
|--|--|---|----------|-----|
| Project:   | CHV, BSW   |   |          |     |
| Source:  | PRM  |   |          |     |
| Size (in bits):  | 1024   |   |          |     |
| Default Value:   | 0x00000000, 0x00000000 |   |          |     |
| DWord  | Bit  | Description   |          |     |
| 0.0-0.7  | 255:0  | <b>Slot[3:0] Src0</b>   |          |     |
|  |  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_QW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot [3:0] Source 0 data</p> | Project: | All |
| Project:   | All  |   |          |     |
| Format:  | MDCR_QW [CHV, BSW]   |   |          |     |
| 1.0-1.7  | 255:0  | <b>Slot[7:4] Src0</b>   |          |     |
|  |  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_QW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot [7:4] Source 0 data</p> | Project: | All |
| Project:   | All  |   |          |     |
| Format:  | MDCR_QW [CHV, BSW]   |   |          |     |
| 2.0-2.7  | 255:0  | <b>Slot[3:0] Src1</b>   |          |     |
|  |  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_QW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot [3:0] Source 1 data</p> | Project: | All |
| Project:   | All  |   |          |     |
| Format:  | MDCR_QW [CHV, BSW]   |   |          |     |
| 3.0-3.7  | 255:0  | <b>Slot[7:4] Src1</b>   |          |     |
|  |  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_QW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot [7:4] Source 1 data</p> | Project: | All |
| Project:   | All  |   |          |     |
| Format:  | MDCR_QW [CHV, BSW]   |   |          |     |

## Qword SIMD8 Atomic Operation Return Data Message Data Payload

| <b>MDP_AOP8_QW1 - Qword SIMD8 Atomic Operation Return Data Message Data Payload</b> |  |  |          |     |
|---|--|--|----------|-----|
| Project:  | CHV, BSW   |  |          |     |
| Source:   | PRM  |  |          |     |
| Size (in bits):   | 512  |  |          |     |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |
| <b>DWord</b>  | <b>Bit</b>   | <b>Description</b>   |          |     |
| 0.0-0.7   | 255:0  | <b>Slot[7:0] Qword[31:0]</b>   |          |     |
|   |  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> <p>Specifies the lower 32-bits of Slot [7:0] Return data</p> | Project: | All |
| Project:  | All  |  |          |     |
| Format:   | MDCR_DW [CHV, BSW]   |  |          |     |
| 1.0-1.7   | 255:0  | <b>Slot[7:0] Qword[63:32]</b>  |          |     |
|   |  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> <p>Specifies the upper 32-bits of Slot [7:0] Return data</p> | Project: | All |
| Project:  | All  |  |          |     |
| Format:   | MDCR_DW [CHV, BSW]   |  |          |     |

## Qword SIMD8 Data Payload

| MDP_QW_SIMD8 - Qword SIMD8 Data Payload |  |                               |
|---|--|-------------------------------|
| Project:                                | CHV, BSW   |                               |
| Source:                                 | PRM  |                               |
| Size (in bits):                         | 512  |                               |
| Default Value:                          | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |                               |
| DWord                                   | Bit  | Description                   |
| 0.0-0.7                                 | 255:0  | <b>Data[3:0]</b>              |
|   |  | Project: All                  |
|   |  | Format: MDCR_QW [CHV, BSW]    |
|   |  | Specifies the Slot [3:0] data |
| 1.0-1.7                                 | 255:0  | <b>Data[7:4]</b>              |
|   |  | Project: All                  |
|   |  | Format: MDCR_QW [CHV, BSW]    |
|   |  | Specifies the Slot [7:4] data |





| <b>MDP_AOP16_QW2 - Qword SIMD16 Atomic Operation CMPWR8B<br/>Message Data Payload</b> |                    |   |          |     |         |                    |
|---|--------------------|---|----------|-----|---------|--------------------|
| 4.0-4.7   | 255:0              | <b>Slot[7:0] Src1[31:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the lower 32-bits of Source 1 data for Slot [7:0]  | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All                |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW] |   |          |     |         |                    |
| 5.0-5.7   | 255:0              | <b>Slot[15:8] Src1[31:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the lower 32-bits Source 1 data for Slot [15:8]   | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All                |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW] |   |          |     |         |                    |
| 6.0-6.7   | 255:0              | <b>Slot[7:0] Src1[63:32]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the upper 32-bits of Source 1 data for Slot [7:0] | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All                |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW] |   |          |     |         |                    |
| 7.0-7.7   | 255:0              | <b>Slot[15:8] Src1[63:32]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> Specifies the upper 32-bits Source 1 data for Slot [15:8]  | Project: | All | Format: | MDCR_DW [CHV, BSW] |
| Project:  | All                |   |          |     |         |                    |
| Format:   | MDCR_DW [CHV, BSW] |   |          |     |         |                    |

## Qword SIMD16 Atomic Operation Return Data Message Data Payload

| <b>MDP_AOP16_QW1 - Qword SIMD16 Atomic Operation Return Data Message Data Payload</b> |  |   |          |     |
|---|--|---|----------|-----|
| Project:  | CHV, BSW   |   |          |     |
| Source:   | PRM  |   |          |     |
| Size (in bits):   | 1024   |   |          |     |
| Default Value:  | 0x00000000, 0x00000000 |   |          |     |
| DWord   | Bit  | Description   |          |     |
| 0.0-0.7   | 255:0  | <b>Slot[7:0] Qword[31:0]</b>  |          |     |
|   |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> <p>Specifies the lower 32-bits of Return data for Slot [7:0]</p>  | Project: | All |
| Project:  | All  |   |          |     |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |
| 1.0-1.7   | 255:0  | <b>Slot[15:8] Qword[31:0]</b>   |          |     |
|   |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> <p>Specifies the lower 32-bits of Return data for Slot [15:8]</p> | Project: | All |
| Project:  | All  |   |          |     |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |
| 2.0-2.7   | 255:0  | <b>Slot[7:0] Qword[63:32]</b>   |          |     |
|   |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> <p>Specifies the upper 32-bits of Return data for Slot [7:0]</p>  | Project: | All |
| Project:  | All  |   |          |     |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |
| 3.0-3.7   | 255:0  | <b>Slot[15:8] Qword[63:32]</b>  |          |     |
|   |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_DW [CHV, BSW]</td> </tr> </table> <p>Specifies the upper 32-bits of Return data for Slot [15:8]</p> | Project: | All |
| Project:  | All  |   |          |     |
| Format:   | MDCR_DW [CHV, BSW]   |   |          |     |

## Qword SIMD16 Data Payload

| MDP_QW_SIMD16 - Qword SIMD16 Data Payload |  |   |          |     |         |                    |
|---|--|---|----------|-----|---------|--------------------|
| Project:                                  | CHV, BSW   |   |          |     |         |                    |
| Source:                                   | PRM  |   |          |     |         |                    |
| Size (in bits):                           | 1024   |   |          |     |         |                    |
| Default Value:                            | 0x00000000, 0x00000000 |   |          |     |         |                    |
| DWord                                     | Bit  | Description   |          |     |         |                    |
| 0.0-0.7                                   | 255:0  | <b>Data[3:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_QW [CHV, BSW]</td> </tr> </table> Specifies the Slot [3:0] data   | Project: | All | Format: | MDCR_QW [CHV, BSW] |
| Project:                                  | All  |   |          |     |         |                    |
| Format:                                   | MDCR_QW [CHV, BSW]   |   |          |     |         |                    |
| 1.0-1.7                                   | 255:0  | <b>Data[7:4]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_QW [CHV, BSW]</td> </tr> </table> Specifies the Slot [7:4] data   | Project: | All | Format: | MDCR_QW [CHV, BSW] |
| Project:                                  | All  |   |          |     |         |                    |
| Format:                                   | MDCR_QW [CHV, BSW]   |   |          |     |         |                    |
| 2.0-2.7                                   | 255:0  | <b>qw11_qw8</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_QW [CHV, BSW]</td> </tr> </table> Specifies the Slot [11:8] data   | Project: | All | Format: | MDCR_QW [CHV, BSW] |
| Project:                                  | All  |   |          |     |         |                    |
| Format:                                   | MDCR_QW [CHV, BSW]   |   |          |     |         |                    |
| 3.0-3.7                                   | 255:0  | <b>qw15_qw12</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCR_QW [CHV, BSW]</td> </tr> </table> Specifies the Slot [15:12] data | Project: | All | Format: | MDCR_QW [CHV, BSW] |
| Project:                                  | All  |   |          |     |         |                    |
| Format:                                   | MDCR_QW [CHV, BSW]   |   |          |     |         |                    |

## Read-Only Data Port Message Types

| MT_DP_RO - Read-Only Data Port Message Types   |                    |                           |   |
|--|--------------------|---------------------------|---|
| Project:   | CHV, BSW           |                           |   |
| Source:  | Read-Only DataPort |                           |   |
| Size (in bits):  | 5                  |                           |   |
| Default Value:   | 0x00000000         |                           |   |
| Lists all the Message Types in a Read-Only Data Port Message Descriptor [18:14]. Read operations from the Constant Cache and Sampler Cache are encoded in the Read-Only Data Port. Many of the operations are also implemented in Data Port 0, and those operations use the same Message Header. |                    |                           |   |
| DWord  | Bit                | Description               |   |
| 0  | 4                  | <b>Reserved</b>           |   |
|  |                    | Format:                   | MBZ   |
|  |                    | Ignored                   |   |
|  | 3:0                | <b>Message Type</b>       |   |
|  |                    | Format:                   | Enumeration                                       |
|  |                    | Specifies type of message |   |
|  |                    | <b>Value</b>              | <b>Name</b>                                       |
|  |                    | <b>Description</b>        | <b>Project</b>                                    |
|  |                    | 00h                       | MT_CC_OWUB<br>[Default]                           |
|  |                    |                           | Oword Block Read Constant Cache message           |
|  |                    | 01h                       | MT_CC_OWDB  |
|  |                    |                           | Unaligned Oword Block Read Constant Cache message |
|  |                    | 02h                       | MT_CC_DWS   |
|  |                    |                           | Oword Dual Block Read Constant Cache message      |
|  |                    | 03h                       | MT_SC_OWUB  |
|  |                    |                           | Dword Scattered Read Constant Cache message       |
|  |                    | 04h                       | MT_SC_MB  |
|  |                    |                           | Unaligned Oword Block Read Sampler Cache message  |
|  |                    | 05h                       | MT_RSI  |
|  |                    |                           | Media Block Read Sampler Cache message            |
|  |                    | 06h                       | Reserved  |
|  |                    |                           | Read Surface Info message                         |
|  |                    | Others                    | Reserved  |
|  |                    |                           | Ignored   |

## Read Surface Info 32-Bit Address Payload

| MAP32B_RSI - Read Surface Info 32-Bit Address Payload |  |   |
|---|--|---|
| Project:  | CHV, BSW   |   |
| Source:   | PRM  |   |
| Size (in bits):                                       | 256  |   |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |
| DWord   | Bit  | Description                             |
| 0.0   | 31:0   | <b>U</b>                                |
|   |  | Project: All                            |
|   |  | Format: U32                             |
|   |  | Specifies the U channel address offset. |
| 0.1   | 31:0   | <b>V</b>                                |
|   |  | Project: All                            |
|   |  | Format: U32                             |
|   |  | Specifies the V channel address offset. |
| 0.2   | 31:0   | <b>R</b>                                |
|   |  | Project: All                            |
|   |  | Format: U32                             |
|   |  | Specifies the R channel address offset. |
| 0.3   | 31:0   | <b>LOD</b>                              |
|   |  | Project: All                            |
|   |  | Format: MACD_LOD [CHV, BSW]             |
|   |  | Specifies the LOD.                      |
| 0.4-0.7   | 127:0  | <b>Reserved</b>                         |
|   |  | Project: All                            |
|   |  | Format: Ignore                          |
|   |  | Ignored                                 |

## Read Surface Info Data Payload

| MDP_RSI - Read Surface Info Data Payload                              |  |  |
|---|--|--|
| Project:  | CHV, BSW   |  |
| Source:   | PRM  |  |
| Size (in bits):   | 512  |  |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord   | Bit  | Description  |
| 0.0-0.5   | 191:0  | <b>Reserved</b>  |
|   |  | Project: All   |
|   |  | Format: Ignore   |
|   |  | Ignored  |
| 0.6-0.7   | 63:0   | <b>Instruction Base Address</b>  |
|   |  | Project: All   |
|   |  | Format: GraphicsAddress[63:0]  |
|   |  | Instruction Base Address from STATE_BASE_ADDRESS, extended to 64-bit format.   |
|   |  | <b>Programming Notes</b>   |
| The 48-bit address is returned in a 64-bit address in canonical form. |  |  |
| 1.0   | 31:0   | <b>Width</b>   |
|   |  | Project: All   |
|   |  | Format: U32  |
|   |  | Surface Width generally computed from RENDER_SURFACE_STATE Width (stored as width minus 1). The value is 0 for NULL surface, and in all other cases (Width+1) » LOD. Surface Width from RENDER_SURFACE_STATE (U14), zero extended to 32 bits.                                  |
| 1.1   | 31:0   | <b>Height</b>  |
|   |  | Project: All   |
|   |  | Format: U32  |
|   |  | Surface Height, generally computed from RENDER_SURFACE_STATE Height (stored as height minus 1). The value for a 1D array is RENDER_SURFACE_STATE's (Depth + 1). The value for 1D non-array, BUFFER, and NULL surface is 0. In all other case, the value is (Height + 1) » LOD. |
| 1.2   | 31:0   | <b>Depth</b>   |
|   |  | Project: All   |
|   |  | Format: U32  |
|   |  | Surface Depth, generally computed from RENDER_SURFACE_STATE Depth (which is stored depth minus 1). If 2D Array or Cube Array surface, value is the (Depth+1). If 3D surface, value is  |

| <b>MDP_RSI - Read Surface Info Data Payload</b>                               |                 |  |                 |  |                |
|---|-----------------|--|-----------------|--|----------------|
|   |                 | (Depth+1) » LOD. In all other case, the value is 0.              |                 |  |                |
| 1.3   | 31:0            | <b>MIP Count</b>   |                 |  |                |
|   |                 | Project:   | All             |  |                |
|   |                 | Format:  | U32             |  |                |
| MIP Count from RENDER_SURFACE_STATE, range [0, 14], zero extended to 32 bits. |                 |  |                 |  |                |
| 1.4   | 31:0            | <b>Surface Type</b>  |                 |  |                |
|   |                 | Project:   | All             |  |                |
|   |                 | Format:  | U32             |  |                |
|   |                 | Surface Type from RENDER_SURFACE_STATE, zero extended to 32 bits |                 |  |                |
|   |                 | <b>Value</b>   | <b>Name</b>     | <b>Description</b>                     | <b>Project</b> |
|   |                 | 0h   | SURFTYPE_1D     | 1-dimensional map or array of maps     | All            |
|   |                 | 1h   | SURFTYPE_2D     | 2-dimensional map or array of maps     | All            |
|   |                 | 2h   | SURFTYPE_3D     | 3-dimensional map (volumetric) of maps | All            |
|   |                 | 3h   | SURFTYPE_CUBE   | Cube map or array of cube maps         | All            |
|   |                 | 4h   | SURFTYPE_BUFFER | Element in a buffer                    | All            |
| 5h  | SURFTYPE_STRBUF | Structured buffer surface  | All             |  |                |
| 7h  | SURTYPE_NULL    | Null surface   | All             |  |                |
| Others  | Reserved        | Reserved   | All             |  |                |
| 1.5   | 31:0            | <b>Surface Format</b>  |                 |  |                |
|   |                 | Project:   | All             |  |                |
|   |                 | Format:  | U32             |  |                |
| Surface Format from RENDER_SURFACE_STATE (U9), zero extended to 32 bits.      |                 |  |                 |  |                |
| 1.6-1.7   | 63:0            | <b>Reserved</b>  |                 |  |                |
|   |                 | Project:   | All             |  |                |
|   |                 | Format:  | Ignore          |  |                |
| Ignored   |                 |  |                 |  |                |

## RENDER\_SURFACE\_STATE

| RENDER_SURFACE_STATE  |  |  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
|---|--|--|-------|------|-------------|----|-------------|--|----|-------------|--|----|-------------|--|----|---------------|--|----|-----------------|--------------------------------|----|-----------------|-------------------------------------|----|----------|--|----|---------------|------------------------|
| Project:  | CHV, BSW   |  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| Source:   | PRM  |  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| Exists If:  | //[MessageType] != 'Sample_8x8'  |  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| Size (in bits):   | 480  |  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| This is the normal surface state used by all messages that use SURFACE_STATE except those that use MEDIA_SURFACE_STATE. |  |  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| DWord   | Bit  | Description  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| 0   | 31:29  | <p><b>Surface Type</b><br/>This field defines the type of the surface.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>SURFTYPE_1D</td> <td>Defines a 1-dimensional map or array of maps</td> </tr> <tr> <td>1h</td> <td>SURFTYPE_2D</td> <td>Defines a 2-dimensional map or array of maps</td> </tr> <tr> <td>2h</td> <td>SURFTYPE_3D</td> <td>Defines a 3-dimensional (volumetric) map</td> </tr> <tr> <td>3h</td> <td>SURFTYPE_CUBE</td> <td>Defines a cube map or array of cube maps</td> </tr> <tr> <td>4h</td> <td>SURFTYPE_BUFFER</td> <td>Defines an element in a buffer</td> </tr> <tr> <td>5h</td> <td>SURFTYPE_STRBUF</td> <td>Defines a structured buffer surface</td> </tr> <tr> <td>6h</td> <td>Reserved</td> <td></td> </tr> <tr> <td>7h</td> <td>SURFTYPE_NULL</td> <td>Defines a null surface</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>A null surface is used in instances where an actual surface is not bound. When a write message is generated to a null surface, no actual surface is written to. When a read message (including any sampling engine message) is generated to a null surface, the result is all zeros. Note that a null surface type is allowed to be used with all messages, even if it is not specifically indicated as supported. All of the remaining fields in surface state are ignored for null surfaces, with the following exceptions:</p> <ul style="list-style-type: none"> <li>• <b>Width, Height, Depth, LOD,</b> and <b>Render Target View Extent</b> fields must match the depth buffer's corresponding state for all render target surfaces, including null.</li> </ul> <p>All sampling engine and data port messages support null surfaces with the above behavior, even if not mentioned as specifically supported, except for the following:</p> <ul style="list-style-type: none"> <li>• Data Port Media Block Read/Write messages</li> <li>• Data Port Transpose Read message</li> <li>• The <b>Surface Type</b> of a surface used as a render target (accessed via the Data Port's</li> </ul> | Value | Name | Description | 0h | SURFTYPE_1D | Defines a 1-dimensional map or array of maps | 1h | SURFTYPE_2D | Defines a 2-dimensional map or array of maps | 2h | SURFTYPE_3D | Defines a 3-dimensional (volumetric) map | 3h | SURFTYPE_CUBE | Defines a cube map or array of cube maps | 4h | SURFTYPE_BUFFER | Defines an element in a buffer | 5h | SURFTYPE_STRBUF | Defines a structured buffer surface | 6h | Reserved |  | 7h | SURFTYPE_NULL | Defines a null surface |
| Value   | Name   | Description  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| 0h  | SURFTYPE_1D  | Defines a 1-dimensional map or array of maps   |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| 1h  | SURFTYPE_2D  | Defines a 2-dimensional map or array of maps   |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| 2h  | SURFTYPE_3D  | Defines a 3-dimensional (volumetric) map   |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| 3h  | SURFTYPE_CUBE  | Defines a cube map or array of cube maps   |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| 4h  | SURFTYPE_BUFFER  | Defines an element in a buffer   |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| 5h  | SURFTYPE_STRBUF  | Defines a structured buffer surface  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| 6h  | Reserved   |  |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |
| 7h  | SURFTYPE_NULL  | Defines a null surface   |       |      |             |    |             |  |    |             |  |    |             |  |    |               |  |    |                 |                                |    |                 |                                     |    |          |  |    |               |                        |



| <b>RENDER_SURFACE_STATE</b>  |                                   |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
|--|-----------------------------------|---|-------------|---------------------------|--|--------|--|----------|---|--|-------|------|-------------|----|----------|----------|----|----------|---------------------------------|----|----------|---------------------------------|
|  |                                   | <p>Render Target Write message) must be the same as the <b>Surface Type</b> of all other render targets and of the depth buffer (defined in 3DSTATE_DEPTH_BUFFER), unless either the depth buffer or render targets are SURFTYPE_NULL.</p> <p>For sampling using the 3D sampler, if the Surface Type is programmed to SURFTYPE_NULL, the Surface Format must be a supported surface format for the 3D sampler.</p>  |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| 28   | <b>Surface Array</b>              | <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>This field, if enabled, indicates that the surface is an array.</p> <table border="1"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">                     If this field is <i>enabled</i>, the <b>Surface Type</b> must be SURFTYPE_1D, SURFTYPE_2D, or SURFTYPE_CUBE.<br/>                     If this field is <i>disabled</i> and <b>Surface Type</b> is SURFTYPE_1D, SURFTYPE_2D, or SURFTYPE_CUBE, the <b>Depth</b> field must be set to zero.                 </td> </tr> </table>  | Format:     | Enable                    | Programming Notes  |        | If this field is <i>enabled</i> , the <b>Surface Type</b> must be SURFTYPE_1D, SURFTYPE_2D, or SURFTYPE_CUBE.<br>If this field is <i>disabled</i> and <b>Surface Type</b> is SURFTYPE_1D, SURFTYPE_2D, or SURFTYPE_CUBE, the <b>Depth</b> field must be set to zero. |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| Format:  | Enable                            |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| Programming Notes  |                                   |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| If this field is <i>enabled</i> , the <b>Surface Type</b> must be SURFTYPE_1D, SURFTYPE_2D, or SURFTYPE_CUBE.<br>If this field is <i>disabled</i> and <b>Surface Type</b> is SURFTYPE_1D, SURFTYPE_2D, or SURFTYPE_CUBE, the <b>Depth</b> field must be set to zero.   |                                   |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| 27   | <b>Reserved</b>                   | <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table>  | Project:    | CHV, BSW                  | Format:  | Enable |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| Project:   | CHV, BSW                          |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| Format:  | Enable                            |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| 26:18  | <b>Surface Format</b>             | <table border="1"> <tr> <td>Format:</td> <td>SURFACE_FORMAT [CHV, BSW]</td> </tr> </table> <p>This field specifies the format of the surface or element within this surface. This field is ignored for all data port messages other than the render target message and streamed vertex buffer write message. Some forms of the media block messages use the surface format.</p>   | Format:     | SURFACE_FORMAT [CHV, BSW] |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| Format:  | SURFACE_FORMAT [CHV, BSW]         |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| 17:16  | <b>Surface Vertical Alignment</b> | <table border="1"> <thead> <tr> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td> <b>For Sampling Engine and Render Target Surfaces:</b> This field specifies the vertical alignment requirement in elements for the surface. Refer to the "Memory Data Formats" chapter for details on how this field changes the layout of the surface in memory. An <i>element</i> is defined as a pixel in uncompressed surface formats, and as a compression block in compressed surface formats. For MSFMT_DEPTH_STENCIL type multisampled surfaces, an element is a sample.                 </td> <td></td> </tr> <tr> <td>                     This field applies to surface formats other than compressed formats.                 </td> <td>CHV, BSW</td> </tr> <tr> <td> <b>For other surfaces:</b> This field is ignored.                 </td> <td></td> </tr> </tbody> </table><br><table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>Reserved</td> <td>Reserved</td> </tr> <tr> <td>1h</td> <td>VALIGN 4</td> <td>Vertical alignment factor j = 4</td> </tr> <tr> <td>2h</td> <td>VALIGN 8</td> <td>Vertical alignment factor j = 8</td> </tr> </tbody> </table> | Description | Project                   | <b>For Sampling Engine and Render Target Surfaces:</b> This field specifies the vertical alignment requirement in elements for the surface. Refer to the "Memory Data Formats" chapter for details on how this field changes the layout of the surface in memory. An <i>element</i> is defined as a pixel in uncompressed surface formats, and as a compression block in compressed surface formats. For MSFMT_DEPTH_STENCIL type multisampled surfaces, an element is a sample. |        | This field applies to surface formats other than compressed formats.   | CHV, BSW | <b>For other surfaces:</b> This field is ignored. |  | Value | Name | Description | 0h | Reserved | Reserved | 1h | VALIGN 4 | Vertical alignment factor j = 4 | 2h | VALIGN 8 | Vertical alignment factor j = 8 |
| Description  | Project                           |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| <b>For Sampling Engine and Render Target Surfaces:</b> This field specifies the vertical alignment requirement in elements for the surface. Refer to the "Memory Data Formats" chapter for details on how this field changes the layout of the surface in memory. An <i>element</i> is defined as a pixel in uncompressed surface formats, and as a compression block in compressed surface formats. For MSFMT_DEPTH_STENCIL type multisampled surfaces, an element is a sample. |                                   |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| This field applies to surface formats other than compressed formats.   | CHV, BSW                          |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| <b>For other surfaces:</b> This field is ignored.  |                                   |   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| Value  | Name                              | Description   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| 0h   | Reserved                          | Reserved  |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| 1h   | VALIGN 4                          | Vertical alignment factor j = 4   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |
| 2h   | VALIGN 8                          | Vertical alignment factor j = 8   |             |                           |  |        |  |          |   |  |       |      |             |    |          |          |    |          |                                 |    |          |                                 |

| <b>RENDER_SURFACE_STATE</b>   |   |   |                                    |
|---|---|---|------------------------------------|
|   | 3h  | VALIGN 16<br>Vertical alignment factor j = 16 |                                    |
| <b>Programming Notes</b>  |   |   |                                    |
| This field is intended to be set to VALIGN_4 if the surface was rendered as a depth buffer, for a multisampled (4x) render target, or for a multisampled (8x) render target, since these surfaces support only alignment of 4. Use of VALIGN_4 for other surfaces is supported, but increases memory usage.   |   |   |                                    |
| This field is intended to be set to VALIGN_8 only if the surface was rendered as a stencil buffer, since stencil buffer surfaces support only alignment of 8. If set to VALIGN_8, Surface Format must be R8_UINT.   |   |   |                                    |
| For uncompressed surfaces, the units of "j" are rows of pixels on the physical surface. For compressed texture formats, the units of "j" are in compression blocks, thus each increment in "j" is equal to h pixels, where h is the height of the compression block in pixels.  |   |   |                                    |
| 15:14   | <b>Surface Horizontal Alignment</b>   |   |                                    |
|   | <b>Description</b>  | <b>Project</b>                                |                                    |
|   | For Sampling Engine and Render Target Surfaces: This field specifies the horizontal alignment requirement for the surface. This field is ignored when Tiled Resource Mode is not TRMODE_NONE (i.e. Tiled Resources are enabled). See the "Surface Layout and Tiling" section under Common Surface Formats for the table of alignment values for Tile Resources. |   |                                    |
|   | This field applies to surface formats other than compressed formats.  | CHV,<br>BSW                                   |                                    |
|   | <b>For other surfaces:</b> This field is ignored.   |   |                                    |
|   | <b>Value</b>  | <b>Name</b>                                   |                                    |
|   | <b>Description</b>  |   |                                    |
|   | 0h  | Reserved                                      | Reserved                           |
|   | 1h  | HALIGN 4                                      | Horizontal alignment factor j = 4  |
|   | 2h  | HALIGN 8                                      | Horizontal alignment factor j = 8  |
|   | 3h  | HALIGN 16                                     | Horizontal alignment factor j = 16 |
| <b>Programming Notes</b>  |   |   |                                    |
| This field is intended to be set to HALIGN_8 only if the surface was rendered as a depth buffer with Z16 format or a stencil buffer. In this case it must be set to HALIGN_8 since these surfaces support only alignment of 8. For Z32 formats it must be set to HALIGN_4. Use of HALIGN_8 for other surfaces is supported, but increases memory usage. |   |   |                                    |
| For uncompressed surfaces, the units of "i" are pixels on the physical surface. For compressed texture formats, the units of "i" are in compression blocks, thus each increment in "i" is equal to w pixels, where w is the width of the compression block in pixels.   |   |   |                                    |
| When Auxiliary Surface Mode is set to AUX_CCS_D or AUX_CCS_E, HALIGN 16 must be used.   |   |   |                                    |
| 13:12   | <b>Tile Mode</b>  |   |                                    |
|   | This field specifies the type of memory tiling (Linear, WMajor, XMMajor, or YMajor) employed to   |   |                                    |

| <b>RENDER_SURFACE_STATE</b> |   |   |                         |
|-----------------------------|---|---|-------------------------|
|                             |   | tile this surface. See <i>Memory Interface Functions</i> for details on memory tiling and restrictions.   |                         |
|                             |   | <b>Value</b>  | <b>Name</b>             |
|                             |   | <b>Description</b>  | <b>Project</b>          |
|                             | 0h  | LINEAR  | Linear mode (no tiling) |
|                             | 1h  | WMAJOR  | W major tiling          |
|                             | 2h  | XMAJOR  | X major tiling          |
|                             | 3h  | YMAJOR  | Y major tiling          |
|                             |   | <b>Programming Notes</b>  |                         |
|                             |   | <ul style="list-style-type: none"> <li>Refer to <i>Memory Data Formats</i> for restrictions on <i>TileMode</i> direction for the various buffer types. (Of particular interest is the fact that YMAJOR tiling is not supported for display/overlay buffers).</li> <li>The corresponding cache(s) must be invalidated before a previously accessed surface is accessed again with an altered state of this field.</li> <li>Use of WMAJOR is valid only for sampling engine, Data Cache Data Port and render target surfaces and <b>Surface Format</b> must be R8_UINT. Vertical Line Stride must be zero. In addition to W tiling, this mode implies that the surface is stored as a stencil buffer. Refer to <i>Memory Data Formats</i> section for details on stencil buffer surface layout.</li> <li>Linear surfaces can be mapped to Main Memory (uncached) or System Memory (cacheable, snooped). Tiled (X/Y/W) surfaces can only be mapped to Main Memory.</li> <li>If <b>Surface Type</b> is SURFTYPE_BUFFER, this field must be TILEMODE_LINEAR</li> <li>If <b>Number of Multisamples</b> is not MULTISAMPLECOUNT_1, this field must be YMAJOR.</li> </ul> |                         |
|                             |   | If <b>Surface Format</b> is ASTC*, this field must be TILEMODE_YMAJOR.  |                         |
| 11                          | <b>Vertical Line Stride</b>   |   |                         |
|                             | Format:   | U1 In lines to skip between logically adjacent lines  |                         |
|                             | <b>For 2D Non-Array Surfaces accessed via the Sampling Engine or Data Cache Data Port:</b>  |   |                         |
|                             | Specifies number of lines (0 or 1) to skip between logically adjacent lines - provides support of interleaved (field) surfaces as textures. |   |                         |
|                             | <b>For Other Surfaces:</b> Vertical Line Stride must be zero.   |   |                         |
|                             |   | <b>Programming Notes</b>  |                         |
|                             |   | This bit must not be set if the surface format is a compressed type (BCn*, FXT1, ETC*, EAC*, ASTC*).  |                         |
|                             |   | This bit must not be set if the <b>Auxiliary Surface Mode</b> is not AUX_NONE.  |                         |
|                             |   | If this bit is set on a sampling engine surface, the mip mode filter must be set to MIPFILTER_NONE and the min and mag mode filter cannot be set to MAPFILTER_FLEXIBLE.   |                         |
|                             |   | <b>Workaround</b>   |                         |
|                             |   | All surfaces used by the sampler between sampler cache invalidates must have the same setting of this field in both RENDER_SURFACE_STATE and MEDIA_SURFACE_STATE.   |                         |
|                             |   | <b>Project</b>  |                         |
|                             |   | CHV, BSW  |                         |

| <b>RENDER_SURFACE_STATE</b>  |   |   |         |  |                   |   |                  |   |    |                  |  |                   |  |
|--|---|---|---------|--|-------------------|---|------------------|---|----|------------------|--|-------------------|--|
| 10   | <p><b>Vertical Line Stride Offset</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 15%;">Format:</td> <td>U1 In lines of initial offset (when Vertical Line Stride == 1)</td> </tr> </table> <p><b>For 2D Non-Array Surfaces accessed via the Sampling Engine or Data Cache Data Port:</b><br/>Specifies the offset of the initial line from the beginning of the buffer. Ignored when Vertical Line Stride is 0.</p> <p><b>For Other Surfaces:</b><br/>Vertical Line Stride Offset must be zero.</p>   |   | Format: | U1 In lines of initial offset (when Vertical Line Stride == 1) |                   |   |                  |   |    |                  |  |                   |  |
| Format:  | U1 In lines of initial offset (when Vertical Line Stride == 1)  |   |         |  |                   |   |                  |   |    |                  |  |                   |  |
| 9  | <p><b>Sampler L2 Bypass Mode Disable</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td>Disable</td> </tr> </table> <p>This field allows the Sampler L2 bypass mode to be disabled for the surface. If enabled, Sampler can still disable the L2 bypass as needed.</p> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <tr> <th style="text-align: center;">Programming Notes</th> </tr> <tr> <td>This bit must be set for the following surface types: BC2_UNORM BC3_UNORM BC5_UNORM BC5_SNORM BC7_UNORM</td> </tr> </table>   |   | Format: | Disable  | Programming Notes | This bit must be set for the following surface types: BC2_UNORM BC3_UNORM BC5_UNORM BC5_SNORM BC7_UNORM |                  |   |    |                  |  |                   |  |
| Format:  | Disable   |   |         |  |                   |   |                  |   |    |                  |  |                   |  |
| Programming Notes  |   |   |         |  |                   |   |                  |   |    |                  |  |                   |  |
| This bit must be set for the following surface types: BC2_UNORM BC3_UNORM BC5_UNORM BC5_SNORM BC7_UNORM                  |   |   |         |  |                   |   |                  |   |    |                  |  |                   |  |
| 8  | <p><b>Render Cache Read Write Mode</b></p> <p><b>For Surfaces accessed via the Data Port to Render Cache:</b><br/>This field specifies the way Render Cache treats a write request. If unset, Render Cache allocates a write-only cache line for a write miss. If set, Render Cache allocates a read-write cache line for a write miss.</p> <p><b>For Surfaces accessed via the Sampling Engine or Data Port to Texture Cache or Data Cache:</b><br/>This field is reserved : MBZ</p> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 30%;">Name</th> <th style="width: 55%;">Description</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>Write-Only Cache</td> <td>Allocating write-only cache for a write miss</td> </tr> <tr> <td>1h</td> <td>Read-Write Cache</td> <td>Allocating read-write cache for a write miss</td> </tr> </tbody> </table> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <tr> <th style="text-align: center;">Programming Notes</th> </tr> <tr> <td>This field is provided for performance optimization for Render Cache read/write accesses (from Gen4 EU's point of view).</td> </tr> </table> |   | Value   | Name   | Description       | 0h  | Write-Only Cache | Allocating write-only cache for a write miss                  | 1h | Read-Write Cache | Allocating read-write cache for a write miss | Programming Notes | This field is provided for performance optimization for Render Cache read/write accesses (from Gen4 EU's point of view). |
| Value  | Name  | Description   |         |  |                   |   |                  |   |    |                  |  |                   |  |
| 0h   | Write-Only Cache  | Allocating write-only cache for a write miss                  |         |  |                   |   |                  |   |    |                  |  |                   |  |
| 1h   | Read-Write Cache  | Allocating read-write cache for a write miss                  |         |  |                   |   |                  |   |    |                  |  |                   |  |
| Programming Notes  |   |   |         |  |                   |   |                  |   |    |                  |  |                   |  |
| This field is provided for performance optimization for Render Cache read/write accesses (from Gen4 EU's point of view). |   |   |         |  |                   |   |                  |   |    |                  |  |                   |  |
| 7:6  | <p><b>Media Boundary Pixel Mode</b></p> <p><b>For 2D Non-Array Surfaces accessed via the Data Port Media Block Read Message or Data Port Transpose Read message:</b><br/>This field enables control of which rows are returned on vertical out-of-bounds reads using the Data Port Media Block Read Message or Data Port Transpose Read message. In the description below, frame mode refers to <b>Vertical Line Stride</b> = 0, field mode is <b>Vertical Line Stride</b> = 1 in which only the even or odd rows are addressable. The frame refers to the entire surface, while the field refers only to the even or odd rows within the surface.</p> <p><b>For Other Surfaces:</b><br/>Reserved : MBZ</p> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 30%;">Name</th> <th style="width: 55%;">Description</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>NORMAL_MODE</td> <td>The row returned on an out-of-bound access is the closest row</td> </tr> </tbody> </table>   |   | Value   | Name   | Description       | 0h  | NORMAL_MODE      | The row returned on an out-of-bound access is the closest row |    |                  |  |                   |  |
| Value  | Name  | Description   |         |  |                   |   |                  |   |    |                  |  |                   |  |
| 0h   | NORMAL_MODE   | The row returned on an out-of-bound access is the closest row |         |  |                   |   |                  |   |    |                  |  |                   |  |

| <b>RENDER_SURFACE_STATE</b> |   |  |
|-----------------------------|---|--|
|                             |   | in the frame or field. Rows from the opposite field are never returned.  |
| 1h                          | Reserved  |  |
| 2h                          | PROGRESSIVE_FRAME   | The row returned on an out-of-bound access is the closest row in the frame, even if in field mode.   |
| 3h                          | INTERLACED_FRAME  | In field mode, the row returned on an out-of-bound access is the closest row in the field. In frame mode, even out-of-bound rows return the nearest even row while odd out-of-bound rows return the nearest odd row. |
| 5                           | <b>Cube Face Enable - Negative X</b>  |  |
|                             | Exists If:  | [Surface Type] == 'SURFTYPE_CUBE'  |
|                             | Format:   | Enable   |
|                             | <p><b>For SURFTYPE_CUBE Surfaces accessed via the Sampling Engine:</b> This field enable the individual face of a cube map. Enabling a face indicates that the face is present in the cube map, while disabling it indicates that that face is represented by the texture map's border color. Refer to Memory Data Formats for the correlation between faces and the cube map memory layout. Note that storage for disabled faces must be provided.</p> |  |
|                             | <b>Programming Notes</b>  |  |
|                             | When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled).  |  |
| 4                           | <b>Cube Face Enable - Positive X</b>  |  |
|                             | Exists If:  | [Surface Type] == 'SURFTYPE_CUBE'  |
|                             | Format:   | Enable   |
|                             | <p><b>For SURFTYPE_CUBE Surfaces accessed via the Sampling Engine:</b> This field enable the individual face of a cube map. Enabling a face indicates that the face is present in the cube map, while disabling it indicates that that face is represented by the texture map's border color. Refer to Memory Data Formats for the correlation between faces and the cube map memory layout. Note that storage for disabled faces must be provided.</p> |  |
|                             | <b>Programming Notes</b>  |  |
|                             | When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled).  |  |
| 3                           | <b>Cube Face Enable - Negative Y</b>  |  |
|                             | Exists If:  | [Surface Type] == 'SURFTYPE_CUBE'  |
|                             | Format:   | Enable   |
|                             | <p><b>For SURFTYPE_CUBE Surfaces accessed via the Sampling Engine:</b> This field enable the individual face of a cube map. Enabling a face indicates that the face is present in the cube map, while disabling it indicates that that face is represented by the texture map's border color. Refer to Memory Data Formats for the correlation between faces and the cube map memory layout. Note that storage for disabled faces must be provided.</p> |  |
|                             | <b>Programming Notes</b>  |  |

| <b>RENDER_SURFACE_STATE</b>  |  |            |                                   |         |        |                   |  |  |  |
|--|--|------------|-----------------------------------|---------|--------|-------------------|--|--|--|
|  | When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled).   |            |                                   |         |        |                   |  |  |  |
| 2  | <p><b>Cube Face Enable - Positive Y</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>[Surface Type] == 'SURFTYPE_CUBE'</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p><b>For SURFTYPE_CUBE Surfaces accessed via the Sampling Engine:</b> This field enable the individual face of a cube map. Enabling a face indicates that the face is present in the cube map, while disabling it indicates that that face is represented by the texture map's border color. Refer to Memory Data Formats for the correlation between faces and the cube map memory layout. Note that storage for disabled faces must be provided.</p> <table border="1"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled).</td> </tr> </table> | Exists If: | [Surface Type] == 'SURFTYPE_CUBE' | Format: | Enable | Programming Notes |  | When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled). |  |
| Exists If:   | [Surface Type] == 'SURFTYPE_CUBE'  |            |                                   |         |        |                   |  |  |  |
| Format:  | Enable   |            |                                   |         |        |                   |  |  |  |
| Programming Notes  |  |            |                                   |         |        |                   |  |  |  |
| When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled). |  |            |                                   |         |        |                   |  |  |  |
| 1  | <p><b>Cube Face Enable - Negative Z</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>[Surface Type] == 'SURFTYPE_CUBE'</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p><b>For SURFTYPE_CUBE Surfaces accessed via the Sampling Engine:</b> This field enable the individual face of a cube map. Enabling a face indicates that the face is present in the cube map, while disabling it indicates that that face is represented by the texture map's border color. Refer to Memory Data Formats for the correlation between faces and the cube map memory layout. Note that storage for disabled faces must be provided.</p> <table border="1"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled).</td> </tr> </table> | Exists If: | [Surface Type] == 'SURFTYPE_CUBE' | Format: | Enable | Programming Notes |  | When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled). |  |
| Exists If:   | [Surface Type] == 'SURFTYPE_CUBE'  |            |                                   |         |        |                   |  |  |  |
| Format:  | Enable   |            |                                   |         |        |                   |  |  |  |
| Programming Notes  |  |            |                                   |         |        |                   |  |  |  |
| When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled). |  |            |                                   |         |        |                   |  |  |  |
| 5:0  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>[Surface Type] != 'SURFTYPE_CUBE'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Exists If: | [Surface Type] != 'SURFTYPE_CUBE' | Format: | MBZ    |                   |  |  |  |
| Exists If:   | [Surface Type] != 'SURFTYPE_CUBE'  |            |                                   |         |        |                   |  |  |  |
| Format:  | MBZ  |            |                                   |         |        |                   |  |  |  |
| 0  | <p><b>Cube Face Enable - Positive Z</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>[Surface Type] == 'SURFTYPE_CUBE'</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p><b>For SURFTYPE_CUBE Surfaces accessed via the Sampling Engine:</b> This field enable the individual face of a cube map. Enabling a face indicates that the face is present in the cube map, while disabling it indicates that that face is represented by the texture map's border color. Refer to Memory Data Formats for the correlation between faces and the cube map memory layout. Note that storage for disabled faces must be provided.</p> <table border="1"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled).</td> </tr> </table> | Exists If: | [Surface Type] == 'SURFTYPE_CUBE' | Format: | Enable | Programming Notes |  | When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled). |  |
| Exists If:   | [Surface Type] == 'SURFTYPE_CUBE'  |            |                                   |         |        |                   |  |  |  |
| Format:  | Enable   |            |                                   |         |        |                   |  |  |  |
| Programming Notes  |  |            |                                   |         |        |                   |  |  |  |
| When TEXCOORDMODE_CLAMP is used when accessing a cube map, this field must be programmed to 1b (face enabled). |  |            |                                   |         |        |                   |  |  |  |
| 1  | <p>31 <b>Use Global Clear Value</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project:   | CHV, BSW                          |         |        |                   |  |  |  |
| Project:   | CHV, BSW   |            |                                   |         |        |                   |  |  |  |

| <b>RENDER_SURFACE_STATE</b>   |  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
|---|--|---|--------------|--|-----------------------------|-------------------|------|---|----|--|---|----|--|---|-------------------|--|---------|--|--|----------|
|   | <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> <tr> <td colspan="2">Specifies that the global non 0/1 clear value should be used for clearing the render target.</td> </tr> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> <tr> <td>0h</td> <td></td> <td>Use 0/1 clear value programmed in surface state</td> </tr> <tr> <td>1h</td> <td></td> <td>Use non-pipelined global non 0/1 clear values</td> </tr> <tr> <th colspan="2">Programming Notes</th> <th>Project</th> </tr> <tr> <td colspan="2">If 3DSTATE_MULTISAMPLE::<b>Number of Multisamples</b> is not NUMSAMPLES_1, this field must be set to 0.</td> <td>CHV, BSW</td> </tr> </table> | Format:   | Enable       | Specifies that the global non 0/1 clear value should be used for clearing the render target. |                             | Value             | Name | Description   | 0h |  | Use 0/1 clear value programmed in surface state | 1h |  | Use non-pipelined global non 0/1 clear values | Programming Notes |  | Project | If 3DSTATE_MULTISAMPLE:: <b>Number of Multisamples</b> is not NUMSAMPLES_1, this field must be set to 0. |  | CHV, BSW |
| Format:   | Enable   |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Specifies that the global non 0/1 clear value should be used for clearing the render target.  |  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Value   | Name   | Description                                     |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| 0h  |  | Use 0/1 clear value programmed in surface state |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| 1h  |  | Use non-pipelined global non 0/1 clear values   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Programming Notes   |  | Project   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| If 3DSTATE_MULTISAMPLE:: <b>Number of Multisamples</b> is not NUMSAMPLES_1, this field must be set to 0.  |  | CHV, BSW  |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| 30:24   | <p><b>Memory Object Control State</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MEMORY_OBJECT_CONTROL_STATE</td> </tr> </table> <p>Specifies the memory object control state for this surface and the associated Auxiliary surface (if any).</p>  | Project:  | All          | Format:  | MEMORY_OBJECT_CONTROL_STATE |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Project:  | All  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Format:   | MEMORY_OBJECT_CONTROL_STATE  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| 23:19   | <p><b>Base Mip Level</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U4.1</td> </tr> </table> <p>Range: [0.0, 14.0]</p> <p>Specifies which mip level is considered the "base" level when determining mag-vs-min filter and selecting the "base" mip level.</p> <table border="1"> <tr> <th colspan="2">Programming Notes</th> </tr> <tr> <td colspan="2">This field also exists in SAMPLER_STATE. If both fields are zero, the Base Mip Level is zero. If one is nonzero, Base Mip Level is the nonzero field. It is illegal to have both Base Mip Level fields nonzero.</td> </tr> </table>                                      | Project:  | All          | Format:  | U4.1                        | Programming Notes |      | This field also exists in SAMPLER_STATE. If both fields are zero, the Base Mip Level is zero. If one is nonzero, Base Mip Level is the nonzero field. It is illegal to have both Base Mip Level fields nonzero. |    |  |   |    |  |   |                   |  |         |  |  |          |
| Project:  | All  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Format:   | U4.1   |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Programming Notes   |  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| This field also exists in SAMPLER_STATE. If both fields are zero, the Base Mip Level is zero. If one is nonzero, Base Mip Level is the nonzero field. It is illegal to have both Base Mip Level fields nonzero. |  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| 18  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project:  |              | Format:  | MBZ                         |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Project:  |  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Format:   | MBZ  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| 17  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project:  | CHV, BSW     | Format:  | MBZ                         |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Project:  | CHV, BSW   |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Format:   | MBZ  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| 16:15   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:   | MBZ          |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Format:   | MBZ  |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| 14:0  | <p><b>Surface QPitch</b></p> <table border="1"> <tr> <td>Format:</td> <td>QPitch[16:2]</td> </tr> </table>   | Format:   | QPitch[16:2] |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |
| Format:   | QPitch[16:2]   |   |              |  |                             |                   |      |   |    |  |   |    |  |   |                   |  |         |  |  |          |

| <b>RENDER_SURFACE_STATE</b> |       |   |             |   |                |  |
|-----------------------------|-------|---|-------------|---|----------------|--|
|                             |       | <b>Description</b>  |             | <b>Project</b>  |                |  |
|                             |       | <p>This field specifies the distance in rows between array slices. It is used only in the following cases:</p> <ul style="list-style-type: none"> <li>• <b>Surface Array</b> is enabled OR</li> <li>• <b>Number of Multisamples</b> is not NUMSAMPLES_1 and <b>Multisampled Surface Storage Format</b> set to MSFMT_MSS OR</li> <li>• <b>Surface Type</b> is SURFTYPE_CUBE</li> </ul> |             | CHV, BSW  |                |  |
|                             |       | <b>Value</b>  | <b>Name</b> | <b>Description</b>  |                |  |
|                             |       | [4h,1FFFCh]   |             | in multiples of 4 (low 2 bits missing)                          |                |  |
|                             |       | <b>Programming Notes</b>  |             | <b>Project</b>  |                |  |
|                             |       | <p>This field must be set to an integer multiple of the <b>Surface Vertical Alignment</b>. For compressed textures (BC*, FXT1, ETC*, EAC*, ASTC Surface Formats), this field is in units of rows in the uncompressed surface, and must be set to an integer multiple of the vertical alignment parameter "j" defined in the <i>Common Surface Formats</i> section.</p>                |             | CHV, BSW  |                |  |
|                             |       | <p>Software must ensure that this field is set to a value sufficiently large such that the array slices in the surface do not overlap. Refer to the Memory Data Formats section for information on how surfaces are stored in memory.</p>   |             |   |                |  |
| 2                           | 31:30 | <b>Reserved</b>   |             |   |                |  |
|                             |       | Format:   |             | MBZ   |                |  |
|                             | 29:16 | <b>Height</b>   |             |   |                |  |
|                             |       | Format:   |             | U14-1   |                |  |
|                             |       | <p>This field specifies the height of the surface, minus 1. If the surface is MIP-mapped, this field contains the height of the base MIP level. For buffers, this field specifies a portion of the buffer size.</p>   |             |   |                |  |
|                             |       | <b>Value</b>  | <b>Name</b> | <b>Description</b>  | <b>Project</b> | <b>Exists If</b>   |
|                             |       | [0,0]   |             | must be zero  |                | [Surface Type] == 'SURFTYPE_1D'  |
|                             |       | [0,16383]   |             | height of surface - 1 (y/v dimension)                           |                | [SurfaceType] == 'SURFTYPE_2D'   |
|                             |       | [0,2047]  |             | height of surface - 1 (y/v dimension)                           | CHV, BSW       | [SurfaceType] == 'SURFTYPE_3D'   |
|                             |       | [0,16383]   |             | height of surface - 1 (y/v dimension)                           |                | [SurfaceType] == 'SURFTYPE_CUBE'   |
|                             |       | [0,16383]   |             | contains bits [20:7] of the number of entries in the buffer - 1 |                | (([SurfaceType] == 'SURFTYPE_BUFFER')    ([SurfaceType] == 'SURFTYPE_STRBUF')) |
|                             |       | <b>Programming Notes</b>  |             | <b>Project</b>  |                |  |
|                             |       | For typed buffer and structured buffer surfaces, the number of entries in the buffer  |             |   |                |  |



| <b>RENDER_SURFACE_STATE</b>  |  |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
|--|--|--------------------------------------|-------------|--|---------|--|-------------|--|--------------------------------------|--|--------------------------------|-----------|--|--------------------------------------|--|--------------------------------|----------|--|--------------------------------------|-------------|--------------------------------|-----------|--|--------------------------------------|--|----------------------------------|---------|--|----------------------------|--|---------------------------------------|
|  | <p>ranges from 1 to 2<sup>27</sup>. For raw buffer surfaces, the number of entries in the buffer is the number of bytes which can range from 1 to 2<sup>30</sup>. After subtracting one from the number of entries, software must place the fields of the resulting 27-bit value into the <b>Height</b>, <b>Width</b>, and <b>Depth</b> fields as indicated, right-justified in each field. Unused upper bits must be set to zero.</p> <p>If <b>Vertical Line Stride</b> is 1, this field indicates the height of the field, not the height of the frame</p> <p>The <b>Height</b> of a render target must be the same as the <b>Height</b> of the other render targets and the depth buffer (defined in 3DSTATE_DEPTH_BUFFER), unless <b>Surface Type</b> is SURFTYPE_1D or SURFTYPE_2D with <b>Depth</b> = 0 (non-array) and <b>LOD</b> = 0 (non-mip mapped).</p> <p>If this surface in memory is accessed with Vertical Line Stride set to both 0 and 1, this field must be an even value when Vertical Line Stride is 0.</p> <p>If Media Pixel Boundary Mode is not set to NORMAL_MODE, this field must be an even value.</p> <p>If Surface Format is PLANAR*, this field must be a multiple of 4</p> |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
|  | CHV,<br>BSW  |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| 15:14  | <b>Reserved</b>  |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
|  | Format: MBZ  |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| 13:0   | <b>Width</b>   |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
|  | Format: U14-1  |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
|  | <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>This field specifies the width of the surface, minus 1. If the surface is MIP-mapped, this field specifies the width of the base MIP level. The width is specified in units of pixels or texels. For buffers, this field specifies a portion of the buffer size.</td> <td></td> </tr> <tr> <td>For surfaces accessed with the Media Block Read/Write message, this field is in units of DWords.</td> <td>CHV,<br/>BSW</td> </tr> <tr> <td>For surfaces accessed with the Transpose Read Message, this field is in units of DWords.</td> <td>CHV,<br/>BSW</td> </tr> </tbody> </table>   | Description                          | Project     | This field specifies the width of the surface, minus 1. If the surface is MIP-mapped, this field specifies the width of the base MIP level. The width is specified in units of pixels or texels. For buffers, this field specifies a portion of the buffer size. |         | For surfaces accessed with the Media Block Read/Write message, this field is in units of DWords. | CHV,<br>BSW | For surfaces accessed with the Transpose Read Message, this field is in units of DWords. | CHV,<br>BSW                          |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| Description  | Project  |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| This field specifies the width of the surface, minus 1. If the surface is MIP-mapped, this field specifies the width of the base MIP level. The width is specified in units of pixels or texels. For buffers, this field specifies a portion of the buffer size. |  |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| For surfaces accessed with the Media Block Read/Write message, this field is in units of DWords.   | CHV,<br>BSW  |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| For surfaces accessed with the Transpose Read Message, this field is in units of DWords.   | CHV,<br>BSW  |                                      |             |  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
|  | <table border="1" style="width: 100%;"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> <th>Exists If</th> </tr> </thead> <tbody> <tr> <td>[0,16383]</td> <td></td> <td>width of surface - 1 (x/u dimension)</td> <td></td> <td>[SurfaceType] == 'SURFTYPE_1D'</td> </tr> <tr> <td>[0,16383]</td> <td></td> <td>width of surface - 1 (x/u dimension)</td> <td></td> <td>[SurfaceType] == 'SURFTYPE_2D'</td> </tr> <tr> <td>[0,2047]</td> <td></td> <td>width of surface - 1 (x/u dimension)</td> <td>CHV,<br/>BSW</td> <td>[SurfaceType] == 'SURFTYPE_3D'</td> </tr> <tr> <td>[0,16383]</td> <td></td> <td>width of surface - 1 (x/u dimension)</td> <td></td> <td>[SurfaceType] == 'SURFTYPE_CUBE'</td> </tr> <tr> <td>[0,127]</td> <td></td> <td>contains bits [6:0] of the</td> <td></td> <td>(([SurfaceType] == 'SURFTYPE_BUFFER')</td> </tr> </tbody> </table>  | Value                                | Name        | Description  | Project | Exists If  | [0,16383]   |  | width of surface - 1 (x/u dimension) |  | [SurfaceType] == 'SURFTYPE_1D' | [0,16383] |  | width of surface - 1 (x/u dimension) |  | [SurfaceType] == 'SURFTYPE_2D' | [0,2047] |  | width of surface - 1 (x/u dimension) | CHV,<br>BSW | [SurfaceType] == 'SURFTYPE_3D' | [0,16383] |  | width of surface - 1 (x/u dimension) |  | [SurfaceType] == 'SURFTYPE_CUBE' | [0,127] |  | contains bits [6:0] of the |  | (([SurfaceType] == 'SURFTYPE_BUFFER') |
| Value  | Name   | Description                          | Project     | Exists If  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| [0,16383]  |  | width of surface - 1 (x/u dimension) |             | [SurfaceType] == 'SURFTYPE_1D'   |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| [0,16383]  |  | width of surface - 1 (x/u dimension) |             | [SurfaceType] == 'SURFTYPE_2D'   |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| [0,2047]   |  | width of surface - 1 (x/u dimension) | CHV,<br>BSW | [SurfaceType] == 'SURFTYPE_3D'   |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| [0,16383]  |  | width of surface - 1 (x/u dimension) |             | [SurfaceType] == 'SURFTYPE_CUBE'   |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |
| [0,127]  |  | contains bits [6:0] of the           |             | (([SurfaceType] == 'SURFTYPE_BUFFER')  |         |  |             |  |                                      |  |                                |           |  |                                      |  |                                |          |  |                                      |             |                                |           |  |                                      |  |                                  |         |  |                            |  |                                       |

| <b>RENDER_SURFACE_STATE</b> |       |  |             |   |
|-----------------------------|-------|--|-------------|---|
|                             |       | number of entries in the buffer - 1  |             | ([SurfaceType] == 'SURFTYPE_STRBUF')  |
|                             |       | <b>Programming Notes</b>   |             |   |
|                             |       | <ul style="list-style-type: none"> <li>For surface types other than SURFTYPE_BUFFER or STRBUF The Width specified by this field must be less than or equal to the surface pitch (specified in bytes via the Surface Pitch field).</li> <li>For cube maps, Width must be set equal to the Height.</li> <li>For MONO8 textures, Width must be a multiple of 32 texels.</li> <li>The <b>Width</b> of a render target must be the same as the <b>Width</b> of the other render target(s) and the depth buffer (defined in 3DSTATE_DEPTH_BUFFER), unless <b>Surface Type</b> is SURFTYPE_1D or SURFTYPE_2D with <b>Depth</b> = 0 (non-array) and <b>LOD</b> = 0 (non-mip mapped).</li> <li>The <b>Width</b> of a render target with YUV surface format must be a multiple of 2.</li> <li>For SURFTYPE_BUFFER: The low two bits of this field must be 11 if the Surface Format is RAW (the size of the buffer must be a multiple of 4 bytes).</li> </ul> |             |   |
|                             |       | If <b>Surface Format</b> is PLANAR*, this field must be a multiple of 4  |             |   |
|                             |       |  |             | CHV, BSW  |
| 3                           | 31:21 | <b>Depth</b>   |             |   |
|                             |       | Format:  | U11-1       |   |
|                             |       | <p>This field specifies the total number of levels, minus 1, for a volume texture or the number of array elements, minus 1, allowed to be accessed starting at the <b>Minimum Array Element</b> for arrayed surfaces. If the volume texture is MIP-mapped, this field specifies the depth of the base MIP level. For buffers, this field specifies a portion of the buffer size.</p>   |             |   |
|                             |       | <b>Value</b>   | <b>Name</b> | <b>Description</b>  |
|                             |       | [0,2047]   |             | number of array elements - 1  |
|                             |       | [0,2047]   |             | number of array elements - 1  |
|                             |       | [0,2047]   |             | depth of surface - 1 (z/r dimension)  |
|                             |       | [0,340]  |             | number of array elements - 1 [see programming notes for range]                |
|                             |       | [0,1023]   | CHV, BSW    | contains bits [30:21] of the number of entries in the buffer - 1              |
|                             |       | [0,63]   | CHV, BSW    | contains bits [26:21] of the number of entries in the buffer - 1              |
|                             |       | [0,63]   | CHV, BSW    | contains bits [26:21] of the number of entries in the                         |
|                             |       |  |             | exists if ([SurfaceType] == 'SURFTYPE_1D')                                    |
|                             |       |  |             | exists if ([SurfaceType] == 'SURFTYPE_2D')                                    |
|                             |       |  |             | exists if ([SurfaceType] == 'SURFTYPE_3D')                                    |
|                             |       |  |             | exists if ([SurfaceType] == 'SURFTYPE_CUBE')                                  |
|                             |       |  |             | exists if ([SurfaceType] == 'SURFTYPE_BUFFER') AND ([SurfaceFormat] == 'RAW') |
|                             |       |  |             | exists if ([SurfaceType] == 'SURFTYPE_BUFFER') AND ([SurfaceFormat] != 'RAW') |
|                             |       |  |             | exists if ([SurfaceType] == 'SURFTYPE_STRBUF')                                |

| <b>RENDER_SURFACE_STATE</b> |   |          |                       |         |     |
|-----------------------------|---|----------|-----------------------|---------|-----|
|                             | <table border="1"> <tr> <td></td> <td>buffer - 1</td> <td></td> <td></td> </tr> </table>  |          | buffer - 1            |         |     |
|                             | buffer - 1  |          |                       |         |     |
|                             | <b>Programming Notes</b>  |          |                       |         |     |
|                             | The <b>Depth</b> of a render target must be the same as the <b>Depth</b> of the other render target(s) and of the depth buffer (defined in 3DSTATE_DEPTH_BUFFER).   |          |                       |         |     |
|                             | For SURFTYPE_CUBE: For Sampling Engine Surfaces, the range of this field is [0,340], indicating the number of cube array elements (equal to the number of underlying 2D array elements divided by 6). For other surfaces, this field must be zero.  |          |                       |         |     |
|                             | For SURFTYPE_BUFFER: The range of this field is [0,63] unless the Surface Format is RAW and Surface Pitch is 1 byte.  |          |                       |         |     |
|                             | For SURFTYPE_1D, 2D, and CUBE: The range of this field is reduced by one for each increase from zero of <b>Minimum Array Element</b> . For example, if <b>Minimum Array Element</b> is set to 1024 on a 2D surface, the range of this field is reduced to [0,1023].   |          |                       |         |     |
| 20                          | <b>Reserved</b><br><table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project: | CHV, BSW              | Format: | MBZ |
| Project:                    | CHV, BSW  |          |                       |         |     |
| Format:                     | MBZ   |          |                       |         |     |
| 19                          | <b>Reserved</b><br><table border="1"> <tr> <td>Project:</td> <td></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project: |                       | Format: | MBZ |
| Project:                    |   |          |                       |         |     |
| Format:                     | MBZ   |          |                       |         |     |
| 18                          | <b>Reserved</b><br><table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project: | CHV, BSW              | Format: | MBZ |
| Project:                    | CHV, BSW  |          |                       |         |     |
| Format:                     | MBZ   |          |                       |         |     |
| 17:0                        | <b>Surface Pitch</b><br><table border="1"> <tr> <td>Format:</td> <td>U18-1 Pitch in #Bytes</td> </tr> </table> <p>Range</p> <ol style="list-style-type: none"> <li>For surfaces of type SURFTYPE_BUFFER: [0,2047] -&gt; [1B, 2048B]</li> <li>For surfaces of type SURFTYPE_STRBUF: [0,2047] -&gt; [1B, 2048B]</li> <li>For other linear surfaces: [0, 262143] -&gt; [1B, 256KB]</li> <li>For X-tiled surface: [511, 262143] -&gt; [512B, 256KB] = [1 tile, 512 tiles]</li> <li>For Y-tiled surfaces: [127, 262143]-&gt;[128B, 256KB] = [1 tile, 2048 tiles]</li> <li>For W-tiled surfaces: [127, 262143]-&gt;[128B, 256KB] = [1 tile, 2048 tiles]</li> <li>For TileYF and TileYS surfaces, the range is dependent on the Cu parameter (refer to <i>Memory Data Formats</i> section for the definition of the Cu parameter depending on the case). The range in bytes is [2<sup>Cu</sup>-1,262143] -&gt; [(2<sup>Cu</sup>)B,256KB] = [1 tile, 256KB/(2<sup>Cu</sup>) tiles]</li> </ol> <p>This field specifies the surface pitch in (#Bytes - 1).<br/>                     For surfaces of type SURFTYPE_BUFFER and SURFTYPE_STRBUF, this field indicates the size of the structure.</p> | Format:  | U18-1 Pitch in #Bytes |         |     |
| Format:                     | U18-1 Pitch in #Bytes   |          |                       |         |     |
|                             | <b>Programming Notes</b>  |          |                       |         |     |

| <b>RENDER_SURFACE_STATE</b>  |  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
|--|--|-------------------------|-----------------|----------|----------|------------|-------------------------------------|---------|-----|-------|--|------------|-------------------------------------|--|--|---|--|-------|------|-------------|----|------|-------------------------|----|-------|----------------------|----|--------|-----------------------|-------------------|--|--|--|--|--|--|--|--|
|  | <ul style="list-style-type: none"> <li>For linear <i>render target</i> surfaces and surfaces accessed with the typed data port messages, the pitch must be a multiple of the element size for non-YUV surface formats. Pitch must be a multiple of 2 * element size for YUV surface formats.</li> <li>For untyped data port messages, which are only supported with <b>Surface Type</b> SURFTYPE_BUFFER, the pitch is ignored and assumed to be 1 byte.</li> <li>For linear surfaces with <b>Surface Type</b> of SURFTYPE_STRBUF, the pitch must be a multiple of 4 bytes.</li> <li>For linear surfaces with <b>Surface Type</b> of SURFTYPE_BUFFER and <b>Surface Format</b> RAW, the pitch must be 1 byte.</li> <li>For other linear surfaces, the pitch can be any multiple of bytes.</li> <li>For tiled surfaces, the pitch must be a multiple of the tile width.</li> </ul> <p>If the surface is a stencil buffer (and thus has <b>Tile Mode</b> set to TILEMODE_WMAJOR), the pitch must be set to 2x the value computed based on width, as the stencil buffer is stored with two rows interleaved. For details on the separate stencil buffer storage format in memory, see GPU Overview (vol1a), Memory Data Formats, Surface Layout, 2D Surfaces, Stencil Buffer Layout (section 8.20.4.8).</p>  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| 4  | <table border="1"> <tr> <td>31</td> <td><b>Reserved</b></td> </tr> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Exists If:</td> <td>[Surface Type] != 'SURFTYPE_STRBUF'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table><br><table border="1"> <tr> <td>30:29</td> <td><b>Render Target And Sample Unorm Rotation</b></td> </tr> <tr> <td>Exists If:</td> <td>[Surface Type] != 'SURFTYPE_STRBUF'</td> </tr> <tr> <td colspan="2"><b>For Render Target Surfaces:</b> This field specifies the rotation of this render target surface when being written to memory.</td> </tr> <tr> <td colspan="2"><b>For Other Surfaces:</b> This field is ignored.</td> </tr> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> <tr> <td>0h</td> <td>0DEG</td> <td>No rotation (0 degrees)</td> </tr> <tr> <td>1h</td> <td>90DEG</td> <td>Rotate by 90 degrees</td> </tr> <tr> <td>3h</td> <td>270DEG</td> <td>Rotate by 270 degrees</td> </tr> <tr> <th colspan="3" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="3"><b>Programming Notes for Render Target Surfaces only</b></td> </tr> <tr> <td colspan="3"> <ul style="list-style-type: none"> <li>Rotation is not supported for render targets of any type other than simple, non-mip-mapped, non-array 2D surfaces. The surface must be using tiled with X major.</li> <li><b>Width</b> and <b>Height</b> fields apply to the dimensions of the surface before rotation.</li> <li>For 90 and 270 degree rotated surfaces, the <b>Height</b> (rather than the <b>Width</b>) must be less than or equal to the <b>Surface Pitch</b> (specified in bytes).</li> </ul> </td> </tr> </table> | 31                      | <b>Reserved</b> | Project: | CHV, BSW | Exists If: | [Surface Type] != 'SURFTYPE_STRBUF' | Format: | MBZ | 30:29 | <b>Render Target And Sample Unorm Rotation</b> | Exists If: | [Surface Type] != 'SURFTYPE_STRBUF' | <b>For Render Target Surfaces:</b> This field specifies the rotation of this render target surface when being written to memory. |  | <b>For Other Surfaces:</b> This field is ignored. |  | Value | Name | Description | 0h | 0DEG | No rotation (0 degrees) | 1h | 90DEG | Rotate by 90 degrees | 3h | 270DEG | Rotate by 270 degrees | Programming Notes |  |  | <b>Programming Notes for Render Target Surfaces only</b> |  |  | <ul style="list-style-type: none"> <li>Rotation is not supported for render targets of any type other than simple, non-mip-mapped, non-array 2D surfaces. The surface must be using tiled with X major.</li> <li><b>Width</b> and <b>Height</b> fields apply to the dimensions of the surface before rotation.</li> <li>For 90 and 270 degree rotated surfaces, the <b>Height</b> (rather than the <b>Width</b>) must be less than or equal to the <b>Surface Pitch</b> (specified in bytes).</li> </ul> |  |  |
| 31   | <b>Reserved</b>  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| Project:   | CHV, BSW   |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| Exists If:   | [Surface Type] != 'SURFTYPE_STRBUF'  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| Format:  | MBZ  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| 30:29  | <b>Render Target And Sample Unorm Rotation</b>   |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| Exists If:   | [Surface Type] != 'SURFTYPE_STRBUF'  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| <b>For Render Target Surfaces:</b> This field specifies the rotation of this render target surface when being written to memory.   |  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| <b>For Other Surfaces:</b> This field is ignored.  |  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| Value  | Name   | Description             |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| 0h   | 0DEG   | No rotation (0 degrees) |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| 1h   | 90DEG  | Rotate by 90 degrees    |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| 3h   | 270DEG   | Rotate by 270 degrees   |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| Programming Notes  |  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| <b>Programming Notes for Render Target Surfaces only</b>   |  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Rotation is not supported for render targets of any type other than simple, non-mip-mapped, non-array 2D surfaces. The surface must be using tiled with X major.</li> <li><b>Width</b> and <b>Height</b> fields apply to the dimensions of the surface before rotation.</li> <li>For 90 and 270 degree rotated surfaces, the <b>Height</b> (rather than the <b>Width</b>) must be less than or equal to the <b>Surface Pitch</b> (specified in bytes).</li> </ul> |  |                         |                 |          |          |            |                                     |         |     |       |  |            |                                     |  |  |   |  |       |      |             |    |      |                         |    |       |                      |    |        |                       |                   |  |  |  |  |  |  |  |  |

| <b>RENDER_SURFACE_STATE</b> |  |  |                                     |         |       |             |         |    |     |   |     |    |               |  |     |
|-----------------------------|--|--|-------------------------------------|---------|-------|-------------|---------|----|-----|---|-----|----|---------------|--|-----|
|                             | <ul style="list-style-type: none"> <li>For 90 and 270 degree rotated surfaces, the actual <b>Height</b> and <b>Width</b> of the surface in pixels (not the field value which is decremented) must both be even.</li> </ul> <p>Rotation is supported only for surfaces with the following surface formats: B5G6R5_UNORM, B5G6R5_UNORM_SRGB, R8G8B8A8_UNORM, R8G8B8A8_UNORM_SRGB, B8G8R8[A]X8_UNORM, B8G8R8[A]X8_UNORM_SRGB, B10G10R10[A]X2_UNORM, B10G10R10A2_UNORM_SRGB, R10G10B10A2_UNORM, R10G10B10A2_UNORM_SRGB, R16G16B16A16_FLOAT, R16G16B16X16_FLOAT</p>   |  |                                     |         |       |             |         |    |     |   |     |    |               |  |     |
| 28:18                       | <p><b>Minimum Array Element</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>[Surface Type] != 'SURFTYPE_STRBUF'</td> </tr> <tr> <td>Format:</td> <td>U11</td> </tr> </table>   | Exists If:   | [Surface Type] != 'SURFTYPE_STRBUF' | Format: | U11   |             |         |    |     |   |     |    |               |  |     |
| Exists If:                  | [Surface Type] != 'SURFTYPE_STRBUF'  |  |                                     |         |       |             |         |    |     |   |     |    |               |  |     |
| Format:                     | U11  |  |                                     |         |       |             |         |    |     |   |     |    |               |  |     |
| 17:7                        | <p><b>Render Target View Extent</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>[Surface Type] != 'SURFTYPE_STRBUF'</td> </tr> <tr> <td>Format:</td> <td>U11-1</td> </tr> </table> <p>Range [0,2047] to indicate extent of [1,2048]</p> <p><b>For Render Target and Typed Dataport 3D Surfaces:</b><br/>This field indicates the extent of the accessible 'R' coordinates minus 1 on the LOD currently being rendered to.</p> <p><b>For Render Target and Typed Dataport 1D and 2D Surfaces:</b><br/>This field must be set to the same value as the Depth field.</p> <p><b>For Other Surfaces:</b><br/>This field is ignored.</p>   | Exists If:   | [Surface Type] != 'SURFTYPE_STRBUF' | Format: | U11-1 |             |         |    |     |   |     |    |               |  |     |
| Exists If:                  | [Surface Type] != 'SURFTYPE_STRBUF'  |  |                                     |         |       |             |         |    |     |   |     |    |               |  |     |
| Format:                     | U11-1  |  |                                     |         |       |             |         |    |     |   |     |    |               |  |     |
| 6                           | <p><b>Multisampled Surface Storage Format</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>[Surface Type] != 'SURFTYPE_STRBUF'</td> </tr> </table> <p>This field indicates the storage format of the multisampled surface.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>MSS</td> <td>Multisampled surface was/is rendered as a render target</td> <td>All</td> </tr> <tr> <td>1h</td> <td>DEPTH_STENCIL</td> <td>Multisampled surface was rendered as a depth or stencil buffer</td> <td>All</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <ul style="list-style-type: none"> <li>All multisampled render target surfaces must have this field set to MSFMT_MSS</li> <li>IF this field is MSFMT_DEPTH_STENCIL, the only sampling engine messages allowed are "ld2dms", "resinfo", and "sampleinfo".</li> <li>This field is ignored if <b>Number of Multisamples</b> is MULTISAMPLECOUNT_1</li> </ul> | Exists If:   | [Surface Type] != 'SURFTYPE_STRBUF' | Value   | Name  | Description | Project | 0h | MSS | Multisampled surface was/is rendered as a render target | All | 1h | DEPTH_STENCIL | Multisampled surface was rendered as a depth or stencil buffer | All |
| Exists If:                  | [Surface Type] != 'SURFTYPE_STRBUF'  |  |                                     |         |       |             |         |    |     |   |     |    |               |  |     |
| Value                       | Name   | Description  | Project                             |         |       |             |         |    |     |   |     |    |               |  |     |
| 0h                          | MSS  | Multisampled surface was/is rendered as a render target        | All                                 |         |       |             |         |    |     |   |     |    |               |  |     |
| 1h                          | DEPTH_STENCIL  | Multisampled surface was rendered as a depth or stencil buffer | All                                 |         |       |             |         |    |     |   |     |    |               |  |     |
| 5:3                         | <p><b>Number of Multisamples</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>[Surface Type] != 'SURFTYPE_STRBUF'</td> </tr> </table>   | Exists If:   | [Surface Type] != 'SURFTYPE_STRBUF' |         |       |             |         |    |     |   |     |    |               |  |     |
| Exists If:                  | [Surface Type] != 'SURFTYPE_STRBUF'  |  |                                     |         |       |             |         |    |     |   |     |    |               |  |     |

| <b>RENDER_SURFACE_STATE</b>  |   |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
|--|---|---|------------|-------------------------------------|------------|-------------------------------------|--------------------|---------|-------|--|-------------------|---------|---|-----|----|--------------------|-----|----|----------|----------|-------|----------|--|-------------------|---------|--|--|---|----------|
|  |   | <p>This field indicates the number of multisamples on the surface.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>MULTISAMPLECOUNT_1</td> <td>All</td> </tr> <tr> <td>1h</td> <td>MULTISAMPLECOUNT_2</td> <td>All</td> </tr> <tr> <td>2h</td> <td>MULTISAMPLECOUNT_4</td> <td>All</td> </tr> <tr> <td>3h</td> <td>MULTISAMPLECOUNT_8</td> <td>All</td> </tr> <tr> <td>4h</td> <td>Reserved</td> <td>CHV, BSW</td> </tr> <tr> <td>5h-7h</td> <td>Reserved</td> <td></td> </tr> </tbody> </table><br><table border="1"> <thead> <tr> <th>Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>If this field is any value other than MULTISAMPLECOUNT_1, the <b>Surface Type</b> must be SURFTYPE_2D This field must be set to MULTISAMPLECOUNT_1 unless the surface is a Sampling Engine surface or Render Target surface.</td> <td></td> </tr> <tr> <td>If this field is any value other than MULTISAMPLECOUNT_1, Surface Min LOD, Mip Count / LOD, and Resource Min LOD must be set to zero.</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Value      | Name                                | Project    | 0h                                  | MULTISAMPLECOUNT_1 | All     | 1h    | MULTISAMPLECOUNT_2                     | All               | 2h      | MULTISAMPLECOUNT_4  | All | 3h | MULTISAMPLECOUNT_8 | All | 4h | Reserved | CHV, BSW | 5h-7h | Reserved |  | Programming Notes | Project | If this field is any value other than MULTISAMPLECOUNT_1, the <b>Surface Type</b> must be SURFTYPE_2D This field must be set to MULTISAMPLECOUNT_1 unless the surface is a Sampling Engine surface or Render Target surface. |  | If this field is any value other than MULTISAMPLECOUNT_1, Surface Min LOD, Mip Count / LOD, and Resource Min LOD must be set to zero. | CHV, BSW |
| Value  | Name                                      | Project   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| 0h   | MULTISAMPLECOUNT_1                        | All   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| 1h   | MULTISAMPLECOUNT_2                        | All   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| 2h   | MULTISAMPLECOUNT_4                        | All   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| 3h   | MULTISAMPLECOUNT_8                        | All   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| 4h   | Reserved                                  | CHV, BSW  |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| 5h-7h  | Reserved                                  |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| Programming Notes  | Project                                   |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| If this field is any value other than MULTISAMPLECOUNT_1, the <b>Surface Type</b> must be SURFTYPE_2D This field must be set to MULTISAMPLECOUNT_1 unless the surface is a Sampling Engine surface or Render Target surface. |   |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| If this field is any value other than MULTISAMPLECOUNT_1, Surface Min LOD, Mip Count / LOD, and Resource Min LOD must be set to zero.  | CHV, BSW                                  |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| 31:0   | <b>Reserved</b>                           | <table border="1"> <tr> <td>Exists If:</td> <td>[Surface Type] == 'SURFTYPE_STRBUF'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Exists If: | [Surface Type] == 'SURFTYPE_STRBUF' | Format:    | MBZ                                 |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| Exists If:   | [Surface Type] == 'SURFTYPE_STRBUF'       |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| Format:  | MBZ                                       |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| 2:0  | <b>Multisample Position Palette Index</b> | <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Exists If:</td> <td>[Surface Type] != 'SURFTYPE_STRBUF'</td> </tr> </table> <p>This field indicates the index into the sample position palette that the multisampled surface is using. This field is only used as a return value for the sampleinfo message, and is otherwise not used by hardware.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>[0,7]</td> <td></td> </tr> </tbody> </table>  | Project:   | CHV, BSW                            | Exists If: | [Surface Type] != 'SURFTYPE_STRBUF' | Value              | Name    | [0,7] |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| Project:   | CHV, BSW                                  |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| Exists If:   | [Surface Type] != 'SURFTYPE_STRBUF'       |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| Value  | Name                                      |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| [0,7]  |   |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| 5  | 31:25                                     | <p><b>X Offset</b></p> <table border="1"> <tr> <td>Format:</td> <td>PixelOffset[8:2]</td> </tr> </table> <p>This field specifies the horizontal offset in pixels from the <b>Surface Base Address</b> to the start (origin) of the surface.</p> <p>This field effectively loosens the alignment restrictions on the origin of tiled surfaces. Previously, tiled surface origin was (by definition) located at the base address, and thus needed to satisfy the 4KB base address alignment restriction. Now the origin can be specified at a finer (4-wide x 4-high pixel) resolution.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>[0,508]</td> <td></td> <td>In multiples of 4 (low 2 bits missing)</td> </tr> </tbody> </table><br><table border="1"> <thead> <tr> <th>Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>For linear surfaces, this field must be zero.</li> </ul> </td> <td></td> </tr> </tbody> </table>  | Format:    | PixelOffset[8:2]                    | Value      | Name                                | Description        | [0,508] |       | In multiples of 4 (low 2 bits missing) | Programming Notes | Project | <ul style="list-style-type: none"> <li>For linear surfaces, this field must be zero.</li> </ul> |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| Format:  | PixelOffset[8:2]                          |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| Value  | Name                                      | Description   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| [0,508]  |   | In multiples of 4 (low 2 bits missing)  |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| Programming Notes  | Project                                   |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |
| <ul style="list-style-type: none"> <li>For linear surfaces, this field must be zero.</li> </ul>  |   |   |            |                                     |            |                                     |                    |         |       |  |                   |         |   |     |    |                    |     |    |          |          |       |          |  |                   |         |  |  |   |          |

| <b>RENDER_SURFACE_STATE</b>  |  |   |                |  |             |             |        |  |  |                   |         |  |  |
|--|--|---|----------------|--|-------------|-------------|--------|--|--|-------------------|---------|--|--|
|  | <ul style="list-style-type: none"> <li>For surfaces accessed with the <i>Data Port Media Block Read/Write</i> message, the pixel size is assumed to be 32 bits in width.</li> <li>For surfaces accessed with the <b>Data Port Transpose Read message</b>, the pixel size is assumed to be 32 bits in width.</li> <li>For <b>Surface Format</b> with other than 8, 16, 32, 64, or 128 bits per pixel, this field must be zero.</li> <li>If <b>Render Target Rotation</b> is set to other than RTROTATE_0DEG, this field must be zero.</li> <li>If <b>Surface Type</b> not SURFTYPE_2D, this field must be zero.</li> <li>If <b>MIP Count</b> is not zero, this field must be zero.</li> <li>If <b>Number of Multisamples</b> is not MULTISAMPLECOUNT_1, this field must be zero.</li> <li>If <b>Surface Array</b> is enabled, this field must be zero.</li> <li>If <b>Auxiliary Surface Mode</b> is not AUX_NONE, this field must be zero.</li> <li>If <b>Surface Vertical Alignment</b> is VALIGN_8, this field must be a multiple of 8.</li> <li>For <b>Surface Format</b> with 8 bits per element, this field must be a multiple of 16.</li> <li>For <b>Surface Format</b> with 16 bits per element, this field must be a multiple of 8.</li> </ul>  |   |                |  |             |             |        |  |  |                   |         |  |  |
|  | <table border="1" style="width: 100%;"> <tr> <td style="width: 80%;">This field must be zero if Surface Format is PLANAR*.</td> <td style="width: 20%;">CHV,<br/>BSW</td> </tr> <tr> <td>If sampling an ASTC surface with block size of 5X5 or 5X4 and <math>0 &lt; [(max(Surface\_Width \gg 1, 1) \% 10) &lt; 6</math>, and accessing LOD=2 or higher, then this field must be programmed to 4 pixels.</td> <td>CHV,<br/>BSW</td> </tr> </table>  | This field must be zero if Surface Format is PLANAR*. | CHV,<br>BSW    | If sampling an ASTC surface with block size of 5X5 or 5X4 and $0 < [(max(Surface\_Width \gg 1, 1) \% 10) < 6$ , and accessing LOD=2 or higher, then this field must be programmed to 4 pixels. | CHV,<br>BSW |             |        |  |  |                   |         |  |  |
| This field must be zero if Surface Format is PLANAR*.  | CHV,<br>BSW  |   |                |  |             |             |        |  |  |                   |         |  |  |
| If sampling an ASTC surface with block size of 5X5 or 5X4 and $0 < [(max(Surface\_Width \gg 1, 1) \% 10) < 6$ , and accessing LOD=2 or higher, then this field must be programmed to 4 pixels.   | CHV,<br>BSW  |   |                |  |             |             |        |  |  |                   |         |  |  |
| 24   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td style="width: 40%;">MBZ</td> </tr> </table>   | Format:   | MBZ            |  |             |             |        |  |  |                   |         |  |  |
| Format:  | MBZ  |   |                |  |             |             |        |  |  |                   |         |  |  |
| 23:21  | <b>Y Offset</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 40%;">Format:</td> <td style="width: 60%;">RowOffset[4:2]</td> </tr> </table> <p>This field specifies the vertical offset in rows from the <b>Surface Base Address</b> to the start of the surface. (See additional description in the <b>X Offset</b> field.)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 15%;">Name</th> <th style="width: 70%;">Description</th> </tr> </thead> <tbody> <tr> <td>[0,28]</td> <td></td> <td>In multiples of 4 (low two bits missing)</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%; text-align: center;">Programming Notes</th> <th style="width: 20%; text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>For linear surfaces, this field must be zero.</li> <li>For render targets in which the <b>Render Target Array Index</b> is not zero, this field must be zero.</li> <li>For <b>Surface Format</b> with other than 8, 16, 32, 64, or 128 bits per pixel, this field must be zero.</li> <li>If <b>Render Target Rotation</b> is set to other than RTROTATE_0DEG, this field must be zero.</li> </ul> </td> <td></td> </tr> </tbody> </table> | Format:   | RowOffset[4:2] | Value  | Name        | Description | [0,28] |  | In multiples of 4 (low two bits missing) | Programming Notes | Project | <ul style="list-style-type: none"> <li>For linear surfaces, this field must be zero.</li> <li>For render targets in which the <b>Render Target Array Index</b> is not zero, this field must be zero.</li> <li>For <b>Surface Format</b> with other than 8, 16, 32, 64, or 128 bits per pixel, this field must be zero.</li> <li>If <b>Render Target Rotation</b> is set to other than RTROTATE_0DEG, this field must be zero.</li> </ul> |  |
| Format:  | RowOffset[4:2]   |   |                |  |             |             |        |  |  |                   |         |  |  |
| Value  | Name   | Description   |                |  |             |             |        |  |  |                   |         |  |  |
| [0,28]   |  | In multiples of 4 (low two bits missing)              |                |  |             |             |        |  |  |                   |         |  |  |
| Programming Notes  | Project  |   |                |  |             |             |        |  |  |                   |         |  |  |
| <ul style="list-style-type: none"> <li>For linear surfaces, this field must be zero.</li> <li>For render targets in which the <b>Render Target Array Index</b> is not zero, this field must be zero.</li> <li>For <b>Surface Format</b> with other than 8, 16, 32, 64, or 128 bits per pixel, this field must be zero.</li> <li>If <b>Render Target Rotation</b> is set to other than RTROTATE_0DEG, this field must be zero.</li> </ul> |  |   |                |  |             |             |        |  |  |                   |         |  |  |

| <b>RENDER_SURFACE_STATE</b> |  |   |  |
|-----------------------------|--|---|--|
|                             |  | <ul style="list-style-type: none"> <li>If <b>Surface Type</b> not SURFTYPE_2D, this field must be zero.</li> <li>If <b>MIP Count</b> is not zero, this field must be zero.</li> <li>If <b>Number of Multisamples</b> is not MULTISAMPLECOUNT_1, this field must be zero.</li> <li>If <b>Surface Array</b> is enabled, this field must be zero.</li> <li>If <b>Auxiliary Surface Mode</b> is not AUX_NONE, this field must be zero.</li> </ul> |  |
|                             |  | This field must be zero if <b>Surface Format</b> is PLANAR*.  | CHV,<br>BSW  |
| 20                          | <b>EWA Disable For Cube</b>  |   |  |
|                             | Project:   | CHV, BSW  |  |
|                             | Format:  | Disable   |  |
|                             | Specifies if EWA mode for LOD quality improvement needs to be disabled for cube maps.  |   |  |
|                             | <b>Value</b>   | <b>Name</b>   | <b>Description</b>   |
|                             | 0h   | Enable <b>[Default]</b>   | EWA is enabled for cube maps   |
|                             | 1h   | Disable   | EWA is disabled for cube maps  |
|                             | <b>Programming Notes</b>   |   |  |
|                             | This field indicates if EWA mode for LOD quality improvement needs to be disabled for cube maps. By default EWA would be on for cube maps hence this field must be 0. If there is any spec violation seen with EWA on cube maps then this field must be set to 1 to disable EWA for cubes. |   |  |
| 19:18                       | <b>Reserved</b>  |   |  |
|                             | Project:   | CHV, BSW  |  |
|                             | Format:  | MBZ   |  |
| 17:16                       | <b>Reserved</b>  |   |  |
|                             | Project:   | CHV, BSW  |  |
|                             | Format:  | MBZ   |  |
| 15                          | <b>Reserved</b>  |   |  |
|                             | Format:  | MBZ   |  |
| 14                          | <b>Coherency Type</b>  |   |  |
|                             | Specifies the type of coherency maintained for this surface.   |   |  |
|                             | <b>Value</b>   | <b>Name</b>   | <b>Description</b>   |
|                             | 0h   | GPU coherent  | Surface memory is kept coherent with GPU threads using GPU read/write ordering rules. Surface memory is backed by system memory but is not kept coherent with CPU (LLC). |
|                             | 1h   | IA coherent   | Surface memory is kept coherent with CPU (LLC).  |
|                             |  |   | <b>Project</b>   |
|                             |  |   | All  |
|                             |  |   | All  |



| <b>RENDER_SURFACE_STATE</b>   |   |                   |  |   |   |  |   |   |  |   |  |
|---|---|-------------------|--|---|---|--|---|---|--|---|--|
|   | <table border="1"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">This field may optionally be 1 (IA coherent) for messages sent to SFID_DP_DC0 or SFID_DP_DC1 or SFID_DP_DC2. This field is typically set to 0 (GPU coherent) if the context is operating in a non-SVM legacy mode (for example, Ring Buffer or a Execlist using 32-bit Virtual Address Legacy Context PPGTT32).</td> </tr> </table>   | Programming Notes |  | This field may optionally be 1 (IA coherent) for messages sent to SFID_DP_DC0 or SFID_DP_DC1 or SFID_DP_DC2. This field is typically set to 0 (GPU coherent) if the context is operating in a non-SVM legacy mode (for example, Ring Buffer or a Execlist using 32-bit Virtual Address Legacy Context PPGTT32). |   |  |   |   |  |   |  |
| Programming Notes   |   |                   |  |   |   |  |   |   |  |   |  |
| This field may optionally be 1 (IA coherent) for messages sent to SFID_DP_DC0 or SFID_DP_DC1 or SFID_DP_DC2. This field is typically set to 0 (GPU coherent) if the context is operating in a non-SVM legacy mode (for example, Ring Buffer or a Execlist using 32-bit Virtual Address Legacy Context PPGTT32).   |   |                   |  |   |   |  |   |   |  |   |  |
| 13:12   | <table border="1"> <tr> <th colspan="2">Reserved</th> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Reserved          |  | Format:   | MBZ   |  |   |   |  |   |  |
| Reserved  |   |                   |  |   |   |  |   |   |  |   |  |
| Format:   | MBZ   |                   |  |   |   |  |   |   |  |   |  |
| 11:8  | <table border="1"> <tr> <th colspan="2">Reserved</th> </tr> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Reserved          |  | Project:  | CHV, BSW  | Format:  | MBZ   |   |  |   |  |
| Reserved  |   |                   |  |   |   |  |   |   |  |   |  |
| Project:  | CHV, BSW  |                   |  |   |   |  |   |   |  |   |  |
| Format:   | MBZ   |                   |  |   |   |  |   |   |  |   |  |
| 7:4   | <table border="1"> <tr> <th colspan="2">Surface Min LOD</th> </tr> <tr> <td>Format:</td> <td>U4 In LOD Units</td> </tr> <tr> <td colspan="2"> <p><b>For Sampling Engine and Typed Surfaces:</b><br/>This field indicates the most detailed LOD that can be accessed as part of this surface. This field is added to the delivered LOD (<i>sample_l, ld, or resinfo</i> message types) before it is used to address the surface.</p> <p><b>For Other Surfaces:</b><br/>This field is ignored.</p> </td> </tr> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">This field must be zero if the <b>Surface Format</b> is MONO8</td> </tr> </table>   | Surface Min LOD   |  | Format:   | U4 In LOD Units   | <p><b>For Sampling Engine and Typed Surfaces:</b><br/>This field indicates the most detailed LOD that can be accessed as part of this surface. This field is added to the delivered LOD (<i>sample_l, ld, or resinfo</i> message types) before it is used to address the surface.</p> <p><b>For Other Surfaces:</b><br/>This field is ignored.</p> |   | Programming Notes   |  | This field must be zero if the <b>Surface Format</b> is MONO8 |  |
| Surface Min LOD   |   |                   |  |   |   |  |   |   |  |   |  |
| Format:   | U4 In LOD Units   |                   |  |   |   |  |   |   |  |   |  |
| <p><b>For Sampling Engine and Typed Surfaces:</b><br/>This field indicates the most detailed LOD that can be accessed as part of this surface. This field is added to the delivered LOD (<i>sample_l, ld, or resinfo</i> message types) before it is used to address the surface.</p> <p><b>For Other Surfaces:</b><br/>This field is ignored.</p>  |   |                   |  |   |   |  |   |   |  |   |  |
| Programming Notes   |   |                   |  |   |   |  |   |   |  |   |  |
| This field must be zero if the <b>Surface Format</b> is MONO8   |   |                   |  |   |   |  |   |   |  |   |  |
| 3:0   | <table border="1"> <tr> <th colspan="2">MIP Count / LOD</th> </tr> <tr> <td>Format:</td> <td> <p><b>Sampling Engine and Typed Surfaces:</b><br/>U4 in (LOD units - 1)</p> <p><b>Render Target Surfaces:</b><br/>U4 in LOD units</p> </td> </tr> <tr> <td>Range</td> <td> <p><b>Sampling Engine and Typed Surfaces:</b><br/>[0,14] representing [1,15] MIP levels</p> <p><b>Render Target Surfaces:</b> [0,14] representing LOD</p> <p><b>Other Surfaces:</b> [0]</p> </td> </tr> <tr> <td colspan="2"> <p><b>For Sampling Engine and Typed Surfaces:</b><br/>This field indicates the number of MIP levels allowed to be accessed starting at <b>Surface Min LOD</b>, which must be less than or equal to the number of MIP levels actually stored in memory for this surface. For <i>sample*</i> messages, the mip map access is clamped to be between the mipmap specified by the integer bits of the Min LOD and the ceiling of the value specified here. For <i>ld*</i> messages, out-of-bounds behavior results for LODs outside of the range specified in this field.</p> <p><b>For Render Target Surfaces:</b><br/>This field defines the MIP level that is currently being rendered into. This is the absolute MIP level on the surface and is not relative to the <b>Surface Min LOD</b> field, which is ignored for render target surfaces.</p> <p><b>For Other Surfaces:</b><br/>This field is reserved : MBZ</p> </td> </tr> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> </table> | MIP Count / LOD   |  | Format:   | <p><b>Sampling Engine and Typed Surfaces:</b><br/>U4 in (LOD units - 1)</p> <p><b>Render Target Surfaces:</b><br/>U4 in LOD units</p> | Range  | <p><b>Sampling Engine and Typed Surfaces:</b><br/>[0,14] representing [1,15] MIP levels</p> <p><b>Render Target Surfaces:</b> [0,14] representing LOD</p> <p><b>Other Surfaces:</b> [0]</p> | <p><b>For Sampling Engine and Typed Surfaces:</b><br/>This field indicates the number of MIP levels allowed to be accessed starting at <b>Surface Min LOD</b>, which must be less than or equal to the number of MIP levels actually stored in memory for this surface. For <i>sample*</i> messages, the mip map access is clamped to be between the mipmap specified by the integer bits of the Min LOD and the ceiling of the value specified here. For <i>ld*</i> messages, out-of-bounds behavior results for LODs outside of the range specified in this field.</p> <p><b>For Render Target Surfaces:</b><br/>This field defines the MIP level that is currently being rendered into. This is the absolute MIP level on the surface and is not relative to the <b>Surface Min LOD</b> field, which is ignored for render target surfaces.</p> <p><b>For Other Surfaces:</b><br/>This field is reserved : MBZ</p> |  | Programming Notes   |  |
| MIP Count / LOD   |   |                   |  |   |   |  |   |   |  |   |  |
| Format:   | <p><b>Sampling Engine and Typed Surfaces:</b><br/>U4 in (LOD units - 1)</p> <p><b>Render Target Surfaces:</b><br/>U4 in LOD units</p>   |                   |  |   |   |  |   |   |  |   |  |
| Range   | <p><b>Sampling Engine and Typed Surfaces:</b><br/>[0,14] representing [1,15] MIP levels</p> <p><b>Render Target Surfaces:</b> [0,14] representing LOD</p> <p><b>Other Surfaces:</b> [0]</p>   |                   |  |   |   |  |   |   |  |   |  |
| <p><b>For Sampling Engine and Typed Surfaces:</b><br/>This field indicates the number of MIP levels allowed to be accessed starting at <b>Surface Min LOD</b>, which must be less than or equal to the number of MIP levels actually stored in memory for this surface. For <i>sample*</i> messages, the mip map access is clamped to be between the mipmap specified by the integer bits of the Min LOD and the ceiling of the value specified here. For <i>ld*</i> messages, out-of-bounds behavior results for LODs outside of the range specified in this field.</p> <p><b>For Render Target Surfaces:</b><br/>This field defines the MIP level that is currently being rendered into. This is the absolute MIP level on the surface and is not relative to the <b>Surface Min LOD</b> field, which is ignored for render target surfaces.</p> <p><b>For Other Surfaces:</b><br/>This field is reserved : MBZ</p> |   |                   |  |   |   |  |   |   |  |   |  |
| Programming Notes   |   |                   |  |   |   |  |   |   |  |   |  |

| <b>RENDER_SURFACE_STATE</b>   |   |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
|---|---|--|--------------------------------|--------------------------------|---------|-------------------|-------------|---|----------|--|-------------------|---------|--|--|--|--|---|----------|
|   | <p>The <b>LOD</b> of a render target must be the same as the <b>LOD</b> of the other render target(s) and of the depth buffer (defined in 3DSTATE_DEPTH_BUFFER).</p> <p>For render targets with YUV surface formats, the <b>LOD</b> must be zero.</p> <p>For sampling engine surfaces with YCRCB* or PLANAR* surface format, <b>MIP Count</b> must be zero.</p>   |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| 6   | <p><b>31 Reserved</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>([Surface Format] != 'PLANAR')</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Exists If:                             | ([Surface Format] != 'PLANAR') | Format:                        | MBZ     |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
|   | Exists If:  | ([Surface Format] != 'PLANAR')         |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
|   | Format:   | MBZ                                    |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
|   | <p><b>31 Separate UV Plane Enable</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>([Surface Format] == 'PLANAR')</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>If enabled, this field indicates that the U and V are present as separate planes. If disabled, the UV data is interleaved on a single plane.</p> <table border="1"> <thead> <tr> <th style="text-align: center;">Programming Notes</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>This field must be disabled (separate UV planes are not supported).</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Exists If:                             | ([Surface Format] == 'PLANAR') | Format:                        | Enable  | Programming Notes | Project     | This field must be disabled (separate UV planes are not supported). | CHV, BSW |  |                   |         |  |  |  |  |   |          |
| Exists If:  | ([Surface Format] == 'PLANAR')  |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Format:   | Enable  |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Programming Notes   | Project   |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| This field must be disabled (separate UV planes are not supported).   | CHV, BSW  |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| <p><b>30 Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td></td> </tr> <tr> <td>Exists If:</td> <td>([Surface Format] == 'PLANAR')</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project:  |  | Exists If:                     | ([Surface Format] == 'PLANAR') | Format: | MBZ               |             |   |          |  |                   |         |  |  |  |  |   |          |
| Project:  |   |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Exists If:  | ([Surface Format] == 'PLANAR')  |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Format:   | MBZ   |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| <p><b>30:16 Auxiliary Surface QPitch</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>([Surface Format] != 'PLANAR')</td> </tr> <tr> <td>Format:</td> <td>QPitch[16:2]</td> </tr> </table> <p>This field specifies the distance in rows between array slices on the auxiliary surface.</p> <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td>[4h,1FFFCh]</td> <td></td> <td>in multiples of 4 (low 2 bits missing)</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th style="text-align: center;">Programming Notes</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>This field must be set to an integer multiple of the <b>Surface Vertical Alignment</b></td> <td></td> </tr> <tr> <td>Software must ensure that this field is set to a value sufficiently large such that the array slices in the auxiliary surface do not overlap. Refer to the Memory Data Formats section for information on how surfaces are stored in memory.</td> <td></td> </tr> <tr> <td>For non-multisampled render target's auxiliary surface, MCS, QPitch must be computed with Horizontal Alignment = 256 and Surface Vertical Alignment = 128. These alignments are only for MCS buffer and not for associated render target.</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Exists If:  | ([Surface Format] != 'PLANAR')         | Format:                        | QPitch[16:2]                   | Value   | Name              | Description | [4h,1FFFCh]   |          | in multiples of 4 (low 2 bits missing) | Programming Notes | Project | This field must be set to an integer multiple of the <b>Surface Vertical Alignment</b> |  | Software must ensure that this field is set to a value sufficiently large such that the array slices in the auxiliary surface do not overlap. Refer to the Memory Data Formats section for information on how surfaces are stored in memory. |  | For non-multisampled render target's auxiliary surface, MCS, QPitch must be computed with Horizontal Alignment = 256 and Surface Vertical Alignment = 128. These alignments are only for MCS buffer and not for associated render target. | CHV, BSW |
| Exists If:  | ([Surface Format] != 'PLANAR')  |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Format:   | QPitch[16:2]  |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Value   | Name  | Description                            |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| [4h,1FFFCh]   |   | in multiples of 4 (low 2 bits missing) |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Programming Notes   | Project   |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| This field must be set to an integer multiple of the <b>Surface Vertical Alignment</b>  |   |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Software must ensure that this field is set to a value sufficiently large such that the array slices in the auxiliary surface do not overlap. Refer to the Memory Data Formats section for information on how surfaces are stored in memory.  |   |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| For non-multisampled render target's auxiliary surface, MCS, QPitch must be computed with Horizontal Alignment = 256 and Surface Vertical Alignment = 128. These alignments are only for MCS buffer and not for associated render target.   | CHV, BSW  |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| <p><b>29:16 X Offset for U or UV Plane</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>([Surface Format] == 'PLANAR')</td> </tr> <tr> <td>Format:</td> <td>U14</td> </tr> </table> <p>This field specifies the horizontal offset in pixels from the <b>Surface Base Address</b> to the start (origin) of the U plane or interleaved UV plane, depending on the setting of <b>Separate UV Plane</b></p>  | Exists If:  | ([Surface Format] == 'PLANAR')         | Format:                        | U14                            |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Exists If:  | ([Surface Format] == 'PLANAR')  |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |
| Format:   | U14   |  |                                |                                |         |                   |             |   |          |  |                   |         |  |  |  |  |   |          |

| <b>RENDER_SURFACE_STATE</b> |   |                                |
|-----------------------------|---|--------------------------------|
|                             | <b>Enable.</b>  |                                |
|                             | <b>Programming Notes</b>  |                                |
|                             | This field must be a multiple of 4 (bits 1:0 MBZ).  |                                |
|                             | <b>Auxiliary Surface Mode</b> is forced to AUX_NONE.  |                                |
| 15                          | <b>Reserved</b>   |                                |
|                             | Project:  |                                |
|                             | Format:   | MBZ                            |
| 14                          | <b>Reserved</b>   |                                |
|                             | Project:  | All                            |
|                             | Exists If:  | ([Surface Format] == 'PLANAR') |
|                             | Format:   | MBZ                            |
| 14:12                       | <b>Reserved</b>   |                                |
|                             | Exists If:  | ([Surface Format] != 'PLANAR') |
|                             | Format:   | MBZ                            |
| 11:3                        | <b>Auxiliary Surface Pitch</b>  |                                |
|                             | Project:  | CHV, BSW                       |
|                             | Exists If:  | ([Surface Format] != 'PLANAR') |
|                             | Format:   | U9-1 Pitch in #Tiles           |
|                             | This field specifies the Auxiliary surface pitch in (#Tiles - 1).   |                                |
|                             | <b>Value</b>  | <b>Name</b>                    |
|                             | [0, 511]  | -> [1 tile, 512 tiles]         |
| 13:0                        | <b>Y Offset for U or UV Plane</b>   |                                |
|                             | Exists If:  | ([Surface Format] == 'PLANAR') |
|                             | Format:   | U14                            |
|                             | This field specifies the vertical offset in rows from the <b>Surface Base Address</b> to the start (origin) of the U plane or interleaved UV plane, depending on the setting of <b>Separate UV Plane Enable</b> . |                                |
|                             | <b>Programming Notes</b>  |                                |
|                             | <b>Auxiliary Surface Mode</b> is forced to AUX_NONE.  |                                |
|                             | <b>Workaround</b>   |                                |
|                             | For formats PLANAR_420_* when this field is not a multiple of 4 the Out-of-Bounds Supression check must be disabled (HALF_SLICE_CHICKEN3[5] must be set to 1) to avoid false out of bound detection.              |                                |
| 2:0                         | <b>Auxiliary Surface Mode</b>   |                                |
|                             | Project:  | CHV, BSW                       |
|                             | Exists If:  | ([Surface Format] != 'PLANAR') |
|                             | Format:   | U3                             |

| <b>RENDER_SURFACE_STATE</b>   |  |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
|---|--|--|----------|-------------------|----------|---|--|--|----------|--|-----|----|---------|--|----------|----|------------|---|-----|----|---------|--|-----|----|----------|--|--|----|----------|--|----------|-------|----------|--|--|
|   |  | <p>Specifies what type of surface the Auxiliary surface is. The Auxiliary surface has its own base address and pitch, but otherwise shares or overrides other fields set for the primary surface, detailed in the programming notes below.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>AUX_NONE</td> <td>No Auxiliary surface is used</td> <td>All</td> </tr> <tr> <td>1h</td> <td>AUX_MCS</td> <td>The Auxiliary surfaces is an MCS (Multisample Control Surface)</td> <td>CHV, BSW</td> </tr> <tr> <td>2h</td> <td>AUX_APPEND</td> <td>The Auxiliary surface is an append buffer</td> <td>All</td> </tr> <tr> <td>3h</td> <td>AUX_HIZ</td> <td>The Auxiliary surface is a hierarchical depth buffer</td> <td>All</td> </tr> <tr> <td>4h</td> <td>Reserved</td> <td></td> <td></td> </tr> <tr> <td>5h</td> <td>Reserved</td> <td></td> <td>CHV, BSW</td> </tr> <tr> <td>6h-7h</td> <td>Reserved</td> <td></td> <td></td> </tr> </tbody> </table>   |          | Value             | Name     | Description   | Project                                | 0h   | AUX_NONE | No Auxiliary surface is used   | All | 1h | AUX_MCS | The Auxiliary surfaces is an MCS (Multisample Control Surface) | CHV, BSW | 2h | AUX_APPEND | The Auxiliary surface is an append buffer | All | 3h | AUX_HIZ | The Auxiliary surface is a hierarchical depth buffer | All | 4h | Reserved |  |  | 5h | Reserved |  | CHV, BSW | 6h-7h | Reserved |  |  |
| Value   | Name                                   | Description  | Project  |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| 0h  | AUX_NONE                               | No Auxiliary surface is used   | All      |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| 1h  | AUX_MCS                                | The Auxiliary surfaces is an MCS (Multisample Control Surface)   | CHV, BSW |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| 2h  | AUX_APPEND                             | The Auxiliary surface is an append buffer  | All      |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| 3h  | AUX_HIZ                                | The Auxiliary surface is a hierarchical depth buffer   | All      |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| 4h  | Reserved                               |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| 5h  | Reserved                               |  | CHV, BSW |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| 6h-7h   | Reserved                               |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
|   |  | <table border="1"> <thead> <tr> <th>Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>The CCS and hierarchical depth Auxiliary surface shares <b>Height, Width, Depth, Surface Type, Surface Array, Surface Min LOD, MIP Count / LOD, Surface Object Control State, Resource Min LOD, and Minimum Array Element</b> with the primary surface. The hierarchical depth Auxiliary surface uses <b>Surface Horizontal Alignment</b> of 16, <b>Surface Vertical Alignment</b> of 8, regardless of the primary surface's values for these fields. <b>X &amp; Y Offset</b> are set to zero for the purpose of accessing the Auxiliary surface. If this field is set to AUX_HIZ, <b>Surface Format</b> must be one of the following: R32_FLOAT, R24_UNORM_X8_TYPELESS, or R16_UNORM, and the format must match the format used when the surface was used as a depth buffer (with R channel corresponding to D channel).</td> <td></td> </tr> <tr> <td>The CCS Auxiliary surface for non-multisampled render targets has Horizontal Alignment = 256 and Vertical alignment = 128.</td> <td>CHV, BSW</td> </tr> <tr> <td>If this field is set to AUX_HIZ, <b>Number of Multisamples</b> must be MULTISAMPLECOUNT_1, and Surface Type cannot be SURFTYPE_3D.</td> <td></td> </tr> </tbody> </table> |          | Programming Notes | Project  | The CCS and hierarchical depth Auxiliary surface shares <b>Height, Width, Depth, Surface Type, Surface Array, Surface Min LOD, MIP Count / LOD, Surface Object Control State, Resource Min LOD, and Minimum Array Element</b> with the primary surface. The hierarchical depth Auxiliary surface uses <b>Surface Horizontal Alignment</b> of 16, <b>Surface Vertical Alignment</b> of 8, regardless of the primary surface's values for these fields. <b>X &amp; Y Offset</b> are set to zero for the purpose of accessing the Auxiliary surface. If this field is set to AUX_HIZ, <b>Surface Format</b> must be one of the following: R32_FLOAT, R24_UNORM_X8_TYPELESS, or R16_UNORM, and the format must match the format used when the surface was used as a depth buffer (with R channel corresponding to D channel). |  | The CCS Auxiliary surface for non-multisampled render targets has Horizontal Alignment = 256 and Vertical alignment = 128. | CHV, BSW | If this field is set to AUX_HIZ, <b>Number of Multisamples</b> must be MULTISAMPLECOUNT_1, and Surface Type cannot be SURFTYPE_3D. |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| Programming Notes   | Project                                |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| The CCS and hierarchical depth Auxiliary surface shares <b>Height, Width, Depth, Surface Type, Surface Array, Surface Min LOD, MIP Count / LOD, Surface Object Control State, Resource Min LOD, and Minimum Array Element</b> with the primary surface. The hierarchical depth Auxiliary surface uses <b>Surface Horizontal Alignment</b> of 16, <b>Surface Vertical Alignment</b> of 8, regardless of the primary surface's values for these fields. <b>X &amp; Y Offset</b> are set to zero for the purpose of accessing the Auxiliary surface. If this field is set to AUX_HIZ, <b>Surface Format</b> must be one of the following: R32_FLOAT, R24_UNORM_X8_TYPELESS, or R16_UNORM, and the format must match the format used when the surface was used as a depth buffer (with R channel corresponding to D channel). |  |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| The CCS Auxiliary surface for non-multisampled render targets has Horizontal Alignment = 256 and Vertical alignment = 128.  | CHV, BSW                               |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| If this field is set to AUX_HIZ, <b>Number of Multisamples</b> must be MULTISAMPLECOUNT_1, and Surface Type cannot be SURFTYPE_3D.  |  |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| 7   | 31                                     | <p><b>Red Clear Color</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>Clear Color [CHV, BSW] Enumerated Type</td> </tr> </table> <p><b>For Sampling Engine Multisampled Surfaces and Render Targets:</b><br/>Specifies the clear value for the red channel.</p> <p><b>For Other Surfaces:</b><br/>This field is ignored.</p>   |          | Project:          | CHV, BSW | Format:   | Clear Color [CHV, BSW] Enumerated Type |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| Project:  | CHV, BSW                               |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| Format:   | Clear Color [CHV, BSW] Enumerated Type |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
|   | 30                                     | <p><b>Green Clear Color</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>Clear Color [CHV, BSW] Enumerated Type</td> </tr> </table> <p><b>For Sampling Engine Multisampled Surfaces and Render Targets:</b></p>   |          | Project:          | CHV, BSW | Format:   | Clear Color [CHV, BSW] Enumerated Type |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| Project:  | CHV, BSW                               |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |
| Format:   | Clear Color [CHV, BSW] Enumerated Type |  |          |                   |          |   |  |  |          |  |     |    |         |  |          |    |            |   |     |    |         |  |     |    |          |  |  |    |          |  |          |       |          |  |  |

| <b>RENDER_SURFACE_STATE</b>  |  |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
|--|--|----------|--|-------------------|--|--|--|--|--|--|--|---|--|---|------|
|  | <p>Specifies the clear value for the green channel.<br/> <b>For Other Surfaces:</b><br/>                     This field is ignored.</p>  |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| 29   | <p><b>Blue Clear Color</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>Clear Color [CHV, BSW] Enumerated Type</td> </tr> </table> <p><b>For Sampling Engine Multisampled Surfaces and Render Targets:</b><br/>                     Specifies the clear value for the blue channel.<br/> <b>For Other Surfaces:</b><br/>                     This field is ignored.</p>  | Project: | CHV, BSW   | Format:           | Clear Color [CHV, BSW] Enumerated Type |  |  |  |  |  |  |   |  |   |      |
| Project:   | CHV, BSW   |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| Format:  | Clear Color [CHV, BSW] Enumerated Type   |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| 28   | <p><b>Alpha Clear Color</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>Clear Color [CHV, BSW] Enumerated Type</td> </tr> </table> <p><b>For Sampling Engine Multisampled Surfaces and Render Targets:</b><br/>                     Specifies the clear value for the alpha channel.<br/> <b>For Other Surfaces:</b><br/>                     This field is ignored.</p>  | Project: | CHV, BSW   | Format:           | Clear Color [CHV, BSW] Enumerated Type |  |  |  |  |  |  |   |  |   |      |
| Project:   | CHV, BSW   |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| Format:  | Clear Color [CHV, BSW] Enumerated Type   |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| 27:25  | <p><b>Shader Channel Select Red</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Format:</td> <td>Shader Channel Select [CHV, BSW] Enumerated Type</td> </tr> </table> <p>Specifies which surface channel is read or written in the Red shader channel.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Programming Notes</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>The Shader channel selects also define which shader channels are written to which surface channel. If the Shader channel select is SCS_ZERO or SCS_ONE then it is not written to the surface. If the shader channel select is SCS_RED it is written to the surface red channel and so on. If more than one shader channel select is set to the same surface channel only the first shader channel in RGBA order will be written. Each shader channel select must be set to the same surface channel (R = SCS_RED, G = SCS_GREEN, B = SCS_BLUE, A = SCS_ALPHA) if the surface is accessed via the sampler's sample_unorm* or sample_8x8 messages.</td> <td></td> </tr> <tr> <td>The Shader Channel Select fields do not affect the following sampling engine message types: resinfo, sampleinfo, LOD, and ld_mcs. These messages behave as if each Shader Channel Select is set to the same color surface channel.</td> <td></td> </tr> <tr> <td>For the sampling engine <i>gather4*</i> messages, the Gather4 Source Channel Select field in the message header defines which channel's Shader Channel Select is used to select the surface channel to be sampled. Other Shader Channel Select fields are ignored.</td> <td></td> </tr> <tr> <td>For the sampling engine <i>sample*_c</i> and <i>gather4*_c</i> messages, the compare operation always occurs on the red channel from the surface regardless of the setting of the Shader Channel Select fields.</td> <td></td> </tr> <tr> <td>For Render Target, Red, Green and Blue Shader Channel Selects MUST be such that</td> <td>CHV,</td> </tr> </tbody> </table> | Format:  | Shader Channel Select [CHV, BSW] Enumerated Type | Programming Notes | Project                                | The Shader channel selects also define which shader channels are written to which surface channel. If the Shader channel select is SCS_ZERO or SCS_ONE then it is not written to the surface. If the shader channel select is SCS_RED it is written to the surface red channel and so on. If more than one shader channel select is set to the same surface channel only the first shader channel in RGBA order will be written. Each shader channel select must be set to the same surface channel (R = SCS_RED, G = SCS_GREEN, B = SCS_BLUE, A = SCS_ALPHA) if the surface is accessed via the sampler's sample_unorm* or sample_8x8 messages. |  | The Shader Channel Select fields do not affect the following sampling engine message types: resinfo, sampleinfo, LOD, and ld_mcs. These messages behave as if each Shader Channel Select is set to the same color surface channel. |  | For the sampling engine <i>gather4*</i> messages, the Gather4 Source Channel Select field in the message header defines which channel's Shader Channel Select is used to select the surface channel to be sampled. Other Shader Channel Select fields are ignored. |  | For the sampling engine <i>sample*_c</i> and <i>gather4*_c</i> messages, the compare operation always occurs on the red channel from the surface regardless of the setting of the Shader Channel Select fields. |  | For Render Target, Red, Green and Blue Shader Channel Selects MUST be such that | CHV, |
| Format:  | Shader Channel Select [CHV, BSW] Enumerated Type   |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| Programming Notes  | Project  |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| The Shader channel selects also define which shader channels are written to which surface channel. If the Shader channel select is SCS_ZERO or SCS_ONE then it is not written to the surface. If the shader channel select is SCS_RED it is written to the surface red channel and so on. If more than one shader channel select is set to the same surface channel only the first shader channel in RGBA order will be written. Each shader channel select must be set to the same surface channel (R = SCS_RED, G = SCS_GREEN, B = SCS_BLUE, A = SCS_ALPHA) if the surface is accessed via the sampler's sample_unorm* or sample_8x8 messages. |  |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| The Shader Channel Select fields do not affect the following sampling engine message types: resinfo, sampleinfo, LOD, and ld_mcs. These messages behave as if each Shader Channel Select is set to the same color surface channel.   |  |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| For the sampling engine <i>gather4*</i> messages, the Gather4 Source Channel Select field in the message header defines which channel's Shader Channel Select is used to select the surface channel to be sampled. Other Shader Channel Select fields are ignored.   |  |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| For the sampling engine <i>sample*_c</i> and <i>gather4*_c</i> messages, the compare operation always occurs on the red channel from the surface regardless of the setting of the Shader Channel Select fields.  |  |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |
| For Render Target, Red, Green and Blue Shader Channel Selects MUST be such that  | CHV,   |          |  |                   |  |  |  |  |  |  |  |   |  |   |      |

| <b>RENDER_SURFACE_STATE</b>  |   |             |         |  |                   |         |  |                     |
|--|---|-------------|---------|--|-------------------|---------|--|---------------------|
|  | <p>only valid components can be swapped i.e. only change the order of components in the pixel. Any other values for these Shader Channel Select fields are not valid for Render Targets. This also means that there MUST not be multiple shader channels mapped to the same RT channel.</p>   | BSW         |         |  |                   |         |  |                     |
|  | <p>When multiple Channel selects have the same value and shader channel is disabled, disable channel writes 0s to memory. This behavior does not match with Data Port message via HDC.</p>  | CHV,<br>BSW |         |  |                   |         |  |                     |
| 24:22  | <p><b>Shader Channel Select Green</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 15%;">Format:</td> <td>Shader Channel Select [CHV, BSW] Enumerated Type</td> </tr> </table> <p>See <b>Shader Channel Select Red</b> for details.</p>   |             | Format: | Shader Channel Select [CHV, BSW] Enumerated Type |                   |         |  |                     |
| Format:  | Shader Channel Select [CHV, BSW] Enumerated Type  |             |         |  |                   |         |  |                     |
| 21:19  | <p><b>Shader Channel Select Blue</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 15%;">Format:</td> <td>Shader Channel Select [CHV, BSW] Enumerated Type</td> </tr> </table> <p>See <b>Shader Channel Select Red</b> for details.</p>  |             | Format: | Shader Channel Select [CHV, BSW] Enumerated Type |                   |         |  |                     |
| Format:  | Shader Channel Select [CHV, BSW] Enumerated Type  |             |         |  |                   |         |  |                     |
| 18:16  | <p><b>Shader Channel Select Alpha</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 15%;">Format:</td> <td>Shader Channel Select [CHV, BSW] Enumerated Type</td> </tr> </table> <p>See <b>Shader Channel Select Red</b> for details.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%; text-align: center;">Programming Notes</th> <th style="width: 20%; text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td> <p><b>Shader Channel Select Alpha</b> must be set to SCS_ONE for the following formats when sampling (not reading via data port):</p> <ul style="list-style-type: none"> <li>BC6H_SF16</li> <li>BC6H_UF16</li> <li>R32G32B32_FLOAT</li> <li>R11G11B10_FLOAT</li> <li>L32X32_FLOAT</li> <li>PLANAR_420_8</li> <li>ETC1_RGB8</li> <li>ETC2_RGB8</li> <li>EAC_R11</li> <li>EAC_RG11</li> <li>EAC_SIGNED_R11</li> <li>EAC_SIGNED_RG11</li> <li>ETC2_SRGB8</li> <li>R8G8B8_UNORM_SRGB</li> <li>R8G8B8_UNORM</li> <li>R8G8B8_SNORM</li> <li>R8G8B8_UINT</li> <li>R8G8B8_SINT</li> <li>R16G16B16_FLOAT</li> <li>R16G16B16_UNORM</li> <li>R16G16B16_SNORM</li> <li>R16G16B16_UINT</li> </ul> </td> <td style="vertical-align: top;"> <p>CHV,<br/>BSW</p> </td> </tr> </tbody> </table> |             | Format: | Shader Channel Select [CHV, BSW] Enumerated Type | Programming Notes | Project | <p><b>Shader Channel Select Alpha</b> must be set to SCS_ONE for the following formats when sampling (not reading via data port):</p> <ul style="list-style-type: none"> <li>BC6H_SF16</li> <li>BC6H_UF16</li> <li>R32G32B32_FLOAT</li> <li>R11G11B10_FLOAT</li> <li>L32X32_FLOAT</li> <li>PLANAR_420_8</li> <li>ETC1_RGB8</li> <li>ETC2_RGB8</li> <li>EAC_R11</li> <li>EAC_RG11</li> <li>EAC_SIGNED_R11</li> <li>EAC_SIGNED_RG11</li> <li>ETC2_SRGB8</li> <li>R8G8B8_UNORM_SRGB</li> <li>R8G8B8_UNORM</li> <li>R8G8B8_SNORM</li> <li>R8G8B8_UINT</li> <li>R8G8B8_SINT</li> <li>R16G16B16_FLOAT</li> <li>R16G16B16_UNORM</li> <li>R16G16B16_SNORM</li> <li>R16G16B16_UINT</li> </ul> | <p>CHV,<br/>BSW</p> |
| Format:  | Shader Channel Select [CHV, BSW] Enumerated Type  |             |         |  |                   |         |  |                     |
| Programming Notes  | Project   |             |         |  |                   |         |  |                     |
| <p><b>Shader Channel Select Alpha</b> must be set to SCS_ONE for the following formats when sampling (not reading via data port):</p> <ul style="list-style-type: none"> <li>BC6H_SF16</li> <li>BC6H_UF16</li> <li>R32G32B32_FLOAT</li> <li>R11G11B10_FLOAT</li> <li>L32X32_FLOAT</li> <li>PLANAR_420_8</li> <li>ETC1_RGB8</li> <li>ETC2_RGB8</li> <li>EAC_R11</li> <li>EAC_RG11</li> <li>EAC_SIGNED_R11</li> <li>EAC_SIGNED_RG11</li> <li>ETC2_SRGB8</li> <li>R8G8B8_UNORM_SRGB</li> <li>R8G8B8_UNORM</li> <li>R8G8B8_SNORM</li> <li>R8G8B8_UINT</li> <li>R8G8B8_SINT</li> <li>R16G16B16_FLOAT</li> <li>R16G16B16_UNORM</li> <li>R16G16B16_SNORM</li> <li>R16G16B16_UINT</li> </ul> | <p>CHV,<br/>BSW</p>   |             |         |  |                   |         |  |                     |

| <b>RENDER_SURFACE_STATE</b>  |  |                |                                  |  |             |        |  |   |  |
|--|--|----------------|----------------------------------|--|-------------|--------|--|---|--|
|  | <table border="1"> <tr> <td>R16G16B16_SINT</td> <td></td> </tr> <tr> <td>For Render Target, this field MUST be programmed to value = SCS_ALPHA.</td> <td>CHV,<br/>BSW</td> </tr> </table>  | R16G16B16_SINT |                                  | For Render Target, this field MUST be programmed to value = SCS_ALPHA. | CHV,<br>BSW |        |  |   |  |
| R16G16B16_SINT   |  |                |                                  |  |             |        |  |   |  |
| For Render Target, this field MUST be programmed to value = SCS_ALPHA.                       | CHV,<br>BSW  |                |                                  |  |             |        |  |   |  |
| 15:12  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format:        | MBZ                              |  |             |        |  |   |  |
| Format:  | MBZ  |                |                                  |  |             |        |  |   |  |
| 11:0   | <p><b>Resource Min LOD</b></p> <table border="1"> <tr> <td>Format:</td> <td>U4.8 in LOD units</td> </tr> </table> <p><b>For Sampling Engine Surfaces:</b><br/>This field indicates the most detailed LOD that is present in the resource underlying the surface. Refer to the "LOD Computation Pseudocode" section for the use of this field.</p> <p><b>For Other Surfaces:</b><br/>This field is ignored.</p> <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td>[0,14]</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <table border="1"> <tr> <td>This field must be zero if the <b>Surface Format</b> is MONO8</td> </tr> <tr> <td>This field must be zero if the <b>ChromaKey Enable</b> is enabled in the associated sampler.</td> </tr> </table>   | Format:        | U4.8 in LOD units                | Value  | Name        | [0,14] |  | This field must be zero if the <b>Surface Format</b> is MONO8 | This field must be zero if the <b>ChromaKey Enable</b> is enabled in the associated sampler. |
| Format:  | U4.8 in LOD units  |                |                                  |  |             |        |  |   |  |
| Value  | Name   |                |                                  |  |             |        |  |   |  |
| [0,14]   |  |                |                                  |  |             |        |  |   |  |
| This field must be zero if the <b>Surface Format</b> is MONO8                                |  |                |                                  |  |             |        |  |   |  |
| This field must be zero if the <b>ChromaKey Enable</b> is enabled in the associated sampler. |  |                |                                  |  |             |        |  |   |  |
| 8..9   | <p>63:0 <b>Surface Base Address</b></p> <table border="1"> <tr> <td>Format:</td> <td>GraphicsAddress[63:0]SurfaceBase</td> </tr> </table> <p>Specifies the byte-aligned base address of the surface.</p> <p style="text-align: center;"><b>Programming Notes</b></p> <ul style="list-style-type: none"> <li>For SURFTYPE_BUFFER render targets, this field specifies the base address of first element of the surface. The surface is interpreted as a simple array of that single element type. The address must be naturally-aligned to the element size (e.g., a buffer containing R32G32B32A32_FLOAT elements must be 16-byte aligned).</li> <li>For SURFTYPE_BUFFER non-rendertarget surfaces, this field specifies the base address of the first element of the surface, computed in software by adding the surface base address to the byte offset of the element in the buffer. The base address must be aligned to element size.</li> <li>Linear depth buffer surface base addresses must be 64-byte aligned. Note that while render targets (color) can be SURFTYPE_BUFFER, depth buffers cannot.</li> <li>Mipmapped surfaces are stored in a "monolithic" (fixed) format, and only require a single address for the base MIP. All other MIPs are positioned relative to the base MIP.</li> <li>The Base Address for linear (non-tiled) render target surfaces and surfaces accessed with the typed surface read/write data port messages must be element-size aligned for Non-YUV surface formats, or a multiple of 2 element-sizes for YUV surface formats.</li> </ul> | Format:        | GraphicsAddress[63:0]SurfaceBase |  |             |        |  |   |  |
| Format:  | GraphicsAddress[63:0]SurfaceBase   |                |                                  |  |             |        |  |   |  |

| <b>RENDER_SURFACE_STATE</b>   |  |                                  |                                |         |                   |                   |   |  |  |   |  |
|---|--|----------------------------------|--------------------------------|---------|-------------------|-------------------|---|--|--|---|--|
|   | <ul style="list-style-type: none"> <li>Other linear (non-tiled) surfaces have no alignment requirements (byte alignment is sufficient).</li> <li>For tiled surfaces, the actual start of the surface can be offset from the Surface Base Address by the X Offset and Y Offset fields. Tiles are inherently page-aligned (4K or 64K).</li> <li>Certain message types used to access surfaces have more stringent alignment requirements. Please refer to the specific data-port message documentation for additional restrictions.</li> </ul>   |                                  |                                |         |                   |                   |   |  |  |   |  |
| 10..11  | <b>63:62 Reserved</b><br><table border="1"> <tr> <td>Exists If:</td> <td>([Surface Format] == 'PLANAR')</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Exists If:                       | ([Surface Format] == 'PLANAR') | Format: | MBZ               |                   |   |  |  |   |  |
|   | Exists If:   | ([Surface Format] == 'PLANAR')   |                                |         |                   |                   |   |  |  |   |  |
|   | Format:  | MBZ                              |                                |         |                   |                   |   |  |  |   |  |
|   | <b>61:48 X Offset for V Plane</b><br><table border="1"> <tr> <td>Exists If:</td> <td>([Surface Format] == 'PLANAR')</td> </tr> <tr> <td>Format:</td> <td>U14</td> </tr> </table> <p>This field specifies the horizontal offset in pixels from the <b>Surface Base Address</b> to the start (origin) of the V plane.</p> <table border="1"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">This field must be a multiple of 4 (bits 1:0 MBZ).</td> </tr> <tr> <td colspan="2">This field is ignored if <b>Separate UV Plane Enable</b> is disabled.</td> </tr> </table> | Exists If:                       | ([Surface Format] == 'PLANAR') | Format: | U14               | Programming Notes |   | This field must be a multiple of 4 (bits 1:0 MBZ). |  | This field is ignored if <b>Separate UV Plane Enable</b> is disabled. |  |
|   | Exists If:   | ([Surface Format] == 'PLANAR')   |                                |         |                   |                   |   |  |  |   |  |
|   | Format:  | U14                              |                                |         |                   |                   |   |  |  |   |  |
|   | Programming Notes  |                                  |                                |         |                   |                   |   |  |  |   |  |
|   | This field must be a multiple of 4 (bits 1:0 MBZ).   |                                  |                                |         |                   |                   |   |  |  |   |  |
|   | This field is ignored if <b>Separate UV Plane Enable</b> is disabled.  |                                  |                                |         |                   |                   |   |  |  |   |  |
|   | <b>47:46 Reserved</b><br><table border="1"> <tr> <td>Exists If:</td> <td>([Surface Format] == 'PLANAR')</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Exists If:                       | ([Surface Format] == 'PLANAR') | Format: | MBZ               |                   |   |  |  |   |  |
| Exists If:  | ([Surface Format] == 'PLANAR')   |                                  |                                |         |                   |                   |   |  |  |   |  |
| Format:   | MBZ  |                                  |                                |         |                   |                   |   |  |  |   |  |
| <b>45:32 Y Offset for V Plane</b><br><table border="1"> <tr> <td>Exists If:</td> <td>([Surface Format] == 'PLANAR')</td> </tr> <tr> <td>Format:</td> <td>U14</td> </tr> </table> <p>This field specifies the vertical offset in rows from the <b>Surface Base Address</b> to the start (origin) of the V plane.</p> <table border="1"> <tr> <th colspan="2" style="text-align: center;">Programming Notes</th> </tr> <tr> <td colspan="2">This field is ignored if <b>Separate UV Plane Enable</b> is disabled.</td> </tr> </table> | Exists If:   | ([Surface Format] == 'PLANAR')   | Format:                        | U14     | Programming Notes |                   | This field is ignored if <b>Separate UV Plane Enable</b> is disabled. |  |  |   |  |
| Exists If:  | ([Surface Format] == 'PLANAR')   |                                  |                                |         |                   |                   |   |  |  |   |  |
| Format:   | U14  |                                  |                                |         |                   |                   |   |  |  |   |  |
| Programming Notes   |  |                                  |                                |         |                   |                   |   |  |  |   |  |
| This field is ignored if <b>Separate UV Plane Enable</b> is disabled.   |  |                                  |                                |         |                   |                   |   |  |  |   |  |
| <b>31:21 Auxiliary Table Index for Media Compressed Surface</b><br><table border="1"> <tr> <td>Exists If:</td> <td>[Memory Compression Enable] == 1</td> </tr> </table> <p>This field is valid only if Media Memory Compression is on for the surface (Memory Compression Enable == 1). In that case, the Auxiliary Surface Base address is never expected to be used and hence can be overloaded. This represents the 11 bit index into the table in memory which maps the surface to the auxiliary base address.</p>              | Exists If:   | [Memory Compression Enable] == 1 |                                |         |                   |                   |   |  |  |   |  |
| Exists If:  | [Memory Compression Enable] == 1   |                                  |                                |         |                   |                   |   |  |  |   |  |
| <b>63:12 Auxiliary Surface Base Address</b>   |  |                                  |                                |         |                   |                   |   |  |  |   |  |



| <b>RENDER_SURFACE_STATE</b> |   |  |                 |   |            |                                       |            |                                       |         |     |
|-----------------------------|---|--|-----------------|---|------------|---------------------------------------|------------|---------------------------------------|---------|-----|
|                             |   | <table border="1"> <tr> <td>Exists If:</td> <td>[[Surface Format] != 'PLANAR') AND [Memory Compression Enable] == 0</td> </tr> <tr> <td>Format:</td> <td>GraphicsAddress[63:12]</td> </tr> </table> <p>Specifies the 4kbyte-aligned base address of the Auxiliary surface associated with the primary surface specified in other SURFACE_STATE fields.</p> | Exists If:      | [[Surface Format] != 'PLANAR') AND [Memory Compression Enable] == 0 | Format:    | GraphicsAddress[63:12]                |            |                                       |         |     |
| Exists If:                  | [[Surface Format] != 'PLANAR') AND [Memory Compression Enable] == 0 |  |                 |   |            |                                       |            |                                       |         |     |
| Format:                     | GraphicsAddress[63:12]  |  |                 |   |            |                                       |            |                                       |         |     |
|                             | 11  | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | <b>Reserved</b> |   | Format:    | MBZ                                   |            |                                       |         |     |
| <b>Reserved</b>             |   |  |                 |   |            |                                       |            |                                       |         |     |
| Format:                     | MBZ   |  |                 |   |            |                                       |            |                                       |         |     |
|                             | 10  | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | <b>Reserved</b> |   | Project:   | CHV, BSW                              | Format:    | MBZ                                   |         |     |
| <b>Reserved</b>             |   |  |                 |   |            |                                       |            |                                       |         |     |
| Project:                    | CHV, BSW  |  |                 |   |            |                                       |            |                                       |         |     |
| Format:                     | MBZ   |  |                 |   |            |                                       |            |                                       |         |     |
|                             | 9:0   | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | <b>Reserved</b> |   | Project:   | CHV, BSW                              | Format:    | MBZ                                   |         |     |
| <b>Reserved</b>             |   |  |                 |   |            |                                       |            |                                       |         |     |
| Project:                    | CHV, BSW  |  |                 |   |            |                                       |            |                                       |         |     |
| Format:                     | MBZ   |  |                 |   |            |                                       |            |                                       |         |     |
| 12                          |   |  |                 |   |            |                                       |            |                                       |         |     |
| 13                          | 31:0  | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Exists If:</td> <td>[Auxiliary Surface Mode] == 'AUX_HIZ'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | <b>Reserved</b> |   | Project:   | CHV, BSW                              | Exists If: | [Auxiliary Surface Mode] == 'AUX_HIZ' | Format: | MBZ |
| <b>Reserved</b>             |   |  |                 |   |            |                                       |            |                                       |         |     |
| Project:                    | CHV, BSW  |  |                 |   |            |                                       |            |                                       |         |     |
| Exists If:                  | [Auxiliary Surface Mode] == 'AUX_HIZ'                               |  |                 |   |            |                                       |            |                                       |         |     |
| Format:                     | MBZ   |  |                 |   |            |                                       |            |                                       |         |     |
| 14                          | 31:0  | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Exists If:</td> <td>[Auxiliary Surface Mode] == 'AUX_HIZ'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | <b>Reserved</b> |   | Exists If: | [Auxiliary Surface Mode] == 'AUX_HIZ' | Format:    | MBZ                                   |         |     |
| <b>Reserved</b>             |   |  |                 |   |            |                                       |            |                                       |         |     |
| Exists If:                  | [Auxiliary Surface Mode] == 'AUX_HIZ'                               |  |                 |   |            |                                       |            |                                       |         |     |
| Format:                     | MBZ   |  |                 |   |            |                                       |            |                                       |         |     |
| 15                          | 31:0  | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Exists If:</td> <td>[Auxiliary Surface Mode] == 'AUX_HIZ'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | <b>Reserved</b> |   | Project:   | CHV, BSW                              | Exists If: | [Auxiliary Surface Mode] == 'AUX_HIZ' | Format: | MBZ |
| <b>Reserved</b>             |   |  |                 |   |            |                                       |            |                                       |         |     |
| Project:                    | CHV, BSW  |  |                 |   |            |                                       |            |                                       |         |     |
| Exists If:                  | [Auxiliary Surface Mode] == 'AUX_HIZ'                               |  |                 |   |            |                                       |            |                                       |         |     |
| Format:                     | MBZ   |  |                 |   |            |                                       |            |                                       |         |     |

## Render Data Port Message Types

| MT_DP_RT - Render Data Port Message Types                                     |                       |                            |                         |                             |                |
|---|-----------------------|----------------------------|-------------------------|-----------------------------|----------------|
| Project:  | CHV, BSW              |                            |                         |                             |                |
| Source:   | Render Cache DataPort |                            |                         |                             |                |
| Size (in bits):   | 5                     |                            |                         |                             |                |
| Default Value:  | 0x0000000C            |                            |                         |                             |                |
| Lists all the Message Types in a Render Data Port Message Descriptor [18:14]. |                       |                            |                         |                             |                |
| DWord   | Bit                   | Description                |                         |                             |                |
| 0   | 4                     | <b>Reserved</b>            |                         |                             |                |
|   |                       | Project:                   | All                     |                             |                |
|   |                       | Format:                    | MBZ                     |                             |                |
|   |                       | Ignored                    |                         |                             |                |
|   | 3:0                   | <b>Message Type</b>        |                         |                             |                |
|   |                       | Project:                   | All                     |                             |                |
|   |                       | Format:                    | Enumeration             |                             |                |
|   |                       | Specifies type of message  |                         |                             |                |
|   |                       | <b>Value</b>               | <b>Name</b>             | <b>Description</b>          | <b>Project</b> |
|   |                       | 0Ch                        | MT_RTW <b>[Default]</b> | Render Target Write message | All            |
| 0Dh   | MT_RTR                | Render Target Read message | All                     |                             |                |
| Others  | Reserved              | Ignored                    | All                     |                             |                |

## Render Target Index Message Header Control

| MHC_RT_RTI - Render Target Index Message Header Control                                     |            |   |          |     |         |        |
|---|------------|---|----------|-----|---------|--------|
| Project:  | CHV, BSW   |   |          |     |         |        |
| Source:   | PRM        |   |          |     |         |        |
| Size (in bits):   | 32         |   |          |     |         |        |
| Default Value:  | 0x00000000 |   |          |     |         |        |
| DWord   | Bit        | Description   |          |     |         |        |
| 0   | 31:3       | <b>Reserved</b>   |          |     |         |        |
|   |            | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> <tr> <td colspan="2">Ignored</td> </tr> </table> | Project: | All | Format: | Ignore |
| Project:  | All        |   |          |     |         |        |
| Format:   | Ignore     |   |          |     |         |        |
| Ignored   |            |   |          |     |         |        |
| 0   | 2:0        | <b>Render Target Index</b>  |          |     |         |        |
|   |            | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U3</td> </tr> </table>   | Project: | All | Format: | U3     |
|   |            | Project:  | All      |     |         |        |
| Format:   | U3         |   |          |     |         |        |
| Specifies the render target index that will be used to select blend state from BLEND_STATE. |            |   |          |     |         |        |

## Render Target Message Header

| <b>MH_RT - Render Target Message Header</b> |  |  |          |     |         |                        |
|---|--|--|----------|-----|---------|------------------------|
| Project:                                    | CHV, BSW   |  |          |     |         |                        |
| Source:                                     | PRM  |  |          |     |         |                        |
| Size (in bits):                             | 512  |  |          |     |         |                        |
| Default Value:                              | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |         |                        |
| DWord                                       | Bit  | Description  |          |     |         |                        |
| 0.0   | 31:0   | <p><b>Render Target Controls 0</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MHC_RT_C0 [CHV, BSW]</td> </tr> </table> <p>Specifies controls for Render Target Write and Read messages.</p>  | Project: | All | Format: | MHC_RT_C0 [CHV, BSW]   |
| Project:                                    | All  |  |          |     |         |                        |
| Format:                                     | MHC_RT_C0 [CHV, BSW]   |  |          |     |         |                        |
| 0.1   | 31:0   | <p><b>Color Calculator State Pointer</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MHC_RT_CCSP [CHV, BSW]</td> </tr> </table> <p>For Render Target Write message, specifies the HWORD-aligned GeneralStateOffset for Color State. Ignored by Render Target Read message.</p>    | Project: | All | Format: | MHC_RT_CCSP [CHV, BSW] |
| Project:                                    | All  |  |          |     |         |                        |
| Format:                                     | MHC_RT_CCSP [CHV, BSW]   |  |          |     |         |                        |
| 0.2   | 31:0   | <p><b>Render Target Index</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MHC_RT_RTI [CHV, BSW]</td> </tr> </table> <p>For Render Target Write message, specifies the render target index used to select blend state from BLEND_STATE. Ignored by Render Target Read message.</p> | Project: | All | Format: | MHC_RT_RTI [CHV, BSW]  |
| Project:                                    | All  |  |          |     |         |                        |
| Format:                                     | MHC_RT_RTI [CHV, BSW]  |  |          |     |         |                        |
| 0.3-0.4                                     | 63:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>  | Project: | All | Format: | Ignore                 |
| Project:                                    | All  |  |          |     |         |                        |
| Format:                                     | Ignore   |  |          |     |         |                        |
| 0.5   | 31:0   | <p><b>Color Code</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MHC_RT_CC [CHV, BSW]</td> </tr> </table> <p>Hardware uses to track synchronizing events and free resources on thread completion.</p>   | Project: | All | Format: | MHC_RT_CC [CHV, BSW]   |
| Project:                                    | All  |  |          |     |         |                        |
| Format:                                     | MHC_RT_CC [CHV, BSW]   |  |          |     |         |                        |
| 0.6-0.7                                     | 63:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> </table>   | Project: | All |         |                        |
| Project:                                    | All  |  |          |     |         |                        |

| <b>MH_RT - Render Target Message Header</b> |                           |  |          |        |         |                           |
|---|---------------------------|--|----------|--------|---------|---------------------------|
|   |                           | <table border="1"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>   | Format:  | Ignore |         |                           |
| Format:                                     | Ignore                    |  |          |        |         |                           |
| 1.0-1.1                                     | 63:0                      | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>  | Project: | All    | Format: | Ignore                    |
| Project:                                    | All                       |  |          |        |         |                           |
| Format:                                     | Ignore                    |  |          |        |         |                           |
| 1.2   | 31:0                      | <p><b>Subspan 0</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MHC_RT_SUBSPAN [CHV, BSW]</td> </tr> </table> <p>Upper left corner of subspan 0</p> | Project: | All    | Format: | MHC_RT_SUBSPAN [CHV, BSW] |
| Project:                                    | All                       |  |          |        |         |                           |
| Format:                                     | MHC_RT_SUBSPAN [CHV, BSW] |  |          |        |         |                           |
| 1.3   | 31:0                      | <p><b>Subspan 1</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MHC_RT_SUBSPAN [CHV, BSW]</td> </tr> </table> <p>Upper left corner of subspan 1</p> | Project: | All    | Format: | MHC_RT_SUBSPAN [CHV, BSW] |
| Project:                                    | All                       |  |          |        |         |                           |
| Format:                                     | MHC_RT_SUBSPAN [CHV, BSW] |  |          |        |         |                           |
| 1.4   | 31:0                      | <p><b>Subspan 2</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MHC_RT_SUBSPAN [CHV, BSW]</td> </tr> </table> <p>Upper left corner of subspan 2</p> | Project: | All    | Format: | MHC_RT_SUBSPAN [CHV, BSW] |
| Project:                                    | All                       |  |          |        |         |                           |
| Format:                                     | MHC_RT_SUBSPAN [CHV, BSW] |  |          |        |         |                           |
| 1.5   | 31:0                      | <p><b>Subspan 3</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MHC_RT_SUBSPAN [CHV, BSW]</td> </tr> </table> <p>Upper left corner of subspan 3</p> | Project: | All    | Format: | MHC_RT_SUBSPAN [CHV, BSW] |
| Project:                                    | All                       |  |          |        |         |                           |
| Format:                                     | MHC_RT_SUBSPAN [CHV, BSW] |  |          |        |         |                           |
| 1.6   | 31:0                      | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>  | Project: | All    | Format: | Ignore                    |
| Project:                                    | All                       |  |          |        |         |                           |
| Format:                                     | Ignore                    |  |          |        |         |                           |
| 1.7   | 31:0                      | <p><b>Pixel Sample Enables</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MHC_RT_PSM [CHV, BSW]</td> </tr> </table> <p>Pixel Sample Enables</p>    | Project: | All    | Format: | MHC_RT_PSM [CHV, BSW]     |
| Project:                                    | All                       |  |          |        |         |                           |
| Format:                                     | MHC_RT_PSM [CHV, BSW]     |  |          |        |         |                           |

## Render Target Message Header Control

| MHC_RT_C0 - Render Target Message Header Control  |              |  |                    |                |
|---|--------------|--|--------------------|----------------|
| Project:  | CHV, BSW     |  |                    |                |
| Source:   | PRM          |  |                    |                |
| Size (in bits):   | 32           |  |                    |                |
| Default Value:  | 0x00000000   |  |                    |                |
| DWord   | Bit          | Description  |                    |                |
| 0   | 31           | <b>Reserved</b>  |                    |                |
|   |              | Project:   | All                |                |
|   |              | Format:  | Ignore             |                |
|   |              | Ignored  |                    |                |
| 30:27   | 30:27        | <b>Viewport Index</b>  |                    |                |
|   |              | Project:   | All                |                |
|   |              | Format:  | U4                 |                |
| For Render Target Write message, specifies the index of the viewport currently being used. Range = [0,15] Ignored by Render Target Read message.  |              |  |                    |                |
| 26:16   | 26:16        | <b>Render Target Array Index</b>   |                    |                |
|   |              | Project:   | All                |                |
|   |              | Format:  | U11                |                |
|   |              | Specifies the array index to be used for the following surface types: SURFTYPE_1D: specifies the array index. Range = [0,511] SURFTYPE_2D: specifies the array index. Range = [0,511] SURFTYPE_3D: specifies the Z or R coordinate. Range = [0,2047] SURFTYPE_BUFFER: must be zero. SURFTYPE_CUBE: specifies the face identifier. Mapping (0,+x) (1,-x) (2,+y) (3,-y) (4,+z) (5,-z). |                    |                |
| <b>Programming Notes</b>  |              |  |                    |                |
| The Render Target Array Index used by hardware for access to the Render Target is overridden with the Minimum Array Element defined in SURFACE_STATE if it is out of the range between Minimum Array Element and Depth. For cube surfaces, a depth value of 5 is used for this determination. |              |  |                    |                |
| 15  | 15           | <b>Front/Back Facing Polygon</b>   |                    |                |
|   |              | Project:   | All                |                |
|   |              | Format:  | U1                 |                |
|   |              | Determines whether the polygon is front or back facing. Used by the render cache to determine which stencil test state to use.   |                    |                |
|   |              |  |                    |                |
|   | <b>Value</b> | <b>Name</b>  | <b>Description</b> | <b>Project</b> |
|   | 0h           | Front facing   | All                | All            |
|   | 1h           | Back facing  | All                | All            |

| <b>MHC_RT_C0 - Render Target Message Header Control</b> |  |          |          |         |        |                          |  |
|---|--|----------|----------|---------|--------|--------------------------|--|
| 14  | <p><b>Stencil Present to Render Target</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>For Render Target Write message, indicates that computed stencil is included in the message. Must be zero for Render Target Read message.</p>   | Project: | All      | Format: | Enable |                          |  |
| Project:  | All  |          |          |         |        |                          |  |
| Format:   | Enable   |          |          |         |        |                          |  |
| 13  | <p><b>Source Depth Present to Render Target</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>For Render Target Write Message, indicates that source depth data is included in the message. Must be zero for Render Target Read message.</p>   | Project: | All      | Format: | Enable |                          |  |
| Project:  | All  |          |          |         |        |                          |  |
| Format:   | Enable   |          |          |         |        |                          |  |
| 12  | <p><b>oMask to Render Target</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>For Render Target Write message, indicates that oMask data is present in the message and is to be used to mask off samples. Must be zero for Render Target Read message.</p>  | Project: | All      | Format: | Enable |                          |  |
| Project:  | All  |          |          |         |        |                          |  |
| Format:   | Enable   |          |          |         |        |                          |  |
| 11  | <p><b>Source0 Alpha Present to Render Target</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>For Render Target Write message, indicates that Source0 Alpha (aka o0.a) data is included in RTWrite message. If present, these alpha values are used as inputs to AlphaTest and AlphaToCoverage functions. This is required to meet the API rules when writing to multiple render targets (MRTs). Must be zero for Render Target Read message.</p> <table border="1" style="width: 100%; background-color: #e6f2ff;"> <tr> <td colspan="2" style="text-align: center;"><b>Programming Notes</b></td> </tr> </table> <p>This bit should not be set when write to RT0, though sending and using redundant alpha will provide the correct results (at lower performance). This bit is not supported on Dual-Source Blend message types, as source0 alpha is already included in those messages. This bit is not supported on replicated data message types.</p> | Project: | All      | Format: | Enable | <b>Programming Notes</b> |  |
| Project:  | All  |          |          |         |        |                          |  |
| Format:   | Enable   |          |          |         |        |                          |  |
| <b>Programming Notes</b>                                |  |          |          |         |        |                          |  |
| 10  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>   | Project: | All      | Format: | Ignore |                          |  |
| Project:  | All  |          |          |         |        |                          |  |
| Format:   | Ignore   |          |          |         |        |                          |  |
| 9   | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>  | Project: | CHV, BSW | Format: | Ignore |                          |  |
| Project:  | CHV, BSW   |          |          |         |        |                          |  |
| Format:   | Ignore   |          |          |         |        |                          |  |

| <b>MHC_RT_C0 - Render Target Message Header Control</b> |  |          |          |         |        |
|---|--|----------|----------|---------|--------|
| 8:6   | <b>Starting Sample Pair Index</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U3</td> </tr> </table> <p>Indicates the index of the first sample pair of the dispatch. Range = [0,3]</p> | Project: | CHV, BSW | Format: | U3     |
|   | Project:   | CHV, BSW |          |         |        |
| Format:   | U3   |          |          |         |        |
| 5:0   | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>  | Project: | All      | Format: | Ignore |
|   | Project:   | All      |          |         |        |
|   | Format:  | Ignore   |          |         |        |



## Replicated Pixel Render Target Data Payload Register

| <b>MDPR_RGBA - Replicated Pixel Render Target Data Payload Register</b> |  |   |          |     |         |        |
|---|--|---|----------|-----|---------|--------|
| Project:  | CHV, BSW   |   |          |     |         |        |
| Source:   | PRM  |   |          |     |         |        |
| Size (in bits):   | 256  |   |          |     |         |        |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |     |         |        |
| DWord   | Bit  | Description   |          |     |         |        |
| 0   | 31:0   | <p><b>Red</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the value of all slots' red channel.</p>     | Project: | All | Format: | U32    |
| Project:  | All  |   |          |     |         |        |
| Format:   | U32  |   |          |     |         |        |
| 1   | 31:0   | <p><b>Green</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the value of all slots' green channel.</p> | Project: | All | Format: | U32    |
| Project:  | All  |   |          |     |         |        |
| Format:   | U32  |   |          |     |         |        |
| 2   | 31:0   | <p><b>Blue</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the value of all slots' blue channel.</p>   | Project: | All | Format: | U32    |
| Project:  | All  |   |          |     |         |        |
| Format:   | U32  |   |          |     |         |        |
| 3   | 31:0   | <p><b>Alpha</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the value of all slots' alpha channel.</p> | Project: | All | Format: | U32    |
| Project:  | All  |   |          |     |         |        |
| Format:   | U32  |   |          |     |         |        |
| 4-7   | 127:0  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>                                    | Project: | All | Format: | Ignore |
| Project:  | All  |   |          |     |         |        |
| Format:   | Ignore   |   |          |     |         |        |

## Replicated SIMD16 Render Target Data Payload

| <b>MDP_RTW_16REP - Replicated SIMD16 Render Target Data Payload</b> |  |  |          |     |         |                      |
|---|--|--|----------|-----|---------|----------------------|
| Project:  | All  |  |          |     |         |                      |
| Source:   | PRM  |  |          |     |         |                      |
| Size (in bits):   | 256  |  |          |     |         |                      |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |         |                      |
| DWord   | Bit  | Description  |          |     |         |                      |
| 0.0-0.7   | 255:0  | <b>RGBA</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDPR_RGBA [CHV, BSW]</td> </tr> </table> RGBA for all slots [15:0] | Project: | All | Format: | MDPR_RGBA [CHV, BSW] |
| Project:  | All  |  |          |     |         |                      |
| Format:   | MDPR_RGBA [CHV, BSW]   |  |          |     |         |                      |

## Reversed SIMD Mode 2 Message Descriptor Control Field

| <b>MDC_SM2R - Reversed SIMD Mode 2 Message Descriptor Control Field</b> |            |  |             |
|---|------------|--|-------------|
| Project:  | CHV, BSW   |  |             |
| Source:   | PRM        |  |             |
| Size (in bits):   | 1          |  |             |
| Default Value:  | 0x00000000 |  |             |
| DWord   | Bit        | Description  |             |
| 0   | 0          | <b>SIMD Mode</b>   |             |
|   |            | Project:   | All         |
|   |            | Format:  | Enumeration |
|   |            | Specifies the SIMD mode of the message (number of slots processed) |             |
|   |            | Value  | Name        |
|   |            | Description  | Project     |
|   |            | 00h  | SIMD16      |
|   |            | SIMD16   | All         |
|   |            | 01h  | SIMD8       |
|   |            | SIMD8  | All         |

## RoundingPrecisionTable\_3\_Bits

| <b>RoundingPrecisionTable_3_Bits</b> |            |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
|--------------------------------------|------------|---|---------|----|-------|------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|
| Project:                             | All        |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| Source:                              | PRM        |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| Size (in bits):                      | 3          |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| Default Value:                       | 0x00000000 |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| DWord                                | Bit        | Description   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| 0                                    | 2:0        | <b>Rounding Precision</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">U3</td> </tr> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> <tr> <td>000b</td> <td style="text-align: center;">+1/16</td> </tr> <tr> <td>001b</td> <td style="text-align: center;">+2/16</td> </tr> <tr> <td>010b</td> <td style="text-align: center;">+3/16</td> </tr> <tr> <td>011b</td> <td style="text-align: center;">+4/16</td> </tr> <tr> <td>100b</td> <td style="text-align: center;">+5/16</td> </tr> <tr> <td>101b</td> <td style="text-align: center;">+6/16</td> </tr> <tr> <td>110b</td> <td style="text-align: center;">+7/16</td> </tr> <tr> <td>111b</td> <td style="text-align: center;">+8/16</td> </tr> </table> | Format: | U3 | Value | Name | 000b | +1/16 | 001b | +2/16 | 010b | +3/16 | 011b | +4/16 | 100b | +5/16 | 101b | +6/16 | 110b | +7/16 | 111b | +8/16 |
| Format:                              | U3         |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| Value                                | Name       |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| 000b                                 | +1/16      |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| 001b                                 | +2/16      |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| 010b                                 | +3/16      |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| 011b                                 | +4/16      |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| 100b                                 | +5/16      |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| 101b                                 | +6/16      |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| 110b                                 | +7/16      |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |
| 111b                                 | +8/16      |   |         |    |       |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |

## S0A SIMD8 Render Target Data Payload

| MDP_RTW_A8 - S0A SIMD8 Render Target Data Payload |   |  |          |     |         |                         |
|---|---|--|----------|-----|---------|-------------------------|
| Project:  | All   |  |          |     |         |                         |
| Source:   | PRM   |  |          |     |         |                         |
| Size (in bits):                                   | 1280  |  |          |     |         |                         |
| Default Value:                                    | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |         |                         |
| DWord   | Bit   | Description  |          |     |         |                         |
| 0.0-0.7   | 255:0   | <b>Source 0 Alpha</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source 0 Alpha | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 1.0-1.7   | 255:0   | <b>Red</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Red                       | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 2.0-2.7   | 255:0   | <b>Green</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Green                   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 3.0-3.7   | 255:0   | <b>Blue</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue                     | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 4.0-4.7   | 255:0   | <b>Alpha</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Alpha                   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |



| MDP_RTW_A16 - S0A SIMD16 Render Target Data Payload |       |                                 |
|---|-------|---------------------------------|
| 4.0-4.7   | 255:0 | <b>Green[7:0]</b>               |
|   |       | Project: All                    |
|   |       | Format: MDP_DW_SIMD8 [CHV, BSW] |
|   |       | Slots [7:0] Green               |
| 5.0-5.7   | 255:0 | <b>Green[15:8]</b>              |
|   |       | Project: All                    |
|   |       | Format: MDP_DW_SIMD8 [CHV, BSW] |
|   |       | Slots [15:8] Green              |
| 6.0-6.7   | 255:0 | <b>Blue[7:0]</b>                |
|   |       | Project: All                    |
|   |       | Format: MDP_DW_SIMD8 [CHV, BSW] |
|   |       | Slots [7:0] Blue                |
| 7.0-7.7   | 255:0 | <b>Blue[15:8]</b>               |
|   |       | Project: All                    |
|   |       | Format: MDP_DW_SIMD8 [CHV, BSW] |
|   |       | Slots [15:8] Blue               |
| 8.0-8.7   | 255:0 | <b>Alpha[7:0]</b>               |
|   |       | Project: All                    |
|   |       | Format: MDP_DW_SIMD8 [CHV, BSW] |
|   |       | Slots [7:0] Alpha               |
| 9.0-9.7   | 255:0 | <b>Alpha[15:8]</b>              |
|   |       | Project: All                    |
|   |       | Format: MDP_DW_SIMD8 [CHV, BSW] |
|   |       | Slots [15:8] Alpha              |

## SAMPLER\_BORDER\_COLOR\_STATE

| SAMPLER_BORDER_COLOR_STATE   |  |   |            |  |         |        |
|--|--|---|------------|--|---------|--------|
| Project:   | Pre-CHV, BSW   |   |            |  |         |        |
| Source:  | PRM  |   |            |  |         |        |
| Size (in bits):  | 128  |   |            |  |         |        |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000               |   |            |  |         |        |
| Description  |  | Project   |            |  |         |        |
| <p>The interpretation of the border color depends on the Texture Border Color Mode field in SAMPLER_STATE as follows:</p> <ul style="list-style-type: none"> <li>DX9 mode: The border color is 8-bit UNORM format, regardless of the surface format chosen. For surface formats with one or more channels missing (i.e. R5G6R5_UNORM is missing the alpha channel), the value from the border color, if selected, will be used even for the missing channels.</li> <li>DX10/OpenGL mode: the format of the border color depends on the format of the surface being sampled. If the map format is UINT, then the border color format is R32G32B32A32_UINT. If the map format is SINT, then the border color format is R32G32B32A32_SINT. Otherwise, the border color format is R32G32B32A32_FLOAT. For surface formats with one or more channels missing, the value from the border color is not used for the missing channels, resulting in these channels resulting in the overall default value (0 for colors and 1 for alpha) regardless of whether border color is chosen. The surface formats with "L" and "I" have special behavior with respect to the border color. The border color value used for the replicated channels (RGB for "L" formats and RGBA for "I" formats) comes from the red channel of border color. In these cases, the green and blue channels, and also alpha for "I", of the border color are ignored. The format of this state depends on the Texture Border Color Mode field.</li> </ul> |  | CHV, BSW  |            |  |         |        |
| Programming Notes  |  |   |            |  |         |        |
| <ul style="list-style-type: none"> <li>DX9 mode is not supported for surfaces with more than 16 bits in any channel, other than 32-bit float formats which are supported.</li> <li>The conditions under which this color is used depend on the <b>Surface Type</b> - 1D/2D/3D surfaces use the border color when the coordinates extend beyond the surface extent; cube surfaces use the border color for "empty" (disabled) faces.</li> <li>The border color itself is accessed through the texture cache hierarchy rather than the state cache hierarchy. Thus, if the border color is changed in memory, the texture cache must be invalidated and the state cache does not need to be invalidated.</li> <li>MAPFILTER_MONO: The border color is ignored. Border color is fixed at a value of 0 by hardware.</li> </ul>   |  |   |            |  |         |        |
| DWord  | Bit  | Description   |            |  |         |        |
| 0  | 31:24  | <p><b>Border Color Alpha</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>UNORM8</td> </tr> </table> | Exists If: | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9' | Format: | UNORM8 |
| Exists If:   | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9' |   |            |  |         |        |
| Format:  | UNORM8   |   |            |  |         |        |



| <b>SAMPLER_BORDER_COLOR_STATE</b> |   |  |            |   |         |         |
|-----------------------------------|---|--|------------|---|---------|---------|
|                                   |   | Texture Border Color Mode = DX9  |            |   |         |         |
|                                   | 23:16   | <p><b>Border Color Blue</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>UNORM8</td> </tr> </table> <p>Texture Border Color Mode = DX9</p>                        | Exists If: | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      | Format: | UNORM8  |
| Exists If:                        | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      |  |            |   |         |         |
| Format:                           | UNORM8  |  |            |   |         |         |
|                                   | 15:8  | <p><b>Border Color Green</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>UNORM8</td> </tr> </table> <p>Texture Border Color Mode = DX9</p>                       | Exists If: | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      | Format: | UNORM8  |
| Exists If:                        | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      |  |            |   |         |         |
| Format:                           | UNORM8  |  |            |   |         |         |
|                                   | 31:0  | <p><b>Border Color Red - (DX10/OGL)</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL'</td> </tr> <tr> <td>Format:</td> <td>IEEE_FP</td> </tr> </table> <p>Texture Border Color Mode = DX10/OGL</p> | Exists If: | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' | Format: | IEEE_FP |
| Exists If:                        | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' |  |            |   |         |         |
| Format:                           | IEEE_FP   |  |            |   |         |         |
|                                   | 7:0   | <p><b>Border Color Red - (DX9)</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>UNORM8</td> </tr> </table> <p>Texture Border Color Mode = DX9</p>                 | Exists If: | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      | Format: | UNORM8  |
| Exists If:                        | Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      |  |            |   |         |         |
| Format:                           | UNORM8  |  |            |   |         |         |
| 1                                 | 31:0  | <p><b>Border Color Green</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_FP</td> </tr> </table> <p>Texture Border Color Mode = DX10/OGL</p>  | Format:    | IEEE_FP   |         |         |
| Format:                           | IEEE_FP   |  |            |   |         |         |
| 2                                 | 31:0  | <p><b>Border Color Blue</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_FP</td> </tr> </table> <p>Texture Border Color Mode = DX10/OGL</p>   | Format:    | IEEE_FP   |         |         |
| Format:                           | IEEE_FP   |  |            |   |         |         |
| 3                                 | 31:0  | <p><b>Border Color Alpha</b></p> <table border="1"> <tr> <td>Format:</td> <td>IEEE_FP</td> </tr> </table> <p>Texture Border Color Mode = DX10/OGL</p>  | Format:    | IEEE_FP   |         |         |
| Format:                           | IEEE_FP   |  |            |   |         |         |

## SAMPLER\_INDIRECT\_STATE\_BORDER\_COLOR

| <b>SAMPLER_INDIRECT_STATE_BORDER_COLOR</b>  |  |   |
|---|--|---|
| Project:  | CHV, BSW                                       |   |
| Source:   | PRM  |   |
| Size (in bits):   | 128  |   |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |
| <p>This structure is a one version of the SAMPLER_INDIRECT_STATE structure, suitable for many needs. An instance of this structure is pointed to by the <b>Indirect State Pointer</b> field in SAMPLER_STATE. The interpretation of the border color depends on the <b>Texture Border Color Mode</b> field in SAMPLER_STATE as follows:</p> <ul style="list-style-type: none"> <li>In <b>DX9</b> mode, the border color is 8-bit UNORM format, regardless of the surface format chosen. For surface formats with one or more channels missing (i.e. R5G6R5_UNORM is missing the alpha channel), the value from the border color, if selected, will be used <i>even for the missing channels</i>.</li> <li>In <b>DX10/OpenGL</b> mode, the format of the border color is R32G32B32A32_FLOAT, R32G32B32A32_SINT, or R32G32B32A32_UINT, depending on the surface format chosen. For surface formats with one or more channels missing, the value from the border color is not used for the missing channels, resulting in these channels resulting in the overall default value (0 for colors and 1 for alpha) regardless of whether border color is chosen. The surface formats with "L" and "I" have special behavior with respect to the border color. The border color value used for the replicated channels (RGB for "L" formats and RGBA for "I" formats) comes from the <i>red</i> channel of border color. In these cases, the green and blue channels, and also alpha for "I", of the border color are ignored.</li> </ul> |  |   |
| <b>Programming Notes</b>  |  |   |
| <ul style="list-style-type: none"> <li>DX9 mode is not supported for surfaces with more than 16 bits in any channel, other than 32-bit float formats which are supported.</li> <li>The conditions under which this color is used depend on the <b>Surface Type</b> - 1D/2D/3D surfaces use the border color when the coordinates extend beyond the surface extent; cube surfaces use the border color for "empty" (disabled) faces.</li> <li>The border color itself is accessed through the texture cache hierarchy rather than the state cache hierarchy. Thus, if the border color is changed in memory, the texture cache must be invalidated and the state cache does not need to be invalidated.</li> <li>MAPFILTER_MONO: The border color is ignored. Border color is fixed at a value of 0 by hardware.</li> </ul>  |  |   |
| DWord   | Bit  | Description   |
| 0   | 31:24  | <b>Border Color Alpha As U8</b>   |
|   |  | Exists If: //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9' |
|   | Format: U8                                     |   |
|   | 23:16  | <b>Border Color Blue As U8</b>  |
| Exists If: //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'   |  |   |
| Format: U8  |  |   |

| <b>SAMPLER_INDIRECT_STATE_BORDER_COLOR</b> |   |   |  |  |            |            |
|--|---|---|--|--|------------|------------|
|  | 15:8  | <b>Border Color Green As U8</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table>   | Exists If:   | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'   | Format:    | U8         |
|  | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'  |  |  |            |            |
|  | Format:   | U8  |  |  |            |            |
|  | 31:0  | <b>Border Color Red As Float</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true')</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> | Exists If:   | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true')  | Format:    | IEEE_Float |
|  | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true')   |  |  |            |            |
| Format:                                    | IEEE_Float  |   |  |  |            |            |
| 31:0                                       | <b>Border Color Red As U32</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true')</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table>         | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true') | Format:  | U32        |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true')  |   |  |  |            |            |
| Format:                                    | U32   |   |  |  |            |            |
| 31:0                                       | <b>Border Color Red As S31</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true')</td> </tr> <tr> <td>Format:</td> <td>S31</td> </tr> </table>           | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true')   | Format:  | S31        |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true')  |   |  |  |            |            |
| Format:                                    | S31   |   |  |  |            |            |
| 7:0  | <b>Border Color Red As U8</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table>   | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'   | Format:  | U8         |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'  |   |  |  |            |            |
| Format:                                    | U8  |   |  |  |            |            |
| 1  | 31:0  | <b>Reserved</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Exists If:   | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'   | Format:    | MBZ        |
|  | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'  |  |  |            |            |
|  | Format:   | MBZ   |  |  |            |            |
|  | 31:0  | <b>Border Color Green As S31</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true')</td> </tr> <tr> <td>Format:</td> <td>S31</td> </tr> </table>       | Exists If:   | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true') | Format:    | S31        |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true')  |   |  |  |            |            |
| Format:                                    | S31   |   |  |  |            |            |
| 31:0                                       | <b>Border Color Green As U32</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true')</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table>       | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true') | Format:  | U32        |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true')  |   |  |  |            |            |
| Format:                                    | U32   |   |  |  |            |            |
| 31:0                                       | <b>Border Color Green As Float</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true')</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true')    | Format:  | IEEE_Float |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true')   |   |  |  |            |            |
| Format:                                    | IEEE_Float  |   |  |  |            |            |
| 2  | 31:0  | <b>Reserved</b><br><table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Exists If:   | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'   | Format:    | MBZ        |
|  | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'  |  |  |            |            |
| Format:                                    | MBZ   |   |  |  |            |            |
| 31:0                                       | <b>Border Color Blue As S31</b>   |   |  |  |            |            |

| <b>SAMPLER_INDIRECT_STATE_BORDER_COLOR</b> |   |   |                                    |   |            |   |         |            |
|--|---|---|------------------------------------|---|------------|---|---------|------------|
|  |   | <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true'</td> </tr> <tr> <td>Format:</td> <td>S31</td> </tr> </table>  | Exists If:                         | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true' | Format:    | S31   |         |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true'   |   |                                    |   |            |   |         |            |
| Format:                                    | S31   |   |                                    |   |            |   |         |            |
|  | 31:0  | <table border="1"> <tr> <td colspan="2"><b>Border Color Blue As U32</b></td> </tr> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true'</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table>        | <b>Border Color Blue As U32</b>    |   | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true' | Format: | U32        |
| <b>Border Color Blue As U32</b>            |   |   |                                    |   |            |   |         |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true' |   |                                    |   |            |   |         |            |
| Format:                                    | U32   |   |                                    |   |            |   |         |            |
|  | 31:0  | <table border="1"> <tr> <td colspan="2"><b>Border Color Blue As Float</b></td> </tr> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true'</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table>  | <b>Border Color Blue As Float</b>  |   | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true'    | Format: | IEEE_Float |
| <b>Border Color Blue As Float</b>          |   |   |                                    |   |            |   |         |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true'    |   |                                    |   |            |   |         |            |
| Format:                                    | IEEE_Float  |   |                                    |   |            |   |         |            |
| 3  | 31:0  | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | <b>Reserved</b>                    |   | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'  | Format: | MBZ        |
| <b>Reserved</b>                            |   |   |                                    |   |            |   |         |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'  |   |                                    |   |            |   |         |            |
| Format:                                    | MBZ   |   |                                    |   |            |   |         |            |
|  | 31:0  | <table border="1"> <tr> <td colspan="2"><b>Border Color Alpha As S31</b></td> </tr> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true'</td> </tr> <tr> <td>Format:</td> <td>S31</td> </tr> </table>         | <b>Border Color Alpha As S31</b>   |   | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true'   | Format: | S31        |
| <b>Border Color Alpha As S31</b>           |   |   |                                    |   |            |   |         |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsSigned]== 'true'   |   |                                    |   |            |   |         |            |
| Format:                                    | S31   |   |                                    |   |            |   |         |            |
|  | 31:0  | <table border="1"> <tr> <td colspan="2"><b>Border Color Alpha As U32</b></td> </tr> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true'</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table>       | <b>Border Color Alpha As U32</b>   |   | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true' | Format: | U32        |
| <b>Border Color Alpha As U32</b>           |   |   |                                    |   |            |   |         |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsUnsigned]== 'true' |   |                                    |   |            |   |         |            |
| Format:                                    | U32   |   |                                    |   |            |   |         |            |
|  | 31:0  | <table border="1"> <tr> <td colspan="2"><b>Border Color Alpha As Float</b></td> </tr> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true'</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> | <b>Border Color Alpha As Float</b> |   | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true'    | Format: | IEEE_Float |
| <b>Border Color Alpha As Float</b>         |   |   |                                    |   |            |   |         |            |
| Exists If:                                 | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' AND (Structure[RENDER_SURFACE_STATE][Surface Format]Property[IsFloat]== 'true'    |   |                                    |   |            |   |         |            |
| Format:                                    | IEEE_Float  |   |                                    |   |            |   |         |            |

## SAMPLER\_INDIRECT\_STATE

| <b>SAMPLER_INDIRECT_STATE</b>  |  |  |            |  |         |        |
|--|--|--|------------|--|---------|--------|
| Project:   | CHV, BSW   |  |            |  |         |        |
| Source:  | PRM  |  |            |  |         |        |
| Size (in bits):  | 512  |  |            |  |         |        |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |            |  |         |        |
| <p>Note: There are three variations of this structure, defined separately because their payloads have different lengths. Currently only SAMPLER_INDIRECT_STATE_BORDER_COLOR is fully defined.</p> <p>This structure is pointed to by <b>Indirect State Pointer</b> (SAMPLER_STATE).</p> <p>The interpretation of the border color depends on the <b>Texture Border Color Mode</b> field in SAMPLER_STATE as follows:</p> <ul style="list-style-type: none"> <li>In <b>DX9</b> mode, the border color is 8-bit UNORM format, regardless of the surface format chosen. For surface formats with one or more channels missing (i.e. R5G6R5_UNORM is missing the alpha channel), the value from the border color, if selected, will be used <i>even for the missing channels</i>.</li> <li>In <b>DX10/OGL</b> mode, the format of the border color is R32G32B32A32_FLOAT, R32G32B32A32_SINT, or R32G32B32A32_UINT, depending on the surface format chosen. For surface formats with one or more channels missing, the value from the border color is not used for the missing channels, resulting in these channels resulting in the overall default value (0 for colors and 1 for alpha) regardless of whether border color is chosen. The surface formats with "L" and "I" have special behavior with respect to the border color. The border color value used for the replicated channels (RGB for "L" formats and RGBA for "I" formats) comes from the <i>red</i> channel of border color. In these cases, the green and blue channels, and also alpha for "I", of the border color are ignored.</li> </ul> <p>The format of this state depends on the <b>Texture Border Color Mode</b> field.</p> |  |  |            |  |         |        |
| <b>Programming Notes</b>   |  |  |            |  |         |        |
| <ul style="list-style-type: none"> <li>DX9 mode is not supported for surfaces with more than 16 bits in any channel, other than 32-bit float formats which are supported.</li> <li>The conditions under which this color is used depend on the <b>Surface Type</b> - 1D/2D/3D surfaces use the border color when the coordinates extend beyond the surface extent; cube surfaces use the border color for "empty" (disabled) faces.</li> <li>The border color itself is accessed through the texture cache hierarchy rather than the state cache hierarchy. Thus, if the border color is changed in memory, the texture cache must be invalidated and the state cache does not need to be invalidated.</li> <li>MAPFILTER_MONO: The border color is ignored. Border color is fixed at a value of 0 by hardware.</li> </ul>   |  |  |            |  |         |        |
| DWord  | Bit  | Description  |            |  |         |        |
| 0  | 31:24  | <p><b>Border Color Alpha</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 10%;">Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>UNORM8</td> </tr> </table> | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9' | Format: | UNORM8 |
| Exists If:   | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'   |  |            |  |         |        |
| Format:  | UNORM8   |  |            |  |         |        |

| <b>SAMPLER_INDIRECT_STATE</b> |   |  |   |   |         |  |         |                                     |         |                                       |
|-------------------------------|---|--|---|---|---------|--|---------|-------------------------------------|---------|---------------------------------------|
|                               |   | Texture Border Color Mode = DX9  |   |   |         |  |         |                                     |         |                                       |
|                               | 23:16   | <p><b>Border Color Blue</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>UNORM8</td> </tr> </table> <p>Texture Border Color Mode = DX9</p>  | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      | Format: | UNORM8   |         |                                     |         |                                       |
| Exists If:                    | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'  |  |   |   |         |  |         |                                     |         |                                       |
| Format:                       | UNORM8  |  |   |   |         |  |         |                                     |         |                                       |
|                               | 15:8  | <p><b>Border Color Green</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>UNORM8</td> </tr> </table> <p>Texture Border Color Mode = DX9</p>   | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      | Format: | UNORM8   |         |                                     |         |                                       |
| Exists If:                    | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'  |  |   |   |         |  |         |                                     |         |                                       |
| Format:                       | UNORM8  |  |   |   |         |  |         |                                     |         |                                       |
|                               | 31:0  | <p><b>Border Color Red</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL'</td> </tr> <tr> <td>Format:</td> <td>SINT32 (2's complement) for all SINT surface formats</td> </tr> <tr> <td>Format:</td> <td>UINT32 for all UINT surface formats</td> </tr> <tr> <td>Format:</td> <td>IEEE_FP for all other surface formats</td> </tr> </table> <p>Texture Border Color Mode = DX10/OGL</p> | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' | Format: | SINT32 (2's complement) for all SINT surface formats | Format: | UINT32 for all UINT surface formats | Format: | IEEE_FP for all other surface formats |
| Exists If:                    | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL'   |  |   |   |         |  |         |                                     |         |                                       |
| Format:                       | SINT32 (2's complement) for all SINT surface formats  |  |   |   |         |  |         |                                     |         |                                       |
| Format:                       | UINT32 for all UINT surface formats   |  |   |   |         |  |         |                                     |         |                                       |
| Format:                       | IEEE_FP for all other surface formats   |  |   |   |         |  |         |                                     |         |                                       |
|                               | 7:0   | <p><b>Border Color Red</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>UNORM8</td> </tr> </table> <p>Texture Border Color Mode = DX9</p>   | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      | Format: | UNORM8   |         |                                     |         |                                       |
| Exists If:                    | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'  |  |   |   |         |  |         |                                     |         |                                       |
| Format:                       | UNORM8  |  |   |   |         |  |         |                                     |         |                                       |
| 1                             | 31:0  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      | Format: | MBZ  |         |                                     |         |                                       |
|                               | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'   |   |   |         |  |         |                                     |         |                                       |
| Format:                       | MBZ   |  |   |   |         |  |         |                                     |         |                                       |
| 31:0                          | <p><b>Border Color Green</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL'</td> </tr> <tr> <td>Format:</td> <td>IEEE_FP</td> </tr> <tr> <td>Format:</td> <td>S31</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Texture Border Color Mode = DX10/OGL</p> | Exists If:   | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' | Format:   | IEEE_FP | Format:  | S31     | Format:                             | U32     |                                       |
| Exists If:                    | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL'   |  |   |   |         |  |         |                                     |         |                                       |
| Format:                       | IEEE_FP   |  |   |   |         |  |         |                                     |         |                                       |
| Format:                       | S31   |  |   |   |         |  |         |                                     |         |                                       |
| Format:                       | U32   |  |   |   |         |  |         |                                     |         |                                       |
| 2                             | 31:0  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      | Format: | MBZ  |         |                                     |         |                                       |
|                               | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'   |   |   |         |  |         |                                     |         |                                       |
| Format:                       | MBZ   |  |   |   |         |  |         |                                     |         |                                       |
|                               | 31:0  | <b>Border Color Blue</b>   |   |   |         |  |         |                                     |         |                                       |

| <b>SAMPLER_INDIRECT_STATE</b>        |   |  |            |   |         |         |         |     |         |     |                                      |  |
|--------------------------------------|---|--|------------|---|---------|---------|---------|-----|---------|-----|--------------------------------------|--|
|                                      |   | <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL'</td> </tr> <tr> <td>Format:</td> <td>IEEE_FP</td> </tr> <tr> <td>Format:</td> <td>S31</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> <tr> <td colspan="2">Texture Border Color Mode = DX10/OGL</td> </tr> </table>                                  | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' | Format: | IEEE_FP | Format: | S31 | Format: | U32 | Texture Border Color Mode = DX10/OGL |  |
| Exists If:                           | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' |  |            |   |         |         |         |     |         |     |                                      |  |
| Format:                              | IEEE_FP   |  |            |   |         |         |         |     |         |     |                                      |  |
| Format:                              | S31   |  |            |   |         |         |         |     |         |     |                                      |  |
| Format:                              | U32   |  |            |   |         |         |         |     |         |     |                                      |  |
| Texture Border Color Mode = DX10/OGL |   |  |            |   |         |         |         |     |         |     |                                      |  |
| 3                                    | 31:0  | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'      | Format: | MBZ     |         |     |         |     |                                      |  |
|                                      | Exists If:  | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX9'   |            |   |         |         |         |     |         |     |                                      |  |
| Format:                              | MBZ   |  |            |   |         |         |         |     |         |     |                                      |  |
|                                      | 31:0  | <p><b>Border Color Alpha</b></p> <table border="1"> <tr> <td>Exists If:</td> <td>//Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL'</td> </tr> <tr> <td>Format:</td> <td>IEEE_FP</td> </tr> <tr> <td>Format:</td> <td>S31</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> <tr> <td colspan="2">Texture Border Color Mode = DX10/OGL</td> </tr> </table> | Exists If: | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' | Format: | IEEE_FP | Format: | S31 | Format: | U32 | Texture Border Color Mode = DX10/OGL |  |
| Exists If:                           | //Structure[SAMPLER_STATE][Texture Border Color Mode] == 'DX10/OGL' |  |            |   |         |         |         |     |         |     |                                      |  |
| Format:                              | IEEE_FP   |  |            |   |         |         |         |     |         |     |                                      |  |
| Format:                              | S31   |  |            |   |         |         |         |     |         |     |                                      |  |
| Format:                              | U32   |  |            |   |         |         |         |     |         |     |                                      |  |
| Texture Border Color Mode = DX10/OGL |   |  |            |   |         |         |         |     |         |     |                                      |  |
| 4..15                                | 31:0  | <b>Reserved</b>  |            |   |         |         |         |     |         |     |                                      |  |

## SAMPLER\_STATE\_8x8\_AVS\_COEFFICIENTS

| SAMPLER_STATE_8x8_AVS_COEFFICIENTS |  |   |   |
|------------------------------------|--|---|---|
| Project:                           | CHV, BSW   |   |   |
| Source:                            | PRM  |   |   |
| Size (in bits):                    | 256  |   |   |
| Default Value:                     | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |   |
| Description                        |  | Project   |   |
| ExistsIf = AVS                     |  | CHV, BSW  |   |
| DWord                              | Bit  | Description   |   |
| 0                                  | 31:24  | <b>Table 0Y Filter Coefficient[n,1]</b>                               |   |
|                                    |  | Format: S1.6 2's Complement   |   |
|                                    |  | <b>Range:</b> [-2, +2)  |   |
|                                    | 23:16  | <b>Table 0X Filter Coefficient[n,1]</b>                               |   |
|                                    |  | Format: S1.6 2's Complement   |   |
|                                    |  | <b>Range:</b> [-2, +2)  |   |
|                                    | 15:8   | <b>Table 0Y Filter Coefficient[n,0]</b>                               |   |
|                                    |  | Format: S1.6 2's Complement   |   |
|                                    |  | <b>Range:</b> [-2, +2)  |   |
|                                    |  | <b>Programming Notes</b>  |   |
|                                    |  |   | If the format is R10G10B10A2_UNORM or R8G8B8A8_UNORM, this field MBZ. |
|                                    | 7:0  | <b>Table 0X Filter Coefficient[n,0]</b>                               |   |
| Format: S1.6 2's Complement        |  |   |   |
| <b>Range:</b> [-2, +2)             |  |   |   |
| <b>Programming Notes</b>           |  |   |   |
|                                    |  | If the format is R10G10B10A2_UNORM or R8G8B8A8_UNORM, this field MBZ. |   |
| 1                                  | 31:24  | <b>Table 0Y Filter Coefficient[n,3]</b>                               |   |
|                                    |  | Format: S1.6 2's Complement   |   |
|                                    |  | <b>Range:</b> [-2.0, +2.0)  |   |
|                                    | 23:16  | <b>Table 0X Filter Coefficient[n,3]</b>                               |   |
|                                    |  | Format: S1.6 2's Complement   |   |
|                                    | 15:8   | <b>Table 0Y Filter Coefficient[n,2]</b>                               |   |
|                                    |  |   |   |



| <b>SAMPLER_STATE_8x8_AVS_COEFFICIENTS</b>                             |  |   |   |                     |                            |                            |                            |                          |  |   |  |
|---|--|---|---|---------------------|----------------------------|----------------------------|----------------------------|--------------------------|--|---|--|
|   |  | <table border="1"> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2.0, +2.0)</td> </tr> </table>   | Format:                                 | S1.6 2's Complement | <b>Range:</b> [-2.0, +2.0) |                            |                            |                          |  |   |  |
| Format:   | S1.6 2's Complement  |   |   |                     |                            |                            |                            |                          |  |   |  |
| <b>Range:</b> [-2.0, +2.0)  |  |   |   |                     |                            |                            |                            |                          |  |   |  |
|   | 7:0  | <table border="1"> <tr> <td colspan="2"><b>Table 0X Filter Coefficient[n,2]</b></td> </tr> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2.0, +2.0)</td> </tr> </table> | <b>Table 0X Filter Coefficient[n,2]</b> |                     | Format:                    | S1.6 2's Complement        | <b>Range:</b> [-2.0, +2.0) |                          |  |   |  |
| <b>Table 0X Filter Coefficient[n,2]</b>                               |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| Format:   | S1.6 2's Complement  |   |   |                     |                            |                            |                            |                          |  |   |  |
| <b>Range:</b> [-2.0, +2.0)  |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| 2   | 31:24  | <table border="1"> <tr> <td colspan="2"><b>Table 0Y Filter Coefficient[n,5]</b></td> </tr> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2.0, +2.0)</td> </tr> </table> | <b>Table 0Y Filter Coefficient[n,5]</b> |                     | Format:                    | S1.6 2's Complement        | <b>Range:</b> [-2.0, +2.0) |                          |  |   |  |
|   | <b>Table 0Y Filter Coefficient[n,5]</b>  |   |   |                     |                            |                            |                            |                          |  |   |  |
|   | Format:  | S1.6 2's Complement   |   |                     |                            |                            |                            |                          |  |   |  |
|   | <b>Range:</b> [-2.0, +2.0)   |   |   |                     |                            |                            |                            |                          |  |   |  |
|   | 23:16  | <table border="1"> <tr> <td colspan="2"><b>Table 0X Filter Coefficient[n,5]</b></td> </tr> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2.0, +2.0)</td> </tr> </table> | <b>Table 0X Filter Coefficient[n,5]</b> |                     | Format:                    | S1.6 2's Complement        | <b>Range:</b> [-2.0, +2.0) |                          |  |   |  |
| <b>Table 0X Filter Coefficient[n,5]</b>                               |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| Format:   | S1.6 2's Complement  |   |   |                     |                            |                            |                            |                          |  |   |  |
| <b>Range:</b> [-2.0, +2.0)  |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| 15:8  | <table border="1"> <tr> <td colspan="2"><b>Table 0Y Filter Coefficient[n,4]</b></td> </tr> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2.0, +2.0)</td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>Programming Notes</b></td> </tr> <tr> <td colspan="2">If the format is R10G10B10A2_UNORM or R8G8B8A8_UNORM, this field MBZ.</td> </tr> </table> | <b>Table 0Y Filter Coefficient[n,4]</b>   |   | Format:             | S1.6 2's Complement        | <b>Range:</b> [-2.0, +2.0) |                            | <b>Programming Notes</b> |  | If the format is R10G10B10A2_UNORM or R8G8B8A8_UNORM, this field MBZ. |  |
| <b>Table 0Y Filter Coefficient[n,4]</b>                               |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| Format:   | S1.6 2's Complement  |   |   |                     |                            |                            |                            |                          |  |   |  |
| <b>Range:</b> [-2.0, +2.0)  |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| <b>Programming Notes</b>  |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| If the format is R10G10B10A2_UNORM or R8G8B8A8_UNORM, this field MBZ. |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| 7:0   | <table border="1"> <tr> <td colspan="2"><b>Table 0X Filter Coefficient[n,4]</b></td> </tr> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2.0, +2.0)</td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>Programming Notes</b></td> </tr> <tr> <td colspan="2">If the format is R10G10B10A2_UNORM or R8G8B8A8_UNORM, this field MBZ.</td> </tr> </table> | <b>Table 0X Filter Coefficient[n,4]</b>   |   | Format:             | S1.6 2's Complement        | <b>Range:</b> [-2.0, +2.0) |                            | <b>Programming Notes</b> |  | If the format is R10G10B10A2_UNORM or R8G8B8A8_UNORM, this field MBZ. |  |
| <b>Table 0X Filter Coefficient[n,4]</b>                               |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| Format:   | S1.6 2's Complement  |   |   |                     |                            |                            |                            |                          |  |   |  |
| <b>Range:</b> [-2.0, +2.0)  |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| <b>Programming Notes</b>  |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| If the format is R10G10B10A2_UNORM or R8G8B8A8_UNORM, this field MBZ. |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| 3   | 31:24  | <table border="1"> <tr> <td colspan="2"><b>Table 0Y Filter Coefficient[n,7]</b></td> </tr> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2, +2)</td> </tr> </table>     | <b>Table 0Y Filter Coefficient[n,7]</b> |                     | Format:                    | S1.6 2's Complement        | <b>Range:</b> [-2, +2)     |                          |  |   |  |
|   | <b>Table 0Y Filter Coefficient[n,7]</b>  |   |   |                     |                            |                            |                            |                          |  |   |  |
|   | Format:  | S1.6 2's Complement   |   |                     |                            |                            |                            |                          |  |   |  |
|   | <b>Range:</b> [-2, +2)   |   |   |                     |                            |                            |                            |                          |  |   |  |
| 23:16   | <table border="1"> <tr> <td colspan="2"><b>Table 0X Filter Coefficient[n,7]</b></td> </tr> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2, +2)</td> </tr> </table>  | <b>Table 0X Filter Coefficient[n,7]</b>   |   | Format:             | S1.6 2's Complement        | <b>Range:</b> [-2, +2)     |                            |                          |  |   |  |
| <b>Table 0X Filter Coefficient[n,7]</b>                               |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| Format:   | S1.6 2's Complement  |   |   |                     |                            |                            |                            |                          |  |   |  |
| <b>Range:</b> [-2, +2)  |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| 15:8  | <table border="1"> <tr> <td colspan="2"><b>Table 0Y Filter Coefficient[n,6]</b></td> </tr> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2, +2)</td> </tr> </table>  | <b>Table 0Y Filter Coefficient[n,6]</b>   |   | Format:             | S1.6 2's Complement        | <b>Range:</b> [-2, +2)     |                            |                          |  |   |  |
| <b>Table 0Y Filter Coefficient[n,6]</b>                               |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| Format:   | S1.6 2's Complement  |   |   |                     |                            |                            |                            |                          |  |   |  |
| <b>Range:</b> [-2, +2)  |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| 7:0   | <table border="1"> <tr> <td colspan="2"><b>Table 0X Filter Coefficient[n,6]</b></td> </tr> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> </table>   | <b>Table 0X Filter Coefficient[n,6]</b>   |   | Format:             | S1.6 2's Complement        |                            |                            |                          |  |   |  |
| <b>Table 0X Filter Coefficient[n,6]</b>                               |  |   |   |                     |                            |                            |                            |                          |  |   |  |
| Format:   | S1.6 2's Complement  |   |   |                     |                            |                            |                            |                          |  |   |  |

| <b>SAMPLER_STATE_8x8_AVS_COEFFICIENTS</b> |   |  |             |         |
|---|---|--|-------------|---------|
|   |   | <b>Range:</b> [-2, +2)   |             |         |
| 4   | 31:24   | <b>Table 1X Filter Coefficient[n,3]</b>  |             |         |
|   |   | Format: S1.6 2's Complement<br><b>Range:</b> [-2.0, +2.0)  |             |         |
|   | 23:16   | <b>Table 1X Filter Coefficient[n,2]</b>  |             |         |
|   |   | Format: S1.6 2's Complement<br><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%; text-align: center;">Description</th> <th style="width: 40%; text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td><b>Range:</b> [-1.0, +1.0)</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Description | Project |
| Description                               | Project   |  |             |         |
| <b>Range:</b> [-1.0, +1.0)                | CHV, BSW  |  |             |         |
| 15:0                                      | <b>Reserved</b>   |  |             |         |
|   | Format: MBZ   |  |             |         |
| 5   | 31:16   | <b>Reserved</b>  |             |         |
|   |   | Format: MBZ  |             |         |
|   | 15:8  | <b>Table 1X Filter Coefficient[n,5]</b>  |             |         |
|   |   | Format: S1.6 2's Complement<br><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%; text-align: center;">Description</th> <th style="width: 40%; text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td><b>Range:</b> [-1.0, +1.0)</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Description | Project |
| Description                               | Project   |  |             |         |
| <b>Range:</b> [-1.0, +1.0)                | CHV, BSW  |  |             |         |
| 7:0                                       | <b>Table 1X Filter Coefficient[n,4]</b>                   |  |             |         |
|   | Format: S1.6 2's Complement<br><b>Range:</b> [-2.0, +2.0) |  |             |         |
| 6   | 31:24   | <b>Table 1Y Filter Coefficient[n,3]</b>  |             |         |
|   |   | Format: S1.6 2's Complement<br><b>Range:</b> [-2.0, +2.0)  |             |         |
|   | 23:16   | <b>Table 1Y Filter Coefficient[n,2]</b>  |             |         |
|   |   | Format: S1.6 2's Complement<br><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%; text-align: center;">Description</th> <th style="width: 40%; text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td><b>Range:</b> [-1.0, +1.0)</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Description | Project |
| Description                               | Project   |  |             |         |
| <b>Range:</b> [-1.0, +1.0)                | CHV, BSW  |  |             |         |
| 15:0                                      | <b>Reserved</b>   |  |             |         |
|   | Format: MBZ   |  |             |         |
| 7   | 31:16   | <b>Reserved</b>  |             |         |
|   |   | Format: MBZ  |             |         |
|   | 15:8  | <b>Table 1Y Filter Coefficient[n,5]</b>  |             |         |

| <b>SAMPLER_STATE_8x8_AVS_COEFFICIENTS</b> |  |         |                     |                            |  |                            |  |                |  |          |  |
|---|--|---------|---------------------|----------------------------|--|----------------------------|--|----------------|--|----------|--|
|   | <table border="1"> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>Description</b></td> </tr> <tr> <td colspan="2"><b>Range:</b> [-1.0, +1.0)</td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>Project</b></td> </tr> <tr> <td colspan="2">CHV, BSW</td> </tr> </table> | Format: | S1.6 2's Complement | <b>Description</b>         |  | <b>Range:</b> [-1.0, +1.0) |  | <b>Project</b> |  | CHV, BSW |  |
| Format:                                   | S1.6 2's Complement  |         |                     |                            |  |                            |  |                |  |          |  |
| <b>Description</b>                        |  |         |                     |                            |  |                            |  |                |  |          |  |
| <b>Range:</b> [-1.0, +1.0)                |  |         |                     |                            |  |                            |  |                |  |          |  |
| <b>Project</b>                            |  |         |                     |                            |  |                            |  |                |  |          |  |
| CHV, BSW                                  |  |         |                     |                            |  |                            |  |                |  |          |  |
| 7:0                                       | <p><b>Table 1Y Filter Coefficient[n,4]</b></p> <table border="1"> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> <tr> <td colspan="2"><b>Range:</b> [-2.0, +2.0)</td> </tr> </table>   | Format: | S1.6 2's Complement | <b>Range:</b> [-2.0, +2.0) |  |                            |  |                |  |          |  |
| Format:                                   | S1.6 2's Complement  |         |                     |                            |  |                            |  |                |  |          |  |
| <b>Range:</b> [-2.0, +2.0)                |  |         |                     |                            |  |                            |  |                |  |          |  |



| <b>SAMPLER_STATE_8x8_AVS</b> |  |  |                |          |         |     |
|------------------------------|--|--|----------------|----------|---------|-----|
|                              |  | If EM > <b>Strong Edge Threshold</b> , the basic VSA detects a strong edge.  |                |          |         |     |
|                              | 11:6   | <p><b>Weak Edge Threshold</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Format:</td> <td>U6</td> </tr> </table> <p>If <b>Strong Edge Threshold</b> &gt; EM &gt; <b>Weak Edge Threshold</b>, the basic VSA detects a weak edge.</p> | Default Value: | 1        | Format: | U6  |
| Default Value:               | 1  |  |                |          |         |     |
| Format:                      | U6   |  |                |          |         |     |
|                              | 5:0  | <p><b>Gain Factor</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">44</td> </tr> <tr> <td>Format:</td> <td>U6</td> </tr> </table> <p>User control sharpening strength</p>   | Default Value: | 44       | Format: | U6  |
| Default Value:               | 44   |  |                |          |         |     |
| Format:                      | U6   |  |                |          |         |     |
| 1                            | 31:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project:       | CHV, BSW | Format: | MBZ |
| Project:                     | CHV, BSW   |  |                |          |         |     |
| Format:                      | MBZ  |  |                |          |         |     |
| 2                            | 31:27  | Reserved   |                |          |         |     |
|                              | 26:22  | Reserved   |                |          |         |     |
|                              | 21:17  | Reserved   |                |          |         |     |
|                              | 16:14  | <p><b>Strong Edge Weight</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">7</td> </tr> <tr> <td>Format:</td> <td>U3</td> </tr> </table> <p>Sharpening strength when a strong edge is found in basic VSA.</p>  | Default Value: | 7        | Format: | U3  |
|                              | Default Value:   | 7  |                |          |         |     |
|                              | Format:  | U3   |                |          |         |     |
|                              | 13:11  | <p><b>Regular Weight</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Format:</td> <td>U3</td> </tr> </table> <p>Sharpening strength when a weak edge is found in basic VSA.</p>  | Default Value: | 2        | Format: | U3  |
|                              | Default Value:   | 2  |                |          |         |     |
| Format:                      | U3   |  |                |          |         |     |
| 10:8                         | <p><b>Non Edge Weight</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Format:</td> <td>U3</td> </tr> </table> <p>Sharpening strength when no edge is found in basic VSA.</p> | Default Value:   | 1              | Format:  | U3      |     |
| Default Value:               | 1  |  |                |          |         |     |
| Format:                      | U3   |  |                |          |         |     |
| 7:0                          | <p><b>Global Noise Estimation</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">255</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Global noise estimation of previous frame.</p>    | Default Value:   | 255            | Format:  | U8      |     |
| Default Value:               | 255  |  |                |          |         |     |
| Format:                      | U8   |  |                |          |         |     |
|                              |  |  |                |          |         |     |
| 3                            | 31   | <b>Reserved</b>  |                |          |         |     |

| <b>SAMPLER_STATE_8x8_AVS</b> |  |  |
|------------------------------|--|--|
|                              | Default Value:   | 1  |
|                              | Format:  | U1   |
| 30                           | <b>Reserved</b>  |  |
|                              | Format:  | U1   |
| 29:28                        | <b>Enable 8-tap filter</b>   |  |
|                              | <b>Adaptive Filtering (Mode = 11) ExistsIf:</b><br>R10G10B10A2_UNORM R8G8B8A8_UNORM (AYUV also) R8B8G8A8_UNORM<br>B8G8R8A8_UNORM R16G16B16A16  |  |
|                              | <b>Enable 8-tap Filtering on UV channel (Mode = 10) ExistsIf:</b><br>R10G10B10A2_UNORM R8G8B8A8_UNORM (AYUV also) R8B8_UNORM (CrCb) R8_UNORM<br>R8B8G8A8_UNORM B8G8R8A8_UNORM R16G16B16A16 Y8_UNORM  |  |
|                              | <b>Value</b>   | <b>Name</b>  |
|                              |  | <b>Description</b>   |
|                              | 00b  | 4-tap filter is only done on all channels.                                 |
|                              | 01b  | Enable 8-tap Adaptive filter on G-channel. 4-tap filter on other channels. |
|                              | 10b  | 8-tap filter is done on all channels (UV-ch uses the Y-coefficients)       |
|                              | 11b  | Enable 8-tap Adaptive filter all channels (UV-ch uses the Y-coefficients). |
|                              | <b>Programming Notes</b>   |  |
|                              | For 00 and 10, are applicable for RGB surfaces only or surface without Y-ch. In case it is a YUV surface it will default to adaptive mode automatically which is 01 and 11 respectively. Alpha channel is always bi-linear filter irrespective of the above modes. |  |
|                              | Mode 01 and 00 are legacy support and are supported on all surface formats.  |  |
|                              | When Mode is 10 and Surface format is Y8_UNORM, Bypass X/Y Adaptive Filtering must be 1, and Default Sharp Level must be 255   |  |
| 27:22                        | <b>Hue_Max</b>   |  |
|                              | Default Value:   | 14   |
|                              | Format:  | U6   |
|                              | Rectangle half width.  |  |
| 21:16                        | <b>Sat_Max</b>   |  |
|                              | Default Value:   | 31   |
|                              | Format:  | U6   |
|                              | Rectangle half length  |  |
| 15:8                         | <b>Cos(alpha)</b>  |  |

| <b>SAMPLER_STATE_8x8_AVS</b>   |   |  |                     |                                 |                        |                   |  |  |
|--|---|--|---------------------|---------------------------------|------------------------|-------------------|--|--|
|  |   | <table border="1"> <tr> <td>Format:</td> <td>S0.7 2's Complement</td> </tr> <tr> <td colspan="2">Default Value: 79/128</td> </tr> </table>   | Format:             | S0.7 2's Complement             | Default Value: 79/128  |                   |  |  |
| Format:  | S0.7 2's Complement   |  |                     |                                 |                        |                   |  |  |
| Default Value: 79/128  |   |  |                     |                                 |                        |                   |  |  |
|  | 7:0   | <p><b>Sin(alpha)</b></p> <table border="1"> <tr> <td>Format:</td> <td>S0.7 2's Complement</td> </tr> <tr> <td colspan="2">Default Value: 101/128</td> </tr> </table>   | Format:             | S0.7 2's Complement             | Default Value: 101/128 |                   |  |  |
| Format:  | S0.7 2's Complement   |  |                     |                                 |                        |                   |  |  |
| Default Value: 101/128   |   |  |                     |                                 |                        |                   |  |  |
| 4  | 31:24   | <p><b>V_Mid</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>154</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Rectangle middle-point V coordinate.</td> </tr> </table>   | Default Value:      | 154                             | Format:                | U8                | Rectangle middle-point V coordinate.   |  |
|  |   | Default Value:   | 154                 |                                 |                        |                   |  |  |
|  |   | Format:  | U8                  |                                 |                        |                   |  |  |
|  | Rectangle middle-point V coordinate.  |  |                     |                                 |                        |                   |  |  |
|  | 23:16   | <p><b>U_Mid</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>110</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Rectangle middle-point U coordinate.</td> </tr> </table>   | Default Value:      | 110                             | Format:                | U8                | Rectangle middle-point U coordinate.   |  |
|  |   | Default Value:   | 110                 |                                 |                        |                   |  |  |
| Format:  | U8  |  |                     |                                 |                        |                   |  |  |
| Rectangle middle-point U coordinate.   |   |  |                     |                                 |                        |                   |  |  |
| 15   | <p><b>VY_STD_Enable</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> <tr> <td colspan="2">Enables STD in the VY subspace.</td> </tr> </table> | Format:  | Enable              | Enables STD in the VY subspace. |                        |                   |  |  |
| Format:  | Enable  |  |                     |                                 |                        |                   |  |  |
| Enables STD in the VY subspace.  |   |  |                     |                                 |                        |                   |  |  |
| 14:12  | <p><b>Diamond Margin</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>4</td> </tr> <tr> <td>Format:</td> <td>U3</td> </tr> </table>                      | Default Value:   | 4                   | Format:                         | U3                     |                   |  |  |
|  | Default Value:  | 4  |                     |                                 |                        |                   |  |  |
| Format:  | U3  |  |                     |                                 |                        |                   |  |  |
| 11   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>                          | Project:   | CHV, BSW            | Format:                         | MBZ                    |                   |  |  |
|  | Project:  | CHV, BSW   |                     |                                 |                        |                   |  |  |
| Format:  | MBZ   |  |                     |                                 |                        |                   |  |  |
| 10:0   | <p><b>S3U</b></p> <table border="1"> <tr> <td>Format:</td> <td>S2.8 2's Complement</td> </tr> <tr> <td colspan="2">Default Value: 0/256</td> </tr> </table>         | Format:  | S2.8 2's Complement | Default Value: 0/256            |                        |                   |  |  |
| Format:  | S2.8 2's Complement   |  |                     |                                 |                        |                   |  |  |
| Default Value: 0/256   |   |  |                     |                                 |                        |                   |  |  |
| 5  | 31  | Reserved   |                     |                                 |                        |                   |  |  |
|  | 30:24   | <p><b>Diamond_du</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>2</td> </tr> <tr> <td>Format:</td> <td>S6 2's Complement</td> </tr> <tr> <td colspan="2">Rhombus center shift in the sat-direction, relative to the rectangle center.</td> </tr> </table> | Default Value:      | 2                               | Format:                | S6 2's Complement | Rhombus center shift in the sat-direction, relative to the rectangle center. |  |
|  |   | Default Value:   | 2                   |                                 |                        |                   |  |  |
| Format:  | S6 2's Complement   |  |                     |                                 |                        |                   |  |  |
| Rhombus center shift in the sat-direction, relative to the rectangle center. |   |  |                     |                                 |                        |                   |  |  |
| 23:21  | <p><b>HS_margin</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>3</td> </tr> </table>   | Default Value:   | 3                   |                                 |                        |                   |  |  |
| Default Value:   | 3   |  |                     |                                 |                        |                   |  |  |

| <b>SAMPLER_STATE_8x8_AVS</b>   |   |   |                      |                |                          |         |                        |   |  |  |
|--|---|---|----------------------|----------------|--------------------------|---------|------------------------|---|--|--|
|  |   | <table border="1"> <tr> <td>Format:</td> <td>U3</td> </tr> <tr> <td colspan="2">Defines rectangle margin</td> </tr> </table>  | Format:              | U3             | Defines rectangle margin |         |                        |   |  |  |
| Format:  | U3  |   |                      |                |                          |         |                        |   |  |  |
| Defines rectangle margin   |   |   |                      |                |                          |         |                        |   |  |  |
|  | 20:13   | <table border="1"> <tr> <td colspan="2"><b>Diamond_alpha</b></td> </tr> <tr> <td>Format:</td> <td>U2.6</td> </tr> <tr> <td colspan="2">Deafault Value: 100/64</td> </tr> <tr> <td colspan="2">1 / tan(<math>\beta</math>)</td> </tr> </table>   | <b>Diamond_alpha</b> |                | Format:                  | U2.6    | Deafault Value: 100/64 |   | 1 / tan( $\beta$ )   |  |
| <b>Diamond_alpha</b>   |   |   |                      |                |                          |         |                        |   |  |  |
| Format:  | U2.6  |   |                      |                |                          |         |                        |   |  |  |
| Deafault Value: 100/64   |   |   |                      |                |                          |         |                        |   |  |  |
| 1 / tan( $\beta$ )   |   |   |                      |                |                          |         |                        |   |  |  |
|  | 12:7  | <table border="1"> <tr> <td colspan="2"><b>Diamond_Th</b></td> </tr> <tr> <td>Default Value:</td> <td>35</td> </tr> <tr> <td>Format:</td> <td>U6</td> </tr> <tr> <td colspan="2">Half length of the rhombus axis in the sat-direction.</td> </tr> </table>                                      | <b>Diamond_Th</b>    |                | Default Value:           | 35      | Format:                | U6  | Half length of the rhombus axis in the sat-direction.                        |  |
| <b>Diamond_Th</b>  |   |   |                      |                |                          |         |                        |   |  |  |
| Default Value:   | 35  |   |                      |                |                          |         |                        |   |  |  |
| Format:  | U6  |   |                      |                |                          |         |                        |   |  |  |
| Half length of the rhombus axis in the sat-direction.                        |   |   |                      |                |                          |         |                        |   |  |  |
|  | 6:0   | <table border="1"> <tr> <td colspan="2"><b>Diamond_dv</b></td> </tr> <tr> <td>Default Value:</td> <td>0</td> </tr> <tr> <td>Format:</td> <td>S6 2's Complement</td> </tr> <tr> <td colspan="2">Rhombus center shift in the hue-direction, relative to the rectangle center.</td> </tr> </table> | <b>Diamond_dv</b>    |                | Default Value:           | 0       | Format:                | S6 2's Complement   | Rhombus center shift in the hue-direction, relative to the rectangle center. |  |
| <b>Diamond_dv</b>  |   |   |                      |                |                          |         |                        |   |  |  |
| Default Value:   | 0   |   |                      |                |                          |         |                        |   |  |  |
| Format:  | S6 2's Complement   |   |                      |                |                          |         |                        |   |  |  |
| Rhombus center shift in the hue-direction, relative to the rectangle center. |   |   |                      |                |                          |         |                        |   |  |  |
| 6  | 31:24   | <table border="1"> <tr> <td colspan="2"><b>Y_point_4</b></td> </tr> <tr> <td>Default Value:</td> <td>255</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Fourth point of the Y piecewise linear membership function.</td> </tr> </table>                                | <b>Y_point_4</b>     |                | Default Value:           | 255     | Format:                | U8  | Fourth point of the Y piecewise linear membership function.                  |  |
|  | <b>Y_point_4</b>  |   |                      |                |                          |         |                        |   |  |  |
|  | Default Value:  | 255   |                      |                |                          |         |                        |   |  |  |
|  | Format:   | U8  |                      |                |                          |         |                        |   |  |  |
| Fourth point of the Y piecewise linear membership function.                  |   |   |                      |                |                          |         |                        |   |  |  |
| 23:16  | <table border="1"> <tr> <td colspan="2"><b>Y_point_3</b></td> </tr> <tr> <td>Default Value:</td> <td>254</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Third point of the Y piecewise linear membership function.</td> </tr> </table> | <b>Y_point_3</b>  |                      | Default Value: | 254                      | Format: | U8                     | Third point of the Y piecewise linear membership function.  |  |  |
| <b>Y_point_3</b>   |   |   |                      |                |                          |         |                        |   |  |  |
| Default Value:   | 254   |   |                      |                |                          |         |                        |   |  |  |
| Format:  | U8  |   |                      |                |                          |         |                        |   |  |  |
| Third point of the Y piecewise linear membership function.                   |   |   |                      |                |                          |         |                        |   |  |  |
| 15:8   | <table border="1"> <tr> <td colspan="2"><b>Y_point_2</b></td> </tr> <tr> <td>Default Value:</td> <td>47</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Second point of the Y piecewise linear membership function.</td> </tr> </table> | <b>Y_point_2</b>  |                      | Default Value: | 47                       | Format: | U8                     | Second point of the Y piecewise linear membership function. |  |  |
| <b>Y_point_2</b>   |   |   |                      |                |                          |         |                        |   |  |  |
| Default Value:   | 47  |   |                      |                |                          |         |                        |   |  |  |
| Format:  | U8  |   |                      |                |                          |         |                        |   |  |  |
| Second point of the Y piecewise linear membership function.                  |   |   |                      |                |                          |         |                        |   |  |  |
| 7:0  | <table border="1"> <tr> <td colspan="2"><b>Y_point_1</b></td> </tr> <tr> <td>Default Value:</td> <td>46</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">First point of the Y piecewise linear membership function.</td> </tr> </table>  | <b>Y_point_1</b>  |                      | Default Value: | 46                       | Format: | U8                     | First point of the Y piecewise linear membership function.  |  |  |
| <b>Y_point_1</b>   |   |   |                      |                |                          |         |                        |   |  |  |
| Default Value:   | 46  |   |                      |                |                          |         |                        |   |  |  |
| Format:  | U8  |   |                      |                |                          |         |                        |   |  |  |
| First point of the Y piecewise linear membership function.                   |   |   |                      |                |                          |         |                        |   |  |  |
| 7  | 31:16   | <b>Reserved</b>   |                      |                |                          |         |                        |   |  |  |



| <b>SAMPLER_STATE_8x8_AVS</b> |       |  |  |
|------------------------------|-------|--|--|
|                              |       | Format: MBZ  |  |
|                              | 15:0  | <b>INV_Margin_VYL</b><br>Format: U0.16<br>1/Margin_VYL = 3300/65536                                  |  |
| 8                            | 31:24 | <b>P1L</b><br>Default Value: 216<br>Format: U8<br>Y Point 1 of the lower part of the detection PWLF. |  |
|                              |       | <b>P0L</b><br>Default Value: 46<br>Format: U8<br>Y Point 0 of the lower part of the detection PWLF.  |  |
|                              |       | <b>INV_Margin_VYU</b><br>1/Margin_VYU = 1600/65536   |  |
|                              | 9     | 31:24  | <b>B1L</b><br>Default Value: 130<br>Format: U8<br>V Bias 1 of the lower part of the detection PWLF.  |
|                              |       |  | <b>B0L</b><br>Default Value: 133<br>Format: U8<br>V Bias 0 of the lower part of the detection PWLF.  |
|                              |       | 15:8   | <b>P3L</b><br>Default Value: 236<br>Format: U8<br>Y Point 3 of the lower part of the detection PWLF. |
| 7:0                          |       | <b>P2L</b><br>Default Value: 236<br>Format: U8<br>Y Point 2 of the lower part of the detection PWLF. |  |
| 10                           | 31:27 | <b>Y_Slope_2</b><br>Format: U2.3   |  |

| <b>SAMPLER_STATE_8x8_AVS</b>                       |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
|--|---|-----------------------|--|---------------------------------|---------------------|------------------------|----|---|---------------------|----------------------|--|--|----|-----------------|----|--|---------------------|----------------------|--|--|--|
|  | <table border="1"> <tr> <td colspan="2">Deafault Value: 31/8</td> </tr> <tr> <td colspan="2">Slope between points Y3 and Y4.</td> </tr> </table>  | Deafault Value: 31/8  |  | Slope between points Y3 and Y4. |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Deafault Value: 31/8                               |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Slope between points Y3 and Y4.                    |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| 26:16  | <table border="1"> <tr> <td colspan="2"><b>S0L</b></td> </tr> <tr> <td>Format:</td> <td>S2.8 2's Complement</td> </tr> <tr> <td colspan="2">Deafault Value: -5/256</td> </tr> <tr> <td colspan="2">Slope 0 of the lower part of the detection PWLF.</td> </tr> </table>   | <b>S0L</b>            |  | Format:                         | S2.8 2's Complement | Deafault Value: -5/256 |    | Slope 0 of the lower part of the detection PWLF.  |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| <b>S0L</b>   |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Format:  | S2.8 2's Complement   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Deafault Value: -5/256                             |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Slope 0 of the lower part of the detection PWLF.   |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| 15:8   | <table border="1"> <tr> <td colspan="2"><b>B3L</b></td> </tr> <tr> <td>Default Value:</td> <td>130</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">V Bias 3 of the lower part of the detection PWLF.</td> </tr> </table>  | <b>B3L</b>            |  | Default Value:                  | 130                 | Format:                | U8 | V Bias 3 of the lower part of the detection PWLF. |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| <b>B3L</b>   |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Default Value:                                     | 130   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Format:  | U8  |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| V Bias 3 of the lower part of the detection PWLF.  |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| 7:0  | <table border="1"> <tr> <td colspan="2"><b>B2L</b></td> </tr> <tr> <td>Default Value:</td> <td>130</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table>  | <b>B2L</b>            |  | Default Value:                  | 130                 | Format:                | U8 |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| <b>B2L</b>   |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Default Value:                                     | 130   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Format:  | U8  |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| 11   | <table border="1"> <tr> <td colspan="2">31:22 <b>Reserved</b></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> <tr> <td colspan="2">21:11 <b>S2L</b></td> </tr> <tr> <td>Format:</td> <td>S2.8 2's Complement</td> </tr> <tr> <td colspan="2">Default Value: 0/256</td> </tr> <tr> <td colspan="2">Slope 2 of the lower part of the detection PWLF.</td> </tr> <tr> <td colspan="2">10:0 <b>S1L</b></td> </tr> <tr> <td>Format:</td> <td>S2.8 2's Complement</td> </tr> <tr> <td colspan="2">Default Value: 0/256</td> </tr> <tr> <td colspan="2">Slope 1 of the lower part of the detection PWLF.</td> </tr> </table> | 31:22 <b>Reserved</b> |  | Format:                         | MBZ                 | 21:11 <b>S2L</b>       |    | Format:   | S2.8 2's Complement | Default Value: 0/256 |  | Slope 2 of the lower part of the detection PWLF. |    | 10:0 <b>S1L</b> |    | Format:  | S2.8 2's Complement | Default Value: 0/256 |  | Slope 1 of the lower part of the detection PWLF. |  |
| 31:22 <b>Reserved</b>                              |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Format:  | MBZ   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| 21:11 <b>S2L</b>                                   |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Format:  | S2.8 2's Complement   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Default Value: 0/256                               |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Slope 2 of the lower part of the detection PWLF.   |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| 10:0 <b>S1L</b>                                    |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Format:  | S2.8 2's Complement   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Default Value: 0/256                               |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Slope 1 of the lower part of the detection PWLF.   |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| 12   | <table border="1"> <tr> <td colspan="2">31:27 <b>Y_Slope1</b></td> </tr> <tr> <td>Format:</td> <td>U2.3</td> </tr> <tr> <td colspan="2">Default Value: 31/8</td> </tr> <tr> <td colspan="2">Slope between points Y1 and Y2.</td> </tr> <tr> <td colspan="2">26:19 <b>P1U</b></td> </tr> <tr> <td>Default Value:</td> <td>66</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Y Point 1 of the upper part of the detection PWLF.</td> </tr> </table>  | 31:27 <b>Y_Slope1</b> |  | Format:                         | U2.3                | Default Value: 31/8    |    | Slope between points Y1 and Y2.                   |                     | 26:19 <b>P1U</b>     |  | Default Value:                                   | 66 | Format:         | U8 | Y Point 1 of the upper part of the detection PWLF. |                     |                      |  |  |  |
| 31:27 <b>Y_Slope1</b>                              |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Format:  | U2.3  |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Default Value: 31/8                                |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Slope between points Y1 and Y2.                    |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| 26:19 <b>P1U</b>                                   |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Default Value:                                     | 66  |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Format:  | U8  |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |
| Y Point 1 of the upper part of the detection PWLF. |   |                       |  |                                 |                     |                        |    |   |                     |                      |  |  |    |                 |    |  |                     |                      |  |  |  |

| <b>SAMPLER_STATE_8x8_AVS</b> |   |  |                |                     |                        |    |
|------------------------------|---|--|----------------|---------------------|------------------------|----|
|                              | 18:11   | <p><b>P0U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">46</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>Y Point 0 of the upper part of the detection PWLF.</p> | Default Value: | 46                  | Format:                | U8 |
|                              | Default Value:  | 46   |                |                     |                        |    |
| Format:                      | U8  |  |                |                     |                        |    |
|                              | 10:0  | <p><b>S3L</b></p> <table border="1"> <tr> <td>Format:</td> <td style="text-align: center;">S2.8 2's Complement</td> </tr> <tr> <td>Default Value: 0/256</td> <td></td> </tr> </table> <p>Slope 3 of the lower part of the detection PWLF.</p>          | Format:        | S2.8 2's Complement | Default Value: 0/256   |    |
| Format:                      | S2.8 2's Complement   |  |                |                     |                        |    |
| Default Value: 0/256         |   |  |                |                     |                        |    |
| 13                           | 31:24   | <p><b>B1U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">163</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>V Bias 1 of the upper part of the detection PWLF.</p> | Default Value: | 163                 | Format:                | U8 |
|                              | Default Value:  | 163  |                |                     |                        |    |
|                              | Format:   | U8   |                |                     |                        |    |
|                              | 23:16   | <p><b>B0U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">143</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>V Bias 0 of the upper part of the detection PWLF.</p> | Default Value: | 143                 | Format:                | U8 |
|                              | Default Value:  | 143  |                |                     |                        |    |
| Format:                      | U8  |  |                |                     |                        |    |
| 15:8                         | <p><b>P3U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">236</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>Y Point 3 of the upper part of the detection PWLF.</p> | Default Value:   | 236            | Format:             | U8                     |    |
| Default Value:               | 236   |  |                |                     |                        |    |
| Format:                      | U8  |  |                |                     |                        |    |
| 7:0                          | <p><b>P2U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">150</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>Y Point 2 of the upper part of the detection PWLF.</p> | Default Value:   | 150            | Format:             | U8                     |    |
| Default Value:               | 150   |  |                |                     |                        |    |
| Format:                      | U8  |  |                |                     |                        |    |
|                              |   |  |                |                     |                        |    |
| 14                           | 31:27   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td style="text-align: center;">MBZ</td> </tr> </table>  | Format:        | MBZ                 |                        |    |
|                              | Format:   | MBZ  |                |                     |                        |    |
|                              | 26:16   | <p><b>S0U</b></p> <table border="1"> <tr> <td>Format:</td> <td style="text-align: center;">S2.8 2's Complement</td> </tr> <tr> <td>Default Value: 256/256</td> <td></td> </tr> </table> <p>Slope 0 of the upper part of the detection PWLF.</p>        | Format:        | S2.8 2's Complement | Default Value: 256/256 |    |
| Format:                      | S2.8 2's Complement   |  |                |                     |                        |    |
| Default Value: 256/256       |   |  |                |                     |                        |    |
| 15:8                         | <p><b>B3U</b></p>   |  |                |                     |                        |    |

| <b>SAMPLER_STATE_8x8_AVS</b>                     |                             |   |
|--|-----------------------------|---|
|  |                             | Default Value: 140                                    |
|  |                             | Format: U8  |
|  |                             | V Bias 3 of the upper part of the detection PWLF.     |
|  |                             | <b>7:0 B2U</b>  |
|  |                             | Default Value: 200                                    |
|  |                             | Format: U8  |
|  |                             | V Bias 2 of the upper part of the detection PWLF.     |
|  |                             | <b>Reserved</b>                                       |
| 15   | 31:22                       | Format: MBZ   |
|  | 21:11                       | <b>S2U</b>  |
| 16..23   | 255:0                       | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
|  |                             | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
|  |                             | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
|  |                             | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
|  |                             | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
|  |                             | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
|  |                             | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
|  |                             | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
|  |                             | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
|  |                             | Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW] |
| 21:11  | Format: S2.8 2's Complement |   |
| Default Value: -179/256                          |                             |   |
| Slope 2 of the upper part of the detection PWLF. |                             |   |
| 10:0   | Format: S2.8 2's Complement |   |
| Default Value: 113/256                           |                             |   |
| Slope 1 of the upper part of the detection PWLF. |                             |   |
| 24..31   | 255:0                       | <b>Filter Coefficient[1]</b>                          |
| 32..39   | 255:0                       | <b>Filter Coefficient[2]</b>                          |
| 40..47   | 255:0                       | <b>Filter Coefficient[3]</b>                          |
| 48..55   | 255:0                       | <b>Filter Coefficient[4]</b>                          |
| 56..63   | 255:0                       | <b>Filter Coefficient[5]</b>                          |
| 64..71   | 255:0                       | <b>Filter Coefficient[6]</b>                          |
| 72..79   | 255:0                       | <b>Filter Coefficient[7]</b>                          |

| <b>SAMPLER_STATE_8x8_AVS</b> |   |   |                                     |      |             |   |           |                                     |     |  |                                    |
|------------------------------|---|---|-------------------------------------|------|-------------|---|-----------|-------------------------------------|-----|--|------------------------------------|
| 80..87                       | 255:0   | <b>Filter Coefficient[8]</b><br>Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW]   |                                     |      |             |   |           |                                     |     |  |                                    |
| 88..95                       | 255:0   | <b>Filter Coefficient[9]</b><br>Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW]   |                                     |      |             |   |           |                                     |     |  |                                    |
| 96..103                      | 255:0   | <b>Filter Coefficient[10]</b><br>Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW]  |                                     |      |             |   |           |                                     |     |  |                                    |
| 104..111                     | 255:0   | <b>Filter Coefficient[11]</b><br>Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW]  |                                     |      |             |   |           |                                     |     |  |                                    |
| 112..119                     | 255:0   | <b>Filter Coefficient[12]</b><br>Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW]  |                                     |      |             |   |           |                                     |     |  |                                    |
| 120..127                     | 255:0   | <b>Filter Coefficient[13]</b><br>Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW]  |                                     |      |             |   |           |                                     |     |  |                                    |
| 128..135                     | 255:0   | <b>Filter Coefficient[14]</b><br>Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW]  |                                     |      |             |   |           |                                     |     |  |                                    |
| 136..143                     | 255:0   | <b>Filter Coefficient[15]</b><br>Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW]  |                                     |      |             |   |           |                                     |     |  |                                    |
| 144..151                     | 255:0   | <b>Filter Coefficient[16]</b><br>Format: SAMPLER_STATE_8x8_AVS_COEFFICIENTS [CHV, BSW]  |                                     |      |             |   |           |                                     |     |  |                                    |
| 152                          | 31:24   | <b>Default Sharpness Level</b><br>Format: U8<br>When adaptive scaling is off, determines the balance between sharp and smooth scalars. <table border="1" style="width: 100%; margin-top: 5px;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">[Default]</td> <td>Contribute 1 from the smooth scalar</td> </tr> <tr> <td style="text-align: center;">255</td> <td></td> <td>Contribute 1 from the sharp scalar</td> </tr> </tbody> </table> | Value                               | Name | Description | 0 | [Default] | Contribute 1 from the smooth scalar | 255 |  | Contribute 1 from the sharp scalar |
|                              | Value   | Name  | Description                         |      |             |   |           |                                     |     |  |                                    |
|                              | 0   | [Default]   | Contribute 1 from the smooth scalar |      |             |   |           |                                     |     |  |                                    |
|                              | 255   |   | Contribute 1 from the sharp scalar  |      |             |   |           |                                     |     |  |                                    |
|                              | 23:16   | <b>Max Derivative 4 Pixels</b><br>Format: U8<br>Used in adaptive filtering to specify the lower boundary of the smooth 4 pixel area.  |                                     |      |             |   |           |                                     |     |  |                                    |
| 15:8                         | <b>Max Derivative 8 Pixels</b><br>Format: U8<br>Used in adaptive filtering to specify the lower boundary of the smooth 8 pixel area.                      |   |                                     |      |             |   |           |                                     |     |  |                                    |
| 7                            | <b>Reserved</b><br>Format: MBZ  |   |                                     |      |             |   |           |                                     |     |  |                                    |
| 6:4                          | <b>Transition Area with 4 Pixels</b><br>Format: U3<br>Used in adaptive filtering to specify the width of the transition area for the 4 pixel calculation. |   |                                     |      |             |   |           |                                     |     |  |                                    |

| <b>SAMPLER_STATE_8x8_AVS</b> |   |   |                             |         |       |             |             |        |   |                             |        |   |                             |
|------------------------------|---|---|-----------------------------|---------|-------|-------------|-------------|--------|---|-----------------------------|--------|---|-----------------------------|
|                              | 3   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:                     | MBZ     |       |             |             |        |   |                             |        |   |                             |
|                              | Format:   | MBZ   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 2:0                          | <p><b>Transition Area with 8 Pixels</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3</td> </tr> </table> <p>Used in adaptive filtering to specify the width of the transition area for the 8 pixel calculation.</p>  | Format:   | U3                          |         |       |             |             |        |   |                             |        |   |                             |
| Format:                      | U3  |   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 153                          | 31:23   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:                     | MBZ     |       |             |             |        |   |                             |        |   |                             |
|                              | Format:   | MBZ   |                             |         |       |             |             |        |   |                             |        |   |                             |
|                              | 22  | <p><b>Bypass X Adaptive Filtering</b></p> <table border="1"> <tr> <td>Format:</td> <td>Disable</td> </tr> </table> <p>When disabled, the X direction will use <b>Default Sharpness Level</b> to blend between the smooth and sharp filters rather than the calculated value.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Disble</td> <td>Disable X Daptive Filtering</td> </tr> <tr> <td>0</td> <td>Enable</td> <td>Enable X Adaptive Filtering</td> </tr> </tbody> </table> | Format:                     | Disable | Value | Name        | Description | 1      | Disble  | Disable X Daptive Filtering | 0      | Enable  | Enable X Adaptive Filtering |
|                              | Format:   | Disable   |                             |         |       |             |             |        |   |                             |        |   |                             |
|                              | Value   | Name  | Description                 |         |       |             |             |        |   |                             |        |   |                             |
|                              | 1   | Disble  | Disable X Daptive Filtering |         |       |             |             |        |   |                             |        |   |                             |
| 0                            | Enable  | Enable X Adaptive Filtering   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 21                           | <p><b>Bypass Y Adaptive Filtering</b></p> <table border="1"> <tr> <td>Format:</td> <td>Disable</td> </tr> </table> <p>When disabled, the Y direction will use <b>Default Sharpness Level</b> to blend between the smooth and sharp filters rather than the calculated value.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Disble</td> <td>Disable Y Daptive Filtering</td> </tr> <tr> <td>0</td> <td>Enable</td> <td>Enable Y Adaptive Filtering</td> </tr> </tbody> </table>   | Format:   | Disable                     | Value   | Name  | Description | 1           | Disble | Disable Y Daptive Filtering   | 0                           | Enable | Enable Y Adaptive Filtering   |                             |
| Format:                      | Disable   |   |                             |         |       |             |             |        |   |                             |        |   |                             |
| Value                        | Name  | Description   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 1                            | Disble  | Disable Y Daptive Filtering   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 0                            | Enable  | Enable Y Adaptive Filtering   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 20:2                         | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:   | MBZ                         |         |       |             |             |        |   |                             |        |   |                             |
| Format:                      | MBZ   |   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 1                            | <p><b>Adaptive Filter for all channels</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>Only to be enabled if 8-tap Adaptive filter mode is on, eElse it should be disabled.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Enable</td> <td>Enable Adaptive Filter on UV/RB Channels</td> </tr> <tr> <td>0</td> <td>Disble</td> <td>Disable Adaptive Filter on UV/RB Channels</td> </tr> </tbody> </table>  | Format:   | Enable                      | Value   | Name  | Description | 1           | Enable | Enable Adaptive Filter on UV/RB Channels                              | 0                           | Disble | Disable Adaptive Filter on UV/RB Channels                                   |                             |
| Format:                      | Enable  |   |                             |         |       |             |             |        |   |                             |        |   |                             |
| Value                        | Name  | Description   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 1                            | Enable  | Enable Adaptive Filter on UV/RB Channels  |                             |         |       |             |             |        |   |                             |        |   |                             |
| 0                            | Disble  | Disable Adaptive Filter on UV/RB Channels   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 0                            | <p><b>RGB Adaptive</b></p> <table border="1"> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>This should be always set to 0 for YUV input and can be enabled/disabled for RGB input. This should be enabled only if we enable 8-tap adaptive filter for RGB input.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Enable</td> <td>Enable the RGB Adaptive filter using the equation <math>(Y=(R+2G+B)\gg 2)</math></td> </tr> <tr> <td>0</td> <td>Disble</td> <td>Disable the RGB Adaptive equation and use G-Ch directly for adaptive filter</td> </tr> </tbody> </table> | Format:   | Enable                      | Value   | Name  | Description | 1           | Enable | Enable the RGB Adaptive filter using the equation $(Y=(R+2G+B)\gg 2)$ | 0                           | Disble | Disable the RGB Adaptive equation and use G-Ch directly for adaptive filter |                             |
| Format:                      | Enable  |   |                             |         |       |             |             |        |   |                             |        |   |                             |
| Value                        | Name  | Description   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 1                            | Enable  | Enable the RGB Adaptive filter using the equation $(Y=(R+2G+B)\gg 2)$   |                             |         |       |             |             |        |   |                             |        |   |                             |
| 0                            | Disble  | Disable the RGB Adaptive equation and use G-Ch directly for adaptive filter   |                             |         |       |             |             |        |   |                             |        |   |                             |









| <b>SAMPLER_STATE_8x8_CONVOLVE</b>                                   |  |  |  |        |             |        |      |   |   |       |  |
|---|--|--|--|--------|-------------|--------|------|---|---|-------|--|
| 0x00000000, 0x00000000  |  |  |  |        |             |        |      |   |   |       |  |
| Description   |  | Project  |  |        |             |        |      |   |   |       |  |
| Function: 0001b ExistsIf: [Convolve] && [(Kernel Size) = < (15x15)] |  | CHV, BSW   |  |        |             |        |      |   |   |       |  |
| DWord   | Bit  | Description  |  |        |             |        |      |   |   |       |  |
| 0   | 31:21  | <b>Reserved</b><br>Format: MBZ   |  |        |             |        |      |   |   |       |  |
|   | 20   | <b>Reserved</b><br>Project: CHV, BSW<br>Format: MBZ  |  |        |             |        |      |   |   |       |  |
|   | 19:17  | <b>Reserved</b><br>Format: MBZ   |  |        |             |        |      |   |   |       |  |
|   | 16   | <b>Reserved</b><br>Project: CHV, BSW<br>Format: MBZ  |  |        |             |        |      |   |   |       |  |
|   | 15:13  | <b>Reserved</b><br>Format: MBZ   |  |        |             |        |      |   |   |       |  |
|   | 12   | <b>Size of the Coefficient</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>8bit</td> <td>The lower 8 bits of the accumulator is forced to zero or ignored during the accumulation operation.</td> </tr> <tr> <td>1</td> <td>16bit</td> <td>The lower 8 bits are also included for the operation. The final result of the accumulator is shifted before clamping the result as specified by the Scale down value.: Result[15:0] = Clamp(Accum[40:12] » scale_down)</td> </tr> </tbody> </table> | Value  | Name   | Description | 0      | 8bit | The lower 8 bits of the accumulator is forced to zero or ignored during the accumulation operation. | 1 | 16bit | The lower 8 bits are also included for the operation. The final result of the accumulator is shifted before clamping the result as specified by the Scale down value.: Result[15:0] = Clamp(Accum[40:12] » scale_down) |
|   | Value  | Name   | Description  |        |             |        |      |   |   |       |  |
|   | 0  | 8bit   | The lower 8 bits of the accumulator is forced to zero or ignored during the accumulation operation.  |        |             |        |      |   |   |       |  |
|   | 1  | 16bit  | The lower 8 bits are also included for the operation. The final result of the accumulator is shifted before clamping the result as specified by the Scale down value.: Result[15:0] = Clamp(Accum[40:12] » scale_down) |        |             |        |      |   |   |       |  |
|   | 11:8   | <b>Scale down value</b><br>Exists If: //[Convolve] Only<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>[0,10]</td> <td></td> <td>The final result is shifted by this value before clamp is done.</td> </tr> </tbody> </table>  | Value  | Name   | Description | [0,10] |      | The final result is shifted by this value before clamp is done.                                     |   |       |  |
|   | Value  | Name   | Description  |        |             |        |      |   |   |       |  |
|   | [0,10]   |  | The final result is shifted by this value before clamp is done.  |        |             |        |      |   |   |       |  |
| 7:4   | <b>WIDTH</b><br>Exists If: //[Convolve] Only<br>It contains the WIDTH of the kernel.<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>[2-15]</td> <td></td> </tr> </tbody> </table> | Value  | Name   | [2-15] |             |        |      |   |   |       |  |
| Value   | Name   |  |  |        |             |        |      |   |   |       |  |
| [2-15]  |  |  |  |        |             |        |      |   |   |       |  |
| 3:0   | <b>HEIGHT</b><br>Exists If: //[Convolve] Only<br>It contains the HEIGHT of the kernel.<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table>     | Value  | Name   |        |             |        |      |   |   |       |  |
| Value   | Name   |  |  |        |             |        |      |   |   |       |  |
|   |  |  |  |        |             |        |      |   |   |       |  |

|          |       | <b>SAMPLER_STATE_8x8_CONVOLVE</b>  |   |
|----------|-------|--|---|
|          |       | [2-15]   |   |
| 1..15    | 31:0  | <b>Reserved</b>  |   |
|          |       | Format:  | MBZ                                       |
| 16       | 31:16 | <b>Filter Coefficient[0,1]</b>   |   |
|          |       | Exists If:   | //[Filtering] Operation                   |
|          |       | Format:  | S3.4(8bit)/S3.12(16bit) in 2's Complement |
|          |       | <b>Range:</b> [-8.0, +8.0]   |   |
|          |       | <b>Programming Notes</b>   |   |
|          |       | Please note that this field is MBZ if not used in the Filtering Mode.  |   |
|          | 15:0  | <b>Filter Coefficient[0,0]</b>   |   |
|          |       | Exists If:   | //[Filtering] Operation                   |
|          |       | Format:  | S3.4(8bit)/S3.12(16bit) in 2's Complement |
|          |       | <b>Range:</b> [-8.0, +8.0]   |   |
|          |       | <b>Programming Notes</b>   |   |
|          |       | Please note that this field is MBZ if not used in the Filtering Mode.  |   |
| 17       | 31:16 | <b>Filter Coefficient[0,3]</b>   |   |
|          |       | Exists If:   | //[Filtering] Operation                   |
|          |       | Format:  | S3.4(8bit)/S3.12(16bit) in 2's Complement |
|          |       | <b>Range:</b> [-8.0, +8.0]   |   |
|          |       | <b>Programming Notes</b>   |   |
|          |       | Please note that this field is MBZ if not used in the Filtering Mode.  |   |
|          | 15:0  | <b>Filter Coefficient[0,2]</b>   |   |
|          |       | Exists If:   | //[Filtering] Operation                   |
|          |       | Format:  | S3.4(8bit)/S3.12(16bit) in 2's Complement |
|          |       | <b>Range:</b> [-8.0, +8.0]   |   |
|          |       | <b>Programming Notes</b>   |   |
|          |       | Please note that this field is MBZ if not used in the Filtering Mode.  |   |
| 18..19   | 31:0  | <b>Filter Coefficient[0,7:4]</b><br>This table has the same layout as shown above.   |   |
| 20..23   | 31:0  | <b>Filter Coefficient[0,15:8]</b><br>This table has the same layout as shown above.  |   |
| 24..143  | 31:0  | <b>Filter Coefficient[15:1,15:0]</b><br>Columns [15:1] of the coefficient containing 16 coefficients for [15:0] rows. This table has the same layout as shown above. |   |
| 144..263 | 31:0  | <b>Reserved</b>  |   |
|          |       | Project:   | CHV, BSW                                  |
|          |       | Format:  | MBZ                                       |

| <b>SAMPLER_STATE_8x8_CONVOLVE</b> |      |                   |
|-----------------------------------|------|-------------------|
| 264..391                          | 31:0 | <b>Reserved</b>   |
|                                   |      | Project: CHV, BSW |
|                                   |      | Format: MBZ       |
| 392..511                          | 31:0 | <b>Reserved</b>   |
|                                   |      | Project: CHV, BSW |
|                                   |      | Format: MBZ       |

## SAMPLER\_STATE\_8x8\_ERODE\_DILATE\_MINMAXFILTER

| SAMPLER_STATE_8x8_ERODE_DILATE_MINMAXFILTER   |  |   |       |      |      |
|---|--|---|-------|------|------|
| Project:  | CHV, BSW   |   |       |      |      |
| Source:   | PRM  |   |       |      |      |
| Size (in bits):   | 256  |   |       |      |      |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000   |   |       |      |      |
| Description   |  | Project   |       |      |      |
| The table is valid for the following functions: 0100 - Erode 0101 - Dilate 0011 - MinMaxFilter      |  | CHV, BSW  |       |      |      |
| Programming Notes   |  |   |       |      |      |
| Max kernel size is 15x15. For sizes less than 15x15 the coefficients not used should be zeroed out. |  |   |       |      |      |
| DWord   | Bit  | Description   |       |      |      |
| 0   | 31:16  | <b>16bit Mask for Row0 [15:0]</b>   |       |      |      |
|   | 15:8   | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>   |       | MBZ  |      |
|   |  | MBZ   |       |      |      |
|   | 7:4  | <b>Width Of The Kernel</b><br><table border="1" style="display: inline-table; vertical-align: middle;"><thead><tr><th>Value</th><th>Name</th></tr></thead><tbody><tr><td>2-15</td><td> </td></tr></tbody></table> | Value | Name | 2-15 |
| Value   | Name   |   |       |      |      |
| 2-15  |  |   |       |      |      |
| 3:0   | <b>Height Of The Kernel</b><br><table border="1" style="display: inline-table; vertical-align: middle;"><thead><tr><th>Value</th><th>Name</th></tr></thead><tbody><tr><td>2-15</td><td> </td></tr></tbody></table> | Value   | Name  | 2-15 |      |
| Value   | Name   |   |       |      |      |
| 2-15  |  |   |       |      |      |
| 1   | 31:16  | <b>16bit Mask for Row2 [15:0]</b>   |       |      |      |
|   | 15:0   | <b>16bit Mask for Row1 [15:0]</b>   |       |      |      |
| 2   | 31:16  | <b>16bit Mask for Row4 [15:0]</b>   |       |      |      |
|   | 15:0   | <b>16bit Mask for Row3 [15:0]</b>   |       |      |      |
| 3   | 31:16  | <b>16bit Mask for Row6 [15:0]</b>   |       |      |      |
|   | 15:0   | <b>16bit Mask for Row5 [15:0]</b>   |       |      |      |
| 4   | 31:16  | <b>16bit Mask for Row8 [15:0]</b>   |       |      |      |
|   | 15:0   | <b>16bit Mask for Row7 [15:0]</b>   |       |      |      |
| 5   | 31:16  | <b>16bit Mask for Row10 [15:0]</b>  |       |      |      |
|   | 15:0   | <b>16bit Mask for Row9 [15:0]</b>   |       |      |      |
| 6   | 31:16  | <b>16bit Mask for Row12 [15:0]</b>  |       |      |      |
|   | 15:0   | <b>16bit Mask for Row11 [15:0]</b>  |       |      |      |
| 7   | 31:16  | <b>16bit Mask for Row14 [15:0]</b>  |       |      |      |
|   | 15:0   | <b>16bit Mask for Row13 [15:0]</b>  |       |      |      |

## SAMPLER\_STATE

| <b>SAMPLER_STATE</b>  |   |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
|---|---|---|----------|------|-------------|---------|----------|---|----|-----|--|-------------------|---------|---|--|---|--|---|--|---|------|
| Project:  | CHV, BSW  |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| Source:   | PRM   |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| Exists If:  | //((MessageType != 'Deinterlace') && (MessageType != 'Sample_8x8')) |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| Size (in bits):   | 128   |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000                      |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| <p>This is the normal sampler state used by all messages that use SAMPLER_STATE except sample_8x8 and deinterlace. The sampler state is stored as an array of up to 16 elements, each of which contains the dwords described here. The start of each element is spaced 4 dwords apart. The first element of the sampler state array is aligned to a 32-byte boundary.</p> |   |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| DWord   | Bit   | Description   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| 0   | 31  | <b>Sampler Disable</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Disable</td> </tr> </table> <p>This field allows the sampler to be disabled. If disabled, all output channels will return 0.</p>  | Project: | All  | Format:     | Disable |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
|   |   | Project:  | All      |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
|   |   | Format:   | Disable  |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>  | Project:  | CHV, BSW  |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| Project:  | CHV, BSW  |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| 29  |   | <b>Texture Border Color Mode</b><br><p>For some surface formats, the 32 bit border color is decoded differently based on the border color mode. In addition, the default value of channels not included in the surface may be affected by this field. Refer to the "Sampler Output Channel Mapping" table for the values of these channels, and for surface formats that may only support one of these modes. Also refer to the definition of SAMPLER_BORDER_COLOR_STATE for more details on the behavior of the two modes defined by this field.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>DX10/OGL</td> <td>DX10/OGL mode for interpreting the border color</td> </tr> <tr> <td>1h</td> <td>DX9</td> <td>DX9 and earlier mode for interpreting the border color</td> </tr> </tbody> </table> <table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 80%;">Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>This field is required to be the same for every message over a period of time. A flush of the sampler cache must occur before a message with the opposite state of this field is delivered.</td> <td></td> </tr> <tr> <td>This field must be set to DX9 mode when used with surfaces that have Surface Format P4A4_UNORM or A4P4_UNORM.</td> <td></td> </tr> <tr> <td>This field must be set to DX10/OGL mode when used with surfaces that have Surface Format YCRCB_SWAPUV or YCRCB_SWAPY.</td> <td></td> </tr> <tr> <td>This field must be set to DX10/OGL mode if <b>Surface Format</b> for the associated</td> <td>CHV,</td> </tr> </tbody> </table> | Value    | Name | Description | 0h      | DX10/OGL | DX10/OGL mode for interpreting the border color | 1h | DX9 | DX9 and earlier mode for interpreting the border color | Programming Notes | Project | This field is required to be the same for every message over a period of time. A flush of the sampler cache must occur before a message with the opposite state of this field is delivered. |  | This field must be set to DX9 mode when used with surfaces that have Surface Format P4A4_UNORM or A4P4_UNORM. |  | This field must be set to DX10/OGL mode when used with surfaces that have Surface Format YCRCB_SWAPUV or YCRCB_SWAPY. |  | This field must be set to DX10/OGL mode if <b>Surface Format</b> for the associated | CHV, |
| Value   | Name  | Description   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| 0h  | DX10/OGL  | DX10/OGL mode for interpreting the border color   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| 1h  | DX9   | DX9 and earlier mode for interpreting the border color  |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| Programming Notes   | Project   |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| This field is required to be the same for every message over a period of time. A flush of the sampler cache must occur before a message with the opposite state of this field is delivered.   |   |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| This field must be set to DX9 mode when used with surfaces that have Surface Format P4A4_UNORM or A4P4_UNORM.   |   |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| This field must be set to DX10/OGL mode when used with surfaces that have Surface Format YCRCB_SWAPUV or YCRCB_SWAPY.   |   |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |
| This field must be set to DX10/OGL mode if <b>Surface Format</b> for the associated   | CHV,  |   |          |      |             |         |          |   |    |     |  |                   |         |   |  |   |  |   |  |   |      |

## SAMPLER\_STATE

|       |   |  |  |                |
|-------|---|--|--|----------------|
|       |   | surface is UINT OR SINT.   | BSW  |                |
|       |   | This field must be set to DX10/OGL mode if REDUCTION_MINIMUM or REDUCTION_MAXIMUM or message type is sample_min or sample_max. |  |                |
| 28:27 | <b>LOD PreClamp Mode</b>  |  |  |                |
|       | Project:  | CHV, BSW   |  |                |
|       | This field determines whether the computed LOD is clamped to [max,min] mip level before the mag-vs-min determination is performed.  |  |  |                |
|       | PRECLAMP_OGL: LOD pre-clamped to <b>Min LOD</b> and <b>Max LOD</b>  |  |  |                |
|       | OpenGL API currently clamps LOD to the <b>Min LOD</b> and <b>Max LOD</b> (from Sampler State) prior to performing min/mag determination, and therefore it is expected that an OpenGL driver would need to set this field to PRECLAMP_OGL. |  |  |                |
|       | <b>Value</b>  | <b>Name</b>  | <b>Description</b>   |                |
|       | 0h  | NONE   | LOD PreClamp disabled  |                |
|       | 1h  | Reserved   |  |                |
|       | 2h  | OGL  | LOD PreClamp enabled (OGL mode)  |                |
| 26:22 | <b>Base Mip Level</b>   |  |  |                |
|       | Project:  | CHV, BSW   |  |                |
|       | Format:   | U4.1   |  |                |
|       | Range: [0.0, 14.0]  |  |  |                |
|       | Specifies which mip level is considered the "base" level when determining mag-vs-min filter and selecting the "base" mip level.   |  |  |                |
| 21:20 | <b>Mip Mode Filter</b>  |  |  |                |
|       | Project:  | All  |  |                |
|       | Format:   | U2 Enumerated Type   |  |                |
|       | This field determines if and how mip map levels are chosen and/or combined when texture filtering.  |  |  |                |
|       | <b>Value</b>  | <b>Name</b>  | <b>Description</b>   | <b>Project</b> |
|       | 0h  | NONE   | Disable mip mapping - force use of the mipmap level corresponding to Min LOD.  | All            |
|       | 1h  | NEAREST  | Nearest, Select the nearest mip map  | All            |
|       | 2h  | Reserved   |  | All            |
|       | 3h  | LINEAR   | Linearly interpolate between nearest mip maps (combined with linear min/mag filters this is analogous to "Trilinear" filtering). | All            |
|       | <b>Programming Notes</b>  |  |  | <b>Project</b> |
|       | MIPFILTER_LINEAR is not supported for surface formats that do not support   |  |  |                |

| <b>SAMPLER_STATE</b> |  |   |   |                |
|----------------------|--|---|---|----------------|
|                      |  | "Sampling Engine Filtering" as indicated in the Surface Formats table unless using the sample_c message type or minimum/maximum operation.  |   |                |
|                      |  | Mip Mode Filter must be set to MIPFILTER_NONE or MIPFILTER_NEAREST if Surface Format for the associated surface is UINT or SINT. However, all settings of this field are allowed with UINT/SINT if a minimum or maximum operation is being performed. | CHV,<br>BSW   |                |
| 19:17                | <b>Mag Mode Filter</b>   |   |   |                |
|                      | Project:   | All   |   |                |
|                      | Format:  | U3 Enumerated Type  |   |                |
|                      | This field determines how texels are sampled/filtered when a texture is being "magnified" (enlarged). For volume maps, this filter mode selection also applies to the 3rd (inter-layer) dimension.   |   |   |                |
|                      | <b>Value</b>   | <b>Name</b>   | <b>Description</b>                                      | <b>Project</b> |
|                      | 0h   | NEAREST   | Sample the nearest texel                                | All            |
|                      | 1h   | LINEAR  | Bilinearly filter the 4 nearest texels                  | All            |
|                      | 2h   | ANISOTROPIC   | Perform an "anisotropic" filter on the chosen mip level | All            |
|                      | 4h-5h  | Reserved  |   | All            |
|                      | 6h   | MONO  | Perform a monochrome convolution filter                 | All            |
|                      | 7h   | Reserved  |   | All            |
|                      | <b>Programming Notes</b>   |   |   | <b>Project</b> |
|                      | Only MAPFILTER_NEAREST and MAPFILTER_LINEAR are supported for surfaces of type SURFTYPE_3D.  |   |   |                |
|                      | Only MAPFILTER_NEAREST is supported for surface formats that do not support "Sampling Engine Filtering" as indicated in the Surface Formats table unless using the sample_c message type or minimum/maximum operation.   |   |   |                |
|                      | MAPFILTER_MONO: Only CLAMP_BORDER texture addressing mode is supported. . Both Mag Mode Filter and Min Mode Filter must be programmed to MAPFILTER_MONO. Mip Mode Filter must be MIPFILTER_NONE. Only valid on surfaces with Surface Format MONO8 and with Surface Type SURFTYPE_2D.   |   |   |                |
|                      | MAPFILTER_ANISOTROPIC may cause artifacts at cube edges if enabled for cube maps with the TEXCOORDMODE_CUBE addressing mode.   |   |   |                |
|                      | MAPFILTER_ANISOTROPIC will be overridden to MAPFILTER_LINEAR when using a sample_l or sample_l_c message type or when Force LOD to Zero is set in the message header.  |   |   |                |
|                      | Both Mag Mode Filter and Min Mode Filter must be set to MAPFILTER_NEAREST if Surface Format for the associated surface is UINT or SINT. However, all settings of this field other than MAPFILTER_MONO are allowed with UINT/SINT if a minimum or maximum operation is being performed. |   |   | CHV,<br>BSW    |
|                      | MAPFILTER_FLEXIBLE might have data corruption when sampled from surface with float32 format with exponent value exceeded 248   |   |   | CHV,<br>BSW    |



| <b>SAMPLER_STATE</b> |   |   |   |
|----------------------|---|---|---|
|                      |   | MAPFILTER_FLEXIBLE operates on float16 or float32 surfaces could have erroneous signed for infinity output i.e. 0x7f800000 <-> 0xff800000   | CHV,<br>BSW   |
|                      |   | MAPFILTER_FLEXIBLE when float16 +/-inf apply to coefficient that are absolutely larger than 1.0 output result could be nan instead of +/-inf MAPFILTER_FLEXIBLE: A Null Tile reference will be reported back even if the associated texel has a coefficient of 0.0. | CHV,<br>BSW   |
| 16:14                | <b>Min Mode Filter</b>  |   |   |
|                      | Project:  | All   |   |
|                      | Format:   | U3 Enumerated Type  |   |
|                      | This field determines how texels are sampled/filtered when a texture is being "minified" (shrunk). For volume maps, this filter mode selection also applies to the 3rd (inter-layer) dimension. See Mag Mode Filter   |   |   |
|                      | <b>Value</b>  | <b>Name</b>   | <b>Description</b>                                      |
|                      | 0h  | NEAREST   | Sample the nearest texel                                |
|                      | 1h  | LINEAR  | Bilinearly filter the 4 nearest texels                  |
|                      | 2h  | ANISOTROPIC   | Perform an "anisotropic" filter on the chosen mip level |
|                      | 4h-5h   | Reserved  |   |
|                      | 6h  | MONO  | Perform a monochrome convolution filter                 |
|                      | 7h  | Reserved  |   |
|                      | <b>Programming Notes</b>  |   | <b>Project</b>  |
|                      | FLEXIBLE: A Null Tile reference will be reported back even if the associated texel has a coefficient of 0.0.  |   | CHV,<br>BSW   |
| 13:1                 | <b>Texture LOD Bias</b>   |   |   |
|                      | Project:  | All   |   |
|                      | Format:   | S4.8 2's complement   |   |
|                      | Range: [-16.0, 16.0)  |   |   |
|                      | This field specifies the signed bias value added to the calculated texture map LOD prior to min-vs-mag determination and mip-level clamping. Assuming mipmapping is enabled, a positive LOD bias will result in a somewhat blurrier image (using less-detailed mip levels) and possibly higher performance, while a negative bias will result in a somewhat crisper image (using more-detailed mip levels) and may lower performance. |   |   |
|                      | <b>Programming Notes</b>  |   |   |
|                      | There is no requirement or need to offset the LOD Bias in order to produce a correct LOD for texture filtering (as was required for correct bilinear and anisotropic filtering in some legacy devices).   |   |   |
| 0                    | <b>Anisotropic Algorithm</b>  |   |   |
|                      | Project:  | All   |   |

|       |                   | <b>SAMPLER_STATE</b>  |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|-------|-------------------|---|--|------|-------------|---------|----|--------|--|-----|----|-------------------|---|-----|--|
|       |                   | Format:   | U1 Enumerated Type                                 |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | Controls which algorithm is used for anisotropic filtering. Generally, the EWA approximation algorithm results in higher image quality than the legacy algorithm.   |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>LEGACY</td> <td>Use the legacy algorithm for anisotropic filtering</td> <td>All</td> </tr> <tr> <td>1h</td> <td>EWA Approximation</td> <td>Use the new EWA approximation algorithm for anisotropic filtering</td> <td>All</td> </tr> </tbody> </table>   | Value  | Name | Description | Project | 0h | LEGACY | Use the legacy algorithm for anisotropic filtering | All | 1h | EWA Approximation | Use the new EWA approximation algorithm for anisotropic filtering | All |  |
| Value | Name              | Description   | Project  |      |             |         |    |        |  |     |    |                   |   |     |  |
| 0h    | LEGACY            | Use the legacy algorithm for anisotropic filtering  | All  |      |             |         |    |        |  |     |    |                   |   |     |  |
| 1h    | EWA Approximation | Use the new EWA approximation algorithm for anisotropic filtering   | All  |      |             |         |    |        |  |     |    |                   |   |     |  |
| 1     | 31:20             | <b>Min LOD</b>  |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | Project:  | All  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | Format:   | U4.8 in LOD units                                  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | <p>Range: [0.0, 14.0], where the upper limit is also bounded by the Max LOD.</p> <p>This field specifies the minimum value used to clamp the computed LOD after LOD bias is applied. Note that the minification-vs.-magnification status is determined after LOD bias and before this maximum (resolution) mip clamping is applied. The integer bits of this field are used to control the "maximum" (highest resolution) mipmap level that may be accessed (where LOD 0 is the highest resolution map). The fractional bits of this value effectively clamp the inter-level trilinear blend factor when trilinear filtering is in use.</p>   |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | <b>Programming Notes</b>  |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | If Min LOD is greater than Max LOD, Min LOD takes precedence, i.e. the resulting LOD will always be Min LOD.  |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | This field must be zero if the Min or Mag Mode Filter is set to MAPFILTER_MONO  |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       | 19:8              | <b>Max LOD</b>  |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | Project:  | All  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | Format:   | U4.8 in LOD units                                  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | <p>Range: [0.0, 14.0]</p> <p>This field specifies the maximum value used to clamp the computed LOD after LOD bias is applied. Note that the minification-vs.-magnification status is determined after LOD bias and before this minimum (resolution) mip clamping is applied. The integer bits of this field are used to control the "minimum" (lowest resolution) mipmap level that may be accessed. The fractional bits of this value effectively clamp the inter-level trilinear blend factor when trilinear filtering is in use. Force the mip map access to be between the mipmap specified by the integer bits of the Min LOD and the ceiling of the value specified here.</p> |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       | 7                 | <b>ChromaKey Enable</b>   |  |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | Project:  | CHV, BSW   |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | Format:   | Enable This field enables the chroma key function. |      |             |         |    |        |  |     |    |                   |   |     |  |
|       |                   | <b>Programming Notes</b>  |  |      |             |         |    |        |  |     |    |                   |   |     |  |

## SAMPLER\_STATE

|          |                             | Supported only on a specific subset of surface formats. See section titled: "Surface Formats" in this volume for supported formats. This field must be disabled if min or mag filter is MAPFILTER_MONO or MAPFILTER_ANISOTROPIC. This field must be disabled if used with a surface of type SURFTYPE_3D.  |          |          |         |                    |       |      |             |    |                             |   |    |                         |  |
|----------|-----------------------------|---|----------|----------|---------|--------------------|-------|------|-------------|----|-----------------------------|---|----|-------------------------|--|
| 6:5      | <b>ChromaKey Index</b>      | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U2</td> </tr> </table> <p>Range: [0, 3]</p> <p>This field specifies the index of the ChromaKey Table entry associated with this Sampler. This field is a "don't care" unless <b>ChromaKey Enable</b> is ENABLED.</p>  | Project: | CHV, BSW | Format: | U2                 |       |      |             |    |                             |   |    |                         |  |
| Project: | CHV, BSW                    |   |          |          |         |                    |       |      |             |    |                             |   |    |                         |  |
| Format:  | U2                          |   |          |          |         |                    |       |      |             |    |                             |   |    |                         |  |
| 4        | <b>ChromaKey Mode</b>       | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U1 Enumerated Type</td> </tr> </table> <p>This field specifies the behavior of the device in the event of a ChromaKey match. This field is ignored if ChromaKey is disabled.</p> <p>KEYFILTER_REPLACE_BLACK: In this mode, each texel that matches the chroma key is replaced with (0,0,0,0) (black with alpha=0) prior to filtering. This will tend to darken/fade edges of keyed regions. Note that the pixel pipeline must be programmed to use the resulting filtered texel value to gain the intended effect, e.g., handle the case of a totally keyed-out region (filtered texel alpha=0) through use of alpha test, etc.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 35%;">Name</th> <th style="width: 50%;">Description</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>KEYFILTER_KILL_ON_ANY_MATCH</td> <td>In this mode, if any contributing texel matches the chroma key, the corresponding pixel mask bit for that pixel is cleared. The result of this operation is observable only if the Killed Pixel Mask Return flag is set on the input message.</td> </tr> <tr> <td>1h</td> <td>KEYFILTER_REPLACE_BLACK</td> <td>In this mode, each texel that matches the chroma key is replaced with (0,0,0,0) (black with alpha=0) prior to filtering. For YCrCb surface formats, the black value is A=0, R(Cr)=0x80, G(Y)=0x10, B(Cb)=0x80. This will tend to darken/fade edges of keyed regions. Note that the pixel pipeline must be programmed to use the resulting filtered texel value to gain the intended effect, e.g., handle the case of a totally keyed-out region (filtered texel alpha=0) through use of alpha test, etc.</td> </tr> </tbody> </table> | Project: | CHV, BSW | Format: | U1 Enumerated Type | Value | Name | Description | 0h | KEYFILTER_KILL_ON_ANY_MATCH | In this mode, if any contributing texel matches the chroma key, the corresponding pixel mask bit for that pixel is cleared. The result of this operation is observable only if the Killed Pixel Mask Return flag is set on the input message. | 1h | KEYFILTER_REPLACE_BLACK | In this mode, each texel that matches the chroma key is replaced with (0,0,0,0) (black with alpha=0) prior to filtering. For YCrCb surface formats, the black value is A=0, R(Cr)=0x80, G(Y)=0x10, B(Cb)=0x80. This will tend to darken/fade edges of keyed regions. Note that the pixel pipeline must be programmed to use the resulting filtered texel value to gain the intended effect, e.g., handle the case of a totally keyed-out region (filtered texel alpha=0) through use of alpha test, etc. |
| Project: | CHV, BSW                    |   |          |          |         |                    |       |      |             |    |                             |   |    |                         |  |
| Format:  | U1 Enumerated Type          |   |          |          |         |                    |       |      |             |    |                             |   |    |                         |  |
| Value    | Name                        | Description   |          |          |         |                    |       |      |             |    |                             |   |    |                         |  |
| 0h       | KEYFILTER_KILL_ON_ANY_MATCH | In this mode, if any contributing texel matches the chroma key, the corresponding pixel mask bit for that pixel is cleared. The result of this operation is observable only if the Killed Pixel Mask Return flag is set on the input message.   |          |          |         |                    |       |      |             |    |                             |   |    |                         |  |
| 1h       | KEYFILTER_REPLACE_BLACK     | In this mode, each texel that matches the chroma key is replaced with (0,0,0,0) (black with alpha=0) prior to filtering. For YCrCb surface formats, the black value is A=0, R(Cr)=0x80, G(Y)=0x10, B(Cb)=0x80. This will tend to darken/fade edges of keyed regions. Note that the pixel pipeline must be programmed to use the resulting filtered texel value to gain the intended effect, e.g., handle the case of a totally keyed-out region (filtered texel alpha=0) through use of alpha test, etc.  |          |          |         |                    |       |      |             |    |                             |   |    |                         |  |
| 3:1      | <b>Shadow Function</b>      | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> </table>   | Project: | All      |         |                    |       |      |             |    |                             |   |    |                         |  |
| Project: | All                         |   |          |          |         |                    |       |      |             |    |                             |   |    |                         |  |

| <b>SAMPLER_STATE</b> |                      |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
|----------------------|----------------------|---|----------|--------------------|---------|--------------------|-------|--------------------|---------|-------------------|------------|------------------|----|-------------------|-----|--------------------|----|---------------------|----|----------------------|----|--------------------|
|                      |                      | <table border="1"> <tr> <td>Format:</td> <td>U3 Enumerated Type</td> </tr> </table> <p>This field is used for shadow mapping support via the sample_c message type, and specifies the specific comparison operation to be used. The comparison is between the texture sample red channel (except for alpha-only formats which use the alpha channel), and the "ref" value provided in the input message.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr><td>0h</td><td>PREFILTEROP ALWAYS</td></tr> <tr><td>1h</td><td>PREFILTEROP NEVER</td></tr> <tr><td>2h</td><td>PREFILTEROP LESS</td></tr> <tr><td>3h</td><td>PREFILTEROP EQUAL</td></tr> <tr><td>4h</td><td>PREFILTEROP LEQUAL</td></tr> <tr><td>5h</td><td>PREFILTEROP GREATER</td></tr> <tr><td>6h</td><td>PREFILTEROP NOTEQUAL</td></tr> <tr><td>7h</td><td>PREFILTEROP GEQUAL</td></tr> </tbody> </table> | Format:  | U3 Enumerated Type | Value   | Name               | 0h    | PREFILTEROP ALWAYS | 1h      | PREFILTEROP NEVER | 2h         | PREFILTEROP LESS | 3h | PREFILTEROP EQUAL | 4h  | PREFILTEROP LEQUAL | 5h | PREFILTEROP GREATER | 6h | PREFILTEROP NOTEQUAL | 7h | PREFILTEROP GEQUAL |
| Format:              | U3 Enumerated Type   |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| Value                | Name                 |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 0h                   | PREFILTEROP ALWAYS   |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 1h                   | PREFILTEROP NEVER    |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 2h                   | PREFILTEROP LESS     |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 3h                   | PREFILTEROP EQUAL    |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 4h                   | PREFILTEROP LEQUAL   |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 5h                   | PREFILTEROP GREATER  |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 6h                   | PREFILTEROP NOTEQUAL |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 7h                   | PREFILTEROP GEQUAL   |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
|                      | 0                    | <p><b>Cube Surface Control Mode</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U1 Enumerated Type</td> </tr> </table> <p>When sampling from a SURFTYPE_CUBE surface, this field controls whether the TC* Address Control Mode fields are interpreted as programmed or overridden to TEXCOORDMODE_CUBE.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Project</th> </tr> </thead> <tbody> <tr><td>0h</td><td>PROGRAMMED</td><td>All</td></tr> <tr><td>1h</td><td>OVERRIDE</td><td>All</td></tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>This field must be set to CUBECTRLMODE_PROGRAMMED</p>  | Project: | All                | Format: | U1 Enumerated Type | Value | Name               | Project | 0h                | PROGRAMMED | All              | 1h | OVERRIDE          | All |                    |    |                     |    |                      |    |                    |
| Project:             | All                  |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| Format:              | U1 Enumerated Type   |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| Value                | Name                 | Project   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 0h                   | PROGRAMMED           | All   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 1h                   | OVERRIDE             | All   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| 2                    | 31:30                | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project: | CHV, BSW           |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| Project:             | CHV, BSW             |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
|                      | 29:28                | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project: | CHV, BSW           |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| Project:             | CHV, BSW             |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
|                      | 27:26                | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project: | CHV, BSW           |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| Project:             | CHV, BSW             |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
|                      | 31:24                | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project: | CHV, BSW           |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| Project:             | CHV, BSW             |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
|                      | 25:24                | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project: | CHV, BSW           |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| Project:             | CHV, BSW             |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
|                      | 23:6                 | <p><b>Indirect State Pointer</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> </table>   | Project: | CHV, BSW           |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |
| Project:             | CHV, BSW             |   |          |                    |         |                    |       |                    |         |                   |            |                  |    |                   |     |                    |    |                     |    |                      |    |                    |

| <b>SAMPLER_STATE</b> |              |  |                    |  |                |
|----------------------|--------------|--|--------------------|--|----------------|
|                      |              | <b>Description</b>   |                    | <b>Project</b>   |                |
|                      |              | This pointer is relative to the Dynamic State Base Address.  |                    | CHV, BSW   |                |
|                      | 5            | <b>Reserved</b>  |                    |  |                |
|                      |              | Project:   | CHV, BSW           |  |                |
|                      |              | Format:  | MBZ                |  |                |
|                      | 4            | <b>Reserved</b>  |                    |  |                |
|                      |              | Project:   | CHV, BSW           |  |                |
|                      | 3            | <b>Reserved</b>  |                    |  |                |
|                      |              | Project:   | CHV, BSW           |  |                |
|                      | 2            | <b>Reserved</b>  |                    |  |                |
|                      |              | Project:   | CHV, BSW           |  |                |
|                      | 1            | <b>Reserved</b>  |                    |  |                |
|                      |              | Project:   | CHV, BSW           |  |                |
|                      | 0            | <b>LOD Clamp Magnification Mode</b>  |                    |  |                |
|                      |              | Project:   | CHV, BSW           |  |                |
|                      |              | Format:  | U1 Enumerated Type |  |                |
|                      |              | This field allows the flexibility to control how LOD clamping is handled when in magnification mode.                           |                    |  |                |
|                      |              | <b>Value</b>   | <b>Name</b>        | <b>Description</b>   | <b>Project</b> |
|                      |              | 0h   | MIPNONE            | When in magnification mode, Sampler will clamp LOD as if the <b>Mip Mode Filter</b> is MIPFILTER_NONE. This is how OpenGL defines magnification, and therefore it is expected that those drivers would not set this bit. | All            |
|                      |              | 1h   | MIPFILTER          | When in magnification mode, Sampler will clamp LOD based on the value of <b>Mip Mode Filter</b> .  | All            |
| 3                    | 31:24        | <b>Reserved</b>  |                    |  |                |
|                      |              | Project:   | CHV, BSW           |  |                |
|                      | 23:22        | <b>Reserved</b>  |                    |  |                |
|                      |              | Project:   | CHV, BSW           |  |                |
|                      |              | Format:  | MBZ                |  |                |
|                      | 21:19        | <b>Maximum Anisotropy</b>  |                    |  |                |
|                      |              | Project:   | All                |  |                |
|                      |              | Format:  | U3 Enumerated Type |  |                |
|                      |              | This field clamps the maximum value of the anisotropy ratio used by the MAPFILTER_ANISOTROPIC filter (Min or Mag Mode Filter). |                    |  |                |
|                      | <b>Value</b> | <b>Name</b>  | <b>Description</b> | <b>Project</b>   |                |

| <b>SAMPLER_STATE</b> |  |            |  |                |
|----------------------|--|------------|--|----------------|
|                      | 0h   | RATIO 2:1  | At most a 2:1 aspect ratio filter is used  | All            |
|                      | 1h   | RATIO 4:1  | At most a 4:1 aspect ratio filter is used  | All            |
|                      | 2h   | RATIO 6:1  | At most a 6:1 aspect ratio filter is used  | All            |
|                      | 3h   | RATIO 8:1  | At most a 8:1 aspect ratio filter is used  | All            |
|                      | 4h   | RATIO 10:1 | At most a 10:1 aspect ratio filter is used | All            |
|                      | 5h   | RATIO 12:1 | At most a 12:1 aspect ratio filter is used | All            |
|                      | 6h   | RATIO 14:1 | At most a 14:1 aspect ratio filter is used | All            |
|                      | 7h   | RATIO 16:1 | At most a 16:1 aspect ratio filter is used | All            |
| 18                   | <b>U Address Mag Filter Rounding Enable</b>  |            |  |                |
|                      | Project:   | All        |  |                |
|                      | Format:  | Enable     |  |                |
|                      | Controls whether the texture address is rounded or truncated before being used to select texels to sample. Provides independent control of rounding on one texture address dimension (U/V/R) in either mag or min filter mode. |            |  |                |
|                      | <b>Programming Notes</b>   |            |  | <b>Project</b> |
|                      | Hardware will <b>not</b> force rounding enable.  |            |  | CHV, BSW       |
| 17                   | <b>U Address Min Filter Rounding Enable</b>  |            |  |                |
|                      | Project:   | All        |  |                |
|                      | Format:  | Enable     |  |                |
|                      | Controls whether the texture address is rounded or truncated before being used to select texels to sample. Provides independent control of rounding on one texture address dimension (U/V/R) in either mag or min filter mode. |            |  |                |
|                      | <b>Programming Notes</b>   |            |  | <b>Project</b> |
|                      | Hardware will <b>not</b> force rounding enable.  |            |  | CHV, BSW       |
| 16                   | <b>V Address Mag Filter Rounding Enable</b>  |            |  |                |
|                      | Project:   | All        |  |                |
|                      | Format:  | Enable     |  |                |
|                      | Controls whether the texture address is rounded or truncated before being used to select texels to sample. Provides independent control of rounding on one texture address dimension (U/V/R) in either mag or min filter mode. |            |  |                |
|                      | <b>Programming Notes</b>   |            |  | <b>Project</b> |
|                      | Hardware will <b>not</b> force rounding enable.  |            |  | CHV, BSW       |
| 15                   | <b>V Address Min Filter Rounding Enable</b>  |            |  |                |
|                      | Project:   | All        |  |                |
|                      | Format:  | Enable     |  |                |
|                      | Controls whether the texture address is rounded or truncated before being used to select texels to sample. Provides independent control of rounding on one texture address dimension (U/V/R) in either mag or min filter mode. |            |  |                |

| <b>SAMPLER_STATE</b> |   |   |  |
|----------------------|---|---|--|
|                      |   | <b>Programming Notes</b>                        | <b>Project</b>   |
|                      |   | Hardware will <b>not</b> force rounding enable. | CHV, BSW   |
| 14                   | <b>R Address Mag Filter Rounding Enable</b>   |   |  |
|                      | Project:  | All   |  |
|                      | Format:   | Enable  |  |
|                      | Controls whether the texture address is rounded or truncated before being used to select texels to sample. Provides independent control of rounding on one texture address dimension (U/V/R) in either mag or min filter mode.                  |   |  |
|                      |   | <b>Programming Notes</b>                        | <b>Project</b>   |
|                      |   | Hardware will <b>not</b> force rounding enable. | CHV, BSW   |
| 13                   | <b>R Address Min Filter Rounding Enable</b>   |   |  |
|                      | Project:  | All   |  |
|                      | Format:   | Enable  |  |
|                      | Controls whether the texture address is rounded or truncated before being used to select texels to sample. Provides independent control of rounding on one texture address dimension (U/V/R) in either mag or min filter mode.                  |   |  |
|                      |   | <b>Programming Notes</b>                        | <b>Project</b>   |
|                      |   | Hardware will <b>not</b> force rounding enable. | CHV, BSW   |
| 12:11                | <b>Trilinear Filter Quality</b>   |   |  |
|                      | Project:  | All   |  |
|                      | Format:   | U2 Enumerated Type                              |  |
|                      | Selects the quality level for the trilinear filter.   |   |  |
|                      | <b>Value</b>  | <b>Name</b>                                     | <b>Description</b>   |
|                      | 0   | FULL  | Full Quality. Both mip maps are sampled under all circumstances.   |
|                      | 1   | HIGH  | High Quality. Same as full quality.  |
|                      | 2   | MED   | Medium Quality. If the contribution of one mip map is less than 25%, only the other mip map contributes. |
|                      | 3   | LOW   | Low Quality. If the contribution of one mip map is less than 37.5%, only the other mip map contributes.  |
|                      |   |   | <b>Project</b>   |
|                      |   |   | All  |
|                      |   |   | CHV, BSW   |
|                      |   |   | All  |
|                      |   |   | All  |
| 10                   | <b>Non-normalized Coordinate Enable</b>   |   |  |
|                      | Project:  | CHV, BSW  |  |
|                      | Format:   | Enable  |  |
|                      | This field, if enabled, specifies that the input coordinates (U/V/R) are in non-normalized space, where each integer increment is one texel on LOD 0. If disabled, coordinates are normalized, where the range 0 to 1 spans the entire surface. |   |  |
|                      |   | <b>Programming Notes</b>                        |  |
|                      | The following state must be set as indicated if this field is <i>enabled</i> :  |   |  |

| <b>SAMPLER_STATE</b>  |   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
|---|---|----------|----------|---------|--|-------------------|---------|---|----------|---|--|---|--|--|--|
|   | <ul style="list-style-type: none"> <li>• TCX/Y/Z Address Control Mode must be TEXCOORDMODE_CLAMP, TEXCOORDMODE_HALF_BORDER, or TEXCOORDMODE_CLAMP_BORDER.</li> <li>• Surface Type must be SURFTYPE_2D or SURFTYPE_3D.</li> <li>• Mag Mode Filter must be MAPFILTER_NEAREST or MAPFILTER_LINEAR.</li> <li>• Min Mode Filter must be MAPFILTER_NEAREST or MAPFILTER_LINEAR.</li> <li>• Mip Mode Filter must be MIPFILTER_NONE.</li> <li>• Min LOD must be 0.</li> <li>• Max LOD must be 0.</li> <li>• MIP Count must be 0.</li> <li>• Surface Min LOD must be 0.</li> <li>• Texture LOD Bias must be 0.</li> </ul>  |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| 9   | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project: | CHV, BSW | Format: | MBZ  |                   |         |   |          |   |  |   |  |  |  |
| Project:  | CHV, BSW  |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| Format:   | MBZ   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| 8:6   | <p><b>TCX Address Control Mode</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Texture Coordinate Mode [CHV, BSW] Enumerated Type</td> </tr> </table> <p>Controls how the 1st (TCX, aka U) component of input texture coordinates are mapped to texture map addresses - specifically, how coordinates "outside" the texture are handled (wrap/clamp/mirror). The setting of this field is subject to being overridden by the Cube Surface Control Mode field when sampling from a SURFTYPE_CUBE surface.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Programming Notes</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>When using cube map texture coordinates, each TC component must have the same Address Control Mode.</td> <td style="text-align: center;">CHV, BSW</td> </tr> <tr> <td>When TEXCOORDMODE_CUBE is not used accessing a cube map, the map's Cube Face Enable field must be programmed to 11111b (all faces enabled).</td> <td></td> </tr> <tr> <td>MAPFILTER_MONO: Texture addressing modes must all be set to TEXCOORDMODE_CLAMP_BORDER. The <b>Border Color</b> is ignored in this mode, a constant value of 0 is used for border color. Software must pad the border texels within the map itself with 0.</td> <td></td> </tr> <tr> <td>If <b>Surface Format</b> is PLANAR*, this field must be set to TEXCOORDMODE_CLAMP.</td> <td></td> </tr> </tbody> </table> | Project: | All      | Format: | Texture Coordinate Mode [CHV, BSW] Enumerated Type | Programming Notes | Project | When using cube map texture coordinates, each TC component must have the same Address Control Mode. | CHV, BSW | When TEXCOORDMODE_CUBE is not used accessing a cube map, the map's Cube Face Enable field must be programmed to 11111b (all faces enabled). |  | MAPFILTER_MONO: Texture addressing modes must all be set to TEXCOORDMODE_CLAMP_BORDER. The <b>Border Color</b> is ignored in this mode, a constant value of 0 is used for border color. Software must pad the border texels within the map itself with 0. |  | If <b>Surface Format</b> is PLANAR*, this field must be set to TEXCOORDMODE_CLAMP. |  |
| Project:  | All   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| Format:   | Texture Coordinate Mode [CHV, BSW] Enumerated Type  |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| Programming Notes   | Project   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| When using cube map texture coordinates, each TC component must have the same Address Control Mode.   | CHV, BSW  |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| When TEXCOORDMODE_CUBE is not used accessing a cube map, the map's Cube Face Enable field must be programmed to 11111b (all faces enabled).   |   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| MAPFILTER_MONO: Texture addressing modes must all be set to TEXCOORDMODE_CLAMP_BORDER. The <b>Border Color</b> is ignored in this mode, a constant value of 0 is used for border color. Software must pad the border texels within the map itself with 0. |   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| If <b>Surface Format</b> is PLANAR*, this field must be set to TEXCOORDMODE_CLAMP.  |   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| 5:3   | <p><b>TCY Address Control Mode</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Texture Coordinate Mode [CHV, BSW] Enumerated Type</td> </tr> </table> <p>Controls how the 2nd (TCY, aka V) component of input texture coordinates are mapped to texture map addresses - specifically, how coordinates "outside" the texture are handled (wrap/clamp/mirror). See Address TCX Control Mode above for details</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Programming Notes</th> </tr> </thead> <tbody> <tr> <td style="height: 20px;"></td> </tr> </tbody> </table>   | Project: | All      | Format: | Texture Coordinate Mode [CHV, BSW] Enumerated Type | Programming Notes |         |   |          |   |  |   |  |  |  |
| Project:  | All   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| Format:   | Texture Coordinate Mode [CHV, BSW] Enumerated Type  |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
| Programming Notes   |   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |
|   |   |          |          |         |  |                   |         |   |          |   |  |   |  |  |  |



| <b>SAMPLER_STATE</b>   |   |                                 |  |          |     |         |  |             |         |  |  |   |          |
|--|---|---------------------------------|--|----------|-----|---------|--|-------------|---------|--|--|---|----------|
|  | If this field is set to TEXCOORDMODE_CLAMP_BORDER or TEXCOORDMODE_HALF_BORDER and a 1D surface is sampled, incorrect blending with the border color in the vertical direction may occur.  |                                 |  |          |     |         |  |             |         |  |  |   |          |
| 2:0  | <table border="1"> <thead> <tr> <th colspan="2"><b>TCZ Address Control Mode</b></th> </tr> </thead> <tbody> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Texture Coordinate Mode [CHV, BSW] Enumerated Type</td> </tr> <tr> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> <tr> <td>Controls how the 3rd (TCZ) component of input texture coordinates are mapped to texture map addresses - specifically, how coordinates "outside" the texture are handled (wrap/clamp/mirror).See Address TCX Control Mode above for details</td> <td></td> </tr> <tr> <td>If this field is set to TEXCOORDMODE_CLAMP_BORDER or TEXCOORDMODE_HALF_BORDER and a 3D surface is sampled, incorrect blending with the border color in the Q direction may occur.</td> <td>CHV, BSW</td> </tr> </tbody> </table> | <b>TCZ Address Control Mode</b> |  | Project: | All | Format: | Texture Coordinate Mode [CHV, BSW] Enumerated Type | Description | Project | Controls how the 3rd (TCZ) component of input texture coordinates are mapped to texture map addresses - specifically, how coordinates "outside" the texture are handled (wrap/clamp/mirror).See Address TCX Control Mode above for details |  | If this field is set to TEXCOORDMODE_CLAMP_BORDER or TEXCOORDMODE_HALF_BORDER and a 3D surface is sampled, incorrect blending with the border color in the Q direction may occur. | CHV, BSW |
| <b>TCZ Address Control Mode</b>  |   |                                 |  |          |     |         |  |             |         |  |  |   |          |
| Project:   | All   |                                 |  |          |     |         |  |             |         |  |  |   |          |
| Format:  | Texture Coordinate Mode [CHV, BSW] Enumerated Type  |                                 |  |          |     |         |  |             |         |  |  |   |          |
| Description  | Project   |                                 |  |          |     |         |  |             |         |  |  |   |          |
| Controls how the 3rd (TCZ) component of input texture coordinates are mapped to texture map addresses - specifically, how coordinates "outside" the texture are handled (wrap/clamp/mirror).See Address TCX Control Mode above for details |   |                                 |  |          |     |         |  |             |         |  |  |   |          |
| If this field is set to TEXCOORDMODE_CLAMP_BORDER or TEXCOORDMODE_HALF_BORDER and a 3D surface is sampled, incorrect blending with the border color in the Q direction may occur.  | CHV, BSW  |                                 |  |          |     |         |  |             |         |  |  |   |          |

## SCISSOR\_RECT

| SCISSOR_RECT  |  |  |          |         |  |  |       |         |           |           |          |          |
|---|--|--|----------|---------|--|--|-------|---------|-----------|-----------|----------|----------|
| Project:  | CHV, BSW   |  |          |         |  |  |       |         |           |           |          |          |
| Source:   | RenderCS   |  |          |         |  |  |       |         |           |           |          |          |
| Size (in bits):   | 64   |  |          |         |  |  |       |         |           |           |          |          |
| Default Value:  | 0x00000000, 0x00000000   |  |          |         |  |  |       |         |           |           |          |          |
| <p>The viewport-specific state used by the SF unit (SCISSOR_RECT) is stored as an array of up to 16 elements, each of which contains the DWords described below. The start of each element is spaced 2 DWords apart. The location of first element of the array, as specified by Pointer to SCISSOR_RECT, is aligned to a 32-byte boundary.</p> |  |  |          |         |  |  |       |         |           |           |          |          |
| DWord   | Bit  | Description  |          |         |  |  |       |         |           |           |          |          |
| 0   | 31:16  | <p><b>Scissor Rectangle Y Min</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16 Pixels from Drawing Rectangle origin (upper left corner)</td> </tr> </table> <p>Specifies Y Min coordinate of (inclusive) Scissor Rectangle used for scissor test. Pixels with (Draw Rectangle-relative) Y coordinates less than Y Min will be clipped out if Scissor Rectangle is enabled. NOTE: If Y Min is set to a value greater than Y Max, all primitives will be discarded for this viewport.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>[0,16383]</td> <td></td> <td>CHV, BSW</td> </tr> </tbody> </table> | Project: | All     | Format:  | U16 Pixels from Drawing Rectangle origin (upper left corner) | Value | Name    | Project   | [0,16383] |          | CHV, BSW |
|   | Project:   | All  |          |         |  |  |       |         |           |           |          |          |
| Format:   | U16 Pixels from Drawing Rectangle origin (upper left corner)   |  |          |         |  |  |       |         |           |           |          |          |
| Value   | Name   | Project  |          |         |  |  |       |         |           |           |          |          |
| [0,16383]   |  | CHV, BSW   |          |         |  |  |       |         |           |           |          |          |
| 15:0  | <p><b>Scissor Rectangle X Min</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16 Pixels from Drawing Rectangle origin (upper left corner)</td> </tr> </table> <p>Specifies X Min coordinate of (inclusive) Scissor Rectangle used for scissor test. Pixels with (Draw Rectangle-relative) X coordinates less than X Min will be clipped out if Scissor Rectangle is enabled. NOTE: If X Min is set to a value greater than X Max, all primitives will be discarded for this viewport.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>[0,16383]</td> <td></td> <td>CHV, BSW</td> </tr> </tbody> </table> | Project:   | All      | Format: | U16 Pixels from Drawing Rectangle origin (upper left corner) | Value  | Name  | Project | [0,16383] |           | CHV, BSW |          |
| Project:  | All  |  |          |         |  |  |       |         |           |           |          |          |
| Format:   | U16 Pixels from Drawing Rectangle origin (upper left corner)   |  |          |         |  |  |       |         |           |           |          |          |
| Value   | Name   | Project  |          |         |  |  |       |         |           |           |          |          |
| [0,16383]   |  | CHV, BSW   |          |         |  |  |       |         |           |           |          |          |
| 1   | 31:16  | <p><b>Scissor Rectangle Y Max</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16 Pixels from Drawing Rectangle origin (upper left corner)</td> </tr> </table> <p>Specifies Y Max coordinate of (inclusive) Scissor Rectangle used for scissor test. Pixels with (Draw Rectangle-relative) Y coordinates greater than Y Max will be clipped out if Scissor Rectangle is enabled.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>[0,16383]</td> <td></td> <td>CHV, BSW</td> </tr> </tbody> </table>   | Project: | All     | Format:  | U16 Pixels from Drawing Rectangle origin (upper left corner) | Value | Name    | Project   | [0,16383] |          | CHV, BSW |
|   | Project:   | All  |          |         |  |  |       |         |           |           |          |          |
| Format:   | U16 Pixels from Drawing Rectangle origin (upper left corner)   |  |          |         |  |  |       |         |           |           |          |          |
| Value   | Name   | Project  |          |         |  |  |       |         |           |           |          |          |
| [0,16383]   |  | CHV, BSW   |          |         |  |  |       |         |           |           |          |          |
| 15:0  | <p><b>Scissor Rectangle X Max</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> </table>  | Project:   | All      |         |  |  |       |         |           |           |          |          |
| Project:  | All  |  |          |         |  |  |       |         |           |           |          |          |

| <b>SCISSOR_RECT</b> |  |  |
|---------------------|--|--|
|                     | Format:  | U16 Pixels from Drawing Rectangle origin (upper left corner) |
|                     | Specifies X Max coordinate of (inclusive) Scissor Rectangle used for scissor test. Pixels with (Draw Rectangle-relative) Y coordinates greater than X Max will be clipped out if Scissor Rectangle is enabled. |  |
|                     | <b>Value</b>   | <b>Name</b>  |
|                     | 0-16383  | CHV, BSW   |

## Scratch Hword Block Message Header

| <b>MH_A32_HWB - Scratch Hword Block Message Header</b> |   |   |
|--|---|---|
| Project:   | CHV, BSW  |   |
| Source:  | DataPort 0  |   |
| Size (in bits):  | 256   |   |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |   |
| DWord  | Bit   | Description   |
| 0-2  | 95:0  | <b>Reserved</b>   |
|  |   | Project: All  |
|  |   | Format: Ignore  |
|  |   | Ignored   |
| 3  | 31:0  | <b>Per Thread Scratch Space</b>   |
|  |   | Project: All  |
|  |   | Format: MHC_PTSS [CHV, BSW]   |
|  |   | Specifies amount of scratch space used by this thread, for Stateless bounds checking. |
| 4  | 31:0  | <b>Reserved</b>   |
|  |   | Project: All  |
|  |   | Format: Ignore  |
|  |   | Ignored   |
| 5  | 31:0  | <b>Buffer Base Address</b>  |
|  |   | Project: All  |
|  |   | Format: MHC_A32_BBA [CHV, BSW]  |
|  |   | Specifies the surface address offset page [31:10] for A32 stateless messages.         |
| 6-7  | 63:0  | <b>Reserved</b>   |
|  |   | Project: All  |
|  |   | Format: Ignore  |
|  |   | Ignored   |

## SF\_CLIP\_VIEWPORT

| <b>SF_CLIP_VIEWPORT</b> |  |  |                |
|-------------------------|--|--|----------------|
| Project:                | CHV, BSW   |  |                |
| Source:                 | RenderCS   |  |                |
| Size (in bits):         | 512  |  |                |
| Default Value:          | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |                |
| DWord                   | Bit  | Description  |                |
| 0                       | 31:0   | <b>Viewport Matrix Element m00</b>   |                |
|                         |  | Format: IEEE_Float   |                |
| 1                       | 31:0   | <b>Viewport Matrix Element m11</b>   |                |
|                         |  | Format: IEEE_Float   |                |
| 2                       | 31:0   | <b>Viewport Matrix Element m22</b>   |                |
|                         |  | Format: IEEE_Float   |                |
| 3                       | 31:0   | <b>Viewport Matrix Element m30</b>   |                |
|                         |  | Format: IEEE_Float   |                |
| 4                       | 31:0   | <b>Viewport Matrix Element m31</b>   |                |
|                         |  | Format: IEEE_Float   |                |
| 5                       | 31:0   | <b>Viewport Matrix Element m32</b>   |                |
|                         |  | Format: IEEE_Float   |                |
| 6                       | 31:0   | <b>Reserved</b>  |                |
|                         |  | Format: MBZ  |                |
| 7                       | 31:0   | <b>Reserved</b>  |                |
|                         |  | Format: MBZ  |                |
| 8                       | 31:0   | <b>X Min Clip Guardband</b>  |                |
|                         |  | Format: IEEE_Float   |                |
|                         |  | . This 32-bit float represents the XMin guardband boundary (normalized to Viewport.XMin == -1.0f). This corresponds to the left boundary of the NDC guardband. |                |
|                         |  | <b>Workaround</b>  | <b>Project</b> |
|                         |  | Minimum allowed value for this field is -16384.  |                |
|                         |  | CHV, BSW   |                |
| 9                       | 31:0   | <b>X Max Clip Guardband</b>  |                |
|                         |  | Format: IEEE_Float   |                |
|                         |  | This 32-bit float represents the XMax guardband boundary (normalized to Viewport.XMax == 1.0f). This corresponds to the right boundary of the NDC guardband.   |                |
|                         |  | <b>Workaround</b>  | <b>Project</b> |
|                         |  |  |                |

| <b>SF_CLIP_VIEWPORT</b>        |                |   |          |            |                   |                |
|--------------------------------|----------------|---|----------|------------|-------------------|----------------|
|                                |                | Maximum allowed value for this field is 16383. <span style="float: right;">CHV, BSW</span>  |          |            |                   |                |
| 10                             | 31:0           | <p><b>Y Min Clip Guardband</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This 32-bit float represents the YMin guardband boundary (normalized to Viewport.YMin == -1.0f). This corresponds to the bottom boundary of the NDC guardband.</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="background-color: #e6f2ff;"><b>Workaround</b></td> <td style="background-color: #e6f2ff;"><b>Project</b></td> </tr> </table> <p>Minimum allowed value for this field is -16384. <span style="float: right;">CHV, BSW</span></p> | Format:  | IEEE_Float | <b>Workaround</b> | <b>Project</b> |
| Format:                        | IEEE_Float     |   |          |            |                   |                |
| <b>Workaround</b>              | <b>Project</b> |   |          |            |                   |                |
| 11                             | 31:0           | <p><b>Y Max Clip Guardband</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This 32-bit float represents the YMax guardband boundary (normalized to Viewport.YMax == 1.0f). This corresponds to the top boundary of the NDC guardband.</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td style="background-color: #e6f2ff;"><b>Workaround</b></td> <td style="background-color: #e6f2ff;"><b>Project</b></td> </tr> </table> <p>Maximum allowed value for this field is 16383. <span style="float: right;">CHV, BSW</span></p>      | Format:  | IEEE_Float | <b>Workaround</b> | <b>Project</b> |
| Format:                        | IEEE_Float     |   |          |            |                   |                |
| <b>Workaround</b>              | <b>Project</b> |   |          |            |                   |                |
| 12<br><b>Project:</b> CHV, BSW | 31:0           | <p><b>X Min ViewPort</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This 32-bit float represents the Viewport.XMin.<br/>This is the X min of the viewport extents as programmed by API, and this value should be programmed in Screen Space coordinate and not as normalized coordinate.</p>  | Project: | CHV, BSW   | Format:           | IEEE_Float     |
| Project:                       | CHV, BSW       |   |          |            |                   |                |
| Format:                        | IEEE_Float     |   |          |            |                   |                |
| 13<br><b>Project:</b> CHV, BSW | 31:0           | <p><b>X Max ViewPort</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This 32-bit float represents the Viewport.XMax.<br/>This is the X max of the viewport extents as programmed by API, and this value should be programmed in Screen Space coordinate and not as normalized coordinate.</p>  | Project: | CHV, BSW   | Format:           | IEEE_Float     |
| Project:                       | CHV, BSW       |   |          |            |                   |                |
| Format:                        | IEEE_Float     |   |          |            |                   |                |
| 14<br><b>Project:</b> CHV, BSW | 31:0           | <p><b>Y Min ViewPort</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table> <p>This 32-bit float represents the Viewport.YMin.<br/>This is the Y min of the viewport extents as programmed by API, and this value should be programmed in Screen Space coordinate and not as normalized coordinate.</p>  | Project: | CHV, BSW   | Format:           | IEEE_Float     |
| Project:                       | CHV, BSW       |   |          |            |                   |                |
| Format:                        | IEEE_Float     |   |          |            |                   |                |
| 15<br><b>Project:</b> CHV, BSW | 31:0           | <p><b>Y Max ViewPort</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>IEEE_Float</td> </tr> </table>  | Project: | CHV, BSW   | Format:           | IEEE_Float     |
| Project:                       | CHV, BSW       |   |          |            |                   |                |
| Format:                        | IEEE_Float     |   |          |            |                   |                |

## SF\_CLIP\_VIEWPORT

|  |  |  |
|--|--|--|
|  |  | This 32-bit float represents the Viewport.Ymax.  |
|  |  | This is the Y max of the viewport extents as programmed by API, and this value should be programmed in Screen Space coordinate and not as normalized coordinate. |

## SF\_OUTPUT\_ATTRIBUTE\_DETAIL

| <b>SF_OUTPUT_ATTRIBUTE_DETAIL</b> |   |  |          |         |                    |
|-----------------------------------|---|--|----------|---------|--------------------|
| Source:                           | RenderCS  |  |          |         |                    |
| Size (in bits):                   | 16  |  |          |         |                    |
| Default Value:                    | 0x00000000  |  |          |         |                    |
| DWord                             | Bit   | Description  |          |         |                    |
| 0                                 | 15  | <p><b>Component Override W</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>Enable</td> </tr> </table> <p>If set, the W component of this output Attribute is overridden by the W component of the constant vector specified by ConstantSource.</p> | Format:  | Enable  |                    |
|                                   | Format:   | Enable   |          |         |                    |
|                                   | 14  | <p><b>Component Override Z</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>Enable</td> </tr> </table> <p>If set, the Z component of this output Attribute is overridden by the Z component of the constant vector specified by ConstantSource.</p> | Format:  | Enable  |                    |
|                                   | Format:   | Enable   |          |         |                    |
|                                   | 13  | <p><b>Component Override Y</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>Enable</td> </tr> </table> <p>If set, the Y component of output Attribute is overridden by the Y component of the constant vector specified by ConstantSource.</p>      | Format:  | Enable  |                    |
| Format:                           | Enable  |  |          |         |                    |
| 12                                | <p><b>Component Override X</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>Enable</td> </tr> </table> <p>If set, the X component of output Attribute is overridden by the X component of the constant vector specified by ConstantSource.</p>   | Format:  | Enable   |         |                    |
| Format:                           | Enable  |  |          |         |                    |
| 11                                | <p><b>Swizzle Control Mode</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>U1 Enumerated Type</td> </tr> </table> <p>When Attribute Swizzle Enable is ENABLED, this bit controls whether attributes 0-15 or 16-31 are subject to the following swizzle controls:</p> <ul style="list-style-type: none"> <li>• Component Override X/Y/Z/W</li> <li>• Constant Source</li> <li>• Swizzle Select</li> <li>• Source Attribute</li> <li>• WrapShortest Enables</li> </ul> <p>Note that the Number of SF Output Attributes field specifies how many attributes are output.<br/>           Note: This field does not impact any functions which provide separate states for all 32 attributes (e.g., Point sprite, Constant interpolation).</p> | Project:   | CHV, BSW | Format: | U1 Enumerated Type |
| Project:                          | CHV, BSW  |  |          |         |                    |
| Format:                           | U1 Enumerated Type  |  |          |         |                    |



| <b>SF_OUTPUT_ATTRIBUTE_DETAIL</b> |   |  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
|-----------------------------------|---|--|---------|--------------------|-------|------|-------------|----|------------|--|----|------------------|--|----|------------------|---|----|--------------------|--|
|                                   | <p>Note: This field is only valid for the first indexed attribute (Attribute[0]). For all other indices, it is Reserved and MBZ.</p>  |  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 10:9                              | <p><b>Constant Source</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>U2 enumerated type</td> </tr> </table> <p>This state selects a constant vector which can be used to override individual components of this Attribute</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 35%;">Name</th> <th style="width: 50%;">Description</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>CONST_0000</td> <td>Constant.xyzw = 0.0,0.0,0.0,0.0</td> </tr> <tr> <td>1h</td> <td>CONST_0001_FLOAT</td> <td>Constant.xyzw = 0.0,0.0,0.0,1.0</td> </tr> <tr> <td>2h</td> <td>CONST_1111_FLOAT</td> <td>Constant.xyzw = 1.0,1.0,1.0,1.0</td> </tr> <tr> <td>3h</td> <td>PRIM_ID</td> <td>Constant.xyzw = PrimID (replicated)</td> </tr> </tbody> </table>  |  | Format: | U2 enumerated type | Value | Name | Description | 0h | CONST_0000 | Constant.xyzw = 0.0,0.0,0.0,0.0                              | 1h | CONST_0001_FLOAT | Constant.xyzw = 0.0,0.0,0.0,1.0  | 2h | CONST_1111_FLOAT | Constant.xyzw = 1.0,1.0,1.0,1.0   | 3h | PRIM_ID            | Constant.xyzw = PrimID (replicated)  |
| Format:                           | U2 enumerated type  |  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| Value                             | Name  | Description  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 0h                                | CONST_0000  | Constant.xyzw = 0.0,0.0,0.0,0.0  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 1h                                | CONST_0001_FLOAT  | Constant.xyzw = 0.0,0.0,0.0,1.0  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 2h                                | CONST_1111_FLOAT  | Constant.xyzw = 1.0,1.0,1.0,1.0  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 3h                                | PRIM_ID   | Constant.xyzw = PrimID (replicated)  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 8                                 | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td>MBZ</td> </tr> </table>  |  | Format: | MBZ                |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| Format:                           | MBZ   |  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 7:6                               | <p><b>Swizzle Select</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>U2 enumerated type</td> </tr> </table> <p>This state, along with Source Attribute, specifies the source for this output Attribute.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 35%;">Name</th> <th style="width: 50%;">Description</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td>INPUTATTR</td> <td>This attribute is sourced from AttrInputReg[SourceAttribute]</td> </tr> <tr> <td>1h</td> <td>INPUTATTR_FACING</td> <td>If the object is front-facing, this attribute is sourced from AttrInputReg[SourceAttribute]. If the object is back-facing, this attribute is sourced from AttrInputReg[SourceAttribute+1].</td> </tr> <tr> <td>2h</td> <td>INPUTATTR_W</td> <td>This attribute is sourced from AttrInputReg[SourceAttribute]. The W component is copied to the X component.</td> </tr> <tr> <td>3h</td> <td>INPUTATTR_FACING_W</td> <td>If the object is front-facing, this attribute is sourced from AttrInputReg[SourceAttribute]. If the object is back-facing, this attribute is sourced from AttrInputReg[SourceAttribute+1]. The W component is copied to the X component.</td> </tr> </tbody> </table> |  | Format: | U2 enumerated type | Value | Name | Description | 0h | INPUTATTR  | This attribute is sourced from AttrInputReg[SourceAttribute] | 1h | INPUTATTR_FACING | If the object is front-facing, this attribute is sourced from AttrInputReg[SourceAttribute]. If the object is back-facing, this attribute is sourced from AttrInputReg[SourceAttribute+1]. | 2h | INPUTATTR_W      | This attribute is sourced from AttrInputReg[SourceAttribute]. The W component is copied to the X component. | 3h | INPUTATTR_FACING_W | If the object is front-facing, this attribute is sourced from AttrInputReg[SourceAttribute]. If the object is back-facing, this attribute is sourced from AttrInputReg[SourceAttribute+1]. The W component is copied to the X component. |
| Format:                           | U2 enumerated type  |  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| Value                             | Name  | Description  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 0h                                | INPUTATTR   | This attribute is sourced from AttrInputReg[SourceAttribute]   |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 1h                                | INPUTATTR_FACING  | If the object is front-facing, this attribute is sourced from AttrInputReg[SourceAttribute]. If the object is back-facing, this attribute is sourced from AttrInputReg[SourceAttribute+1].   |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 2h                                | INPUTATTR_W   | This attribute is sourced from AttrInputReg[SourceAttribute]. The W component is copied to the X component.  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 3h                                | INPUTATTR_FACING_W  | If the object is front-facing, this attribute is sourced from AttrInputReg[SourceAttribute]. If the object is back-facing, this attribute is sourced from AttrInputReg[SourceAttribute+1]. The W component is copied to the X component. |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 5                                 | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 60%;">Format:</td> <td>MBZ</td> </tr> </table>  |  | Format: | MBZ                |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| Format:                           | MBZ   |  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| 4:0                               | <p><b>Source Attribute</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td>U5</td> </tr> </table> <p>This field selects the source attribute for this Attribute. Source attribute 0 corresponds to the first 128 bits of data indicated by Vertex URB Entry Read Offset</p>   |  | Format: | U5                 |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |
| Format:                           | U5  |  |         |                    |       |      |             |    |            |  |    |                  |  |    |                  |   |    |                    |  |

## SFC\_8x8\_AVS\_COEFFICIENTS

| SFC_8x8_AVS_COEFFICIENTS |  |  |
|--------------------------|--|--|
| Project:                 | CHV, BSW   |  |
| Source:                  | PRM  |  |
| Size (in bits):          | 256  |  |
| Default Value:           | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| Description              |  | Project  |
| ExistsIf = AVS           |  | CHV, BSW   |
| DWord                    | Bit  | Description  |
| 0                        | 31:24  | <b>ZeroYFilterCoefficient1</b><br>Format: <input type="text"/> S1.6 2's Complement<br><b>Range:</b> [-2, +2) |
|                          | 23:16  | <b>ZeroXFilterCoefficient1</b><br>Format: <input type="text"/> S1.6 2's Complement<br><b>Range:</b> [-2, +2) |
|                          | 15:8   | <b>ZeroYFilterCoefficient0</b><br>Format: <input type="text"/> S1.6 2's Complement<br><b>Range:</b> [-2, +2) |
|                          | 7:0  | <b>ZeroXFilterCoefficient0</b><br>Format: <input type="text"/> S1.6 2's Complement<br><b>Range:</b> [-2, +2) |
| 1                        | 31:24  | <b>ZeroYFilterCoefficient3</b><br>Format: <input type="text"/> S1.6 2's Complement<br><b>Range:</b> [-2, +2) |
|                          | 23:16  | <b>ZeroXFilterCoefficient3</b><br>Format: <input type="text"/> S1.6 2's Complement<br><b>Range:</b> [-2, +2) |
|                          | 15:8   | <b>ZeroYFilterCoefficient2</b><br>Format: <input type="text"/> S1.6 2's Complement<br><b>Range:</b> [-2, +2) |

| <b>SFC_8x8_AVS_COEFFICIENTS</b> |  |   |                     |                     |
|---------------------------------|--|---|---------------------|---------------------|
|                                 | 7:0  | <b>ZeroXFilterCoefficient2</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2)    | Format:             | S1.6 2's Complement |
| Format:                         | S1.6 2's Complement  |   |                     |                     |
| 2                               | 31:24  | <b>ZeroYFilterCoefficient5</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2)    | Format:             | S1.6 2's Complement |
|                                 | Format:  | S1.6 2's Complement   |                     |                     |
|                                 | 23:16  | <b>ZeroXFilterCoefficient5</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2)    | Format:             | S1.6 2's Complement |
|                                 | Format:  | S1.6 2's Complement   |                     |                     |
| 15:8                            | <b>ZeroYFilterCoefficient4</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2) | Format:   | S1.6 2's Complement |                     |
| Format:                         | S1.6 2's Complement  |   |                     |                     |
| 7:0                             | <b>ZeroXFilterCoefficient4</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2) | Format:   | S1.6 2's Complement |                     |
| Format:                         | S1.6 2's Complement  |   |                     |                     |
| 3                               | 31:24  | <b>ZeroYFilterCoefficient7</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2)    | Format:             | S1.6 2's Complement |
|                                 | Format:  | S1.6 2's Complement   |                     |                     |
|                                 | 23:16  | <b>ZeroXFilterCoefficient7</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2)    | Format:             | S1.6 2's Complement |
|                                 | Format:  | S1.6 2's Complement   |                     |                     |
| 15:8                            | <b>ZeroYFilterCoefficient6</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2) | Format:   | S1.6 2's Complement |                     |
| Format:                         | S1.6 2's Complement  |   |                     |                     |
| 7:0                             | <b>ZeroXFilterCoefficient6</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2) | Format:   | S1.6 2's Complement |                     |
| Format:                         | S1.6 2's Complement  |   |                     |                     |
| 4                               | 31:24  | <b>OneXFilterCoefficient3</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2.0, +2.0) | Format:             | S1.6 2's Complement |
| Format:                         | S1.6 2's Complement  |   |                     |                     |

| <b>SFC_8x8_AVS_COEFFICIENTS</b> |   |   |  |
|---------------------------------|---|---|--|
|                                 | 23:16   | <b>OneXFilterCoefficient2</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> S1.6 2's Complement<br><b>Range:</b> [-1.0, +1.0) |  |
|                                 |   |   |  |
| 15:0                            | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> MBZ   |   |  |
|                                 |   |   |  |
| 5                               | 31:16   | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> MBZ   |  |
|                                 |   |   |  |
|                                 | 15:8  | <b>OneXFilterCoefficient5</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> S1.6 2's Complement<br><b>Range:</b> [-1.0, +1.0) |  |
|                                 |   |   |  |
| 7:0                             | <b>OneXFilterCoefficient4</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> S1.6 2's Complement<br><b>Range:</b> [-2.0, +2.0) |   |  |
|                                 |   |   |  |
| 6                               | 31:24   | <b>OneYFilterCoefficient3</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> S1.6 2's Complement<br><b>Range:</b> [-2.0, +2.0) |  |
|                                 |   |   |  |
|                                 | 23:16   | <b>OneYFilterCoefficient2</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> S1.6 2's Complement<br><b>Range:</b> [-1.0, +1.0) |  |
|                                 |   |   |  |
| 15:0                            | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> MBZ   |   |  |
|                                 |   |   |  |
| 7                               | 31:16   | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> MBZ   |  |
|                                 |   |   |  |
|                                 | 15:8  | <b>OneYFilterCoefficient5</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> S1.6 2's Complement<br><b>Range:</b> [-1.0, +1.0) |  |
|                                 |   |   |  |
| 7:0                             | <b>OneYFilterCoefficient4</b><br>Format: <table border="1" style="display: inline-table;"><tr><td> </td></tr></table> S1.6 2's Complement<br><b>Range:</b> [-2.0, +2.0) |   |  |
|                                 |   |   |  |

## SIMD4x2 Typed Surface 32-Bit Address Payload

| <b>MAP32B_TS_SIMD4X2 - SIMD4x2 Typed Surface 32-Bit Address Payload</b> |  |  |         |                     |
|---|--|--|---------|---------------------|
| Project:  | CHV, BSW   |  |         |                     |
| Source:   | PRM  |  |         |                     |
| Size (in bits):   | 256  |  |         |                     |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |         |                     |
| DWord   | Bit  | Description  |         |                     |
| 0   | 31:0   | <b>U0</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> Specifies the U channel address offset for slot 0. | Format: | U32                 |
| Format:   | U32  |  |         |                     |
| 1   | 31:0   | <b>V0</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> Specifies the V channel address offset for slot 0. | Format: | U32                 |
| Format:   | U32  |  |         |                     |
| 2   | 31:0   | <b>R0</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> Specifies the R channel address offset for slot 0. | Format: | U32                 |
| Format:   | U32  |  |         |                     |
| 3   | 31:0   | <b>LOD0</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Format:</td> <td style="width: 70%;">MACD_LOD [CHV, BSW]</td> </tr> </table> Specifies the LOD for slot 0.    | Format: | MACD_LOD [CHV, BSW] |
| Format:   | MACD_LOD [CHV, BSW]  |  |         |                     |
| 4   | 31:0   | <b>U1</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> Specifies the U channel address offset for slot 1. | Format: | U32                 |
| Format:   | U32  |  |         |                     |
| 5   | 31:0   | <b>V1</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> Specifies the V channel address offset for slot 1. | Format: | U32                 |
| Format:   | U32  |  |         |                     |
| 6   | 31:0   | <b>R1</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U32</td> </tr> </table> Specifies the R channel address offset for slot 1. | Format: | U32                 |
| Format:   | U32  |  |         |                     |
| 7   | 31:0   | <b>LOD1</b>  |         |                     |

## MAP32B\_TS\_SIMD4X2 - SIMD4x2 Typed Surface 32-Bit Address Payload

|                               |  |         |                     |
|-------------------------------|--|---------|---------------------|
|                               |  | Format: | MACD_LOD [CHV, BSW] |
| Specifies the LOD for slot 1. |  |         |                     |

## SIMD4x2 Untyped BUFFER Surface 32-Bit Address Payload

| MAP32B_USU_SIMD4X2 - SIMD4x2 Untyped BUFFER Surface 32-Bit Address Payload |  |   |         |        |
|--|--|---|---------|--------|
| Project:   | CHV, BSW   |   |         |        |
| Source:  | PRM  |   |         |        |
| Size (in bits):  | 256  |   |         |        |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |         |        |
| DWord  | Bit  | Description   |         |        |
| 0  | 31:0   | <p><b>U0</b></p> <table border="1"> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the U channel address offset for slot 0.</p> | Format: | U32    |
| Format:  | U32  |   |         |        |
| 1-3  | 95:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>                                   | Format: | Ignore |
| Format:  | Ignore   |   |         |        |
| 4  | 31:0   | <p><b>U1</b></p> <table border="1"> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the U channel address offset for slot 1.</p> | Format: | U32    |
| Format:  | U32  |   |         |        |
| 5-7  | 95:0   | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>                                   | Format: | Ignore |
| Format:  | Ignore   |   |         |        |

## SIMD4x2 Untyped BUFFER Surface 64-Bit Address Payload

| <b>MAP64B_USU_SIMD4X2 - SIMD4x2 Untyped BUFFER Surface 64-Bit Address Payload</b> |   |  |         |        |
|---|---|--|---------|--------|
| Project:  | CHV, BSW  |  |         |        |
| Source:   | PRM   |  |         |        |
| Size (in bits):   | 256   |  |         |        |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |  |         |        |
| DWord   | Bit   | Description  |         |        |
| 0-1   | 63:0  | <p><b>U0</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U64</td> </tr> </table> <p>Specifies the U channel address offset for slot 0.</p> | Format: | U64    |
| Format:   | U64   |  |         |        |
| 2-3   | 63:0  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">Ignore</td> </tr> </table> <p>Ignored</p>                                   | Format: | Ignore |
| Format:   | Ignore  |  |         |        |
| 4-5   | 63:0  | <p><b>U1</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U64</td> </tr> </table> <p>Specifies the U channel address offset for slot 1.</p> | Format: | U64    |
| Format:   | U64   |  |         |        |
| 6-7   | 63:0  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">Ignore</td> </tr> </table> <p>Ignored</p>                                   | Format: | Ignore |
| Format:   | Ignore  |  |         |        |



## SIMD4x2 Untyped STRBUF Surface 32-Bit Address Payload

| MAP32B_USUV_SIMD4X2 - SIMD4x2 Untyped STRBUF Surface 32-Bit Address Payload |  |  |
|---|--|--|
| Project:  | CHV, BSW   |  |
| Source:   | PRM  |  |
| Size (in bits):   | 256  |  |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord   | Bit  | Description  |
| 0   | 31:0   | <b>U0</b><br>Format: U32<br>Specifies the U channel address offset for slot 0. |
| 1   | 31:0   | <b>V0</b><br>Format: U32<br>Specifies the V channel address offset for slot 0. |
| 2-3   | 63:0   | <b>Reserved</b><br>Format: Ignore<br>Ignored                                   |
| 4   | 31:0   | <b>U1</b><br>Format: U32<br>Specifies the U channel address offset for slot 1. |
| 5   | 31:0   | <b>V1</b><br>Format: U32<br>Specifies the V channel address offset for slot 1. |
| 6-7   | 63:0   | <b>Reserved</b><br>Format: Ignore<br>Ignored                                   |

## SIMD4x2 32-Bit Address Payload

| MAP32B_SIMD4X2 - SIMD4x2 32-Bit Address Payload |  |  |         |        |
|---|--|--|---------|--------|
| Project:  | CHV, BSW   |  |         |        |
| Source:   | PRM  |  |         |        |
| Size (in bits):                                 | 256  |  |         |        |
| Default Value:                                  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |         |        |
| DWord   | Bit  | Description  |         |        |
| 0   | 31:0   | <b>Offset0</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>U32</td> </tr> </table> Specifies the address offset for slot 0. | Format: | U32    |
| Format:   | U32  |  |         |        |
| 1-3   | 95:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> Ignored                              | Format: | Ignore |
| Format:   | Ignore   |  |         |        |
| 4   | 31:0   | <b>Offset1</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>U32</td> </tr> </table> Specifies the address offset for slot 1. | Format: | U32    |
| Format:   | U32  |  |         |        |
| 5-7   | 95:0   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>Ignore</td> </tr> </table> Ignored                              | Format: | Ignore |
| Format:   | Ignore   |  |         |        |



| MDP_RTW_8DS - SIMD8 Dual Source Render Target Data Payload |                         |  |          |                         |                                  |                         |                                    |  |
|--|-------------------------|--|----------|-------------------------|----------------------------------|-------------------------|------------------------------------|--|
|  |                         | <table border="1"> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots[7:0] or [15:8] of Src1 Red</td> </tr> </table>  | Format:  | MDP_DW_SIMD8 [CHV, BSW] | Slots[7:0] or [15:8] of Src1 Red |                         |                                    |  |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |                         |                                  |                         |                                    |  |
| Slots[7:0] or [15:8] of Src1 Red                           |                         |  |          |                         |                                  |                         |                                    |  |
| 5.0-5.7  | 255:0                   | <p><b>Src1 Green</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots[7:0] or [15:8] of Src1 Green</td> </tr> </table> | Project: | All                     | Format:                          | MDP_DW_SIMD8 [CHV, BSW] | Slots[7:0] or [15:8] of Src1 Green |  |
| Project:   | All                     |  |          |                         |                                  |                         |                                    |  |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |                         |                                  |                         |                                    |  |
| Slots[7:0] or [15:8] of Src1 Green                         |                         |  |          |                         |                                  |                         |                                    |  |
| 6.0-6.7  | 255:0                   | <p><b>Src1 Blue</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots[7:0] or [15:8] of Src1 Blue</td> </tr> </table>   | Project: | All                     | Format:                          | MDP_DW_SIMD8 [CHV, BSW] | Slots[7:0] or [15:8] of Src1 Blue  |  |
| Project:   | All                     |  |          |                         |                                  |                         |                                    |  |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |                         |                                  |                         |                                    |  |
| Slots[7:0] or [15:8] of Src1 Blue                          |                         |  |          |                         |                                  |                         |                                    |  |
| 7.0-7.7  | 255:0                   | <p><b>Src1 Alpha</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots[7:0] or [15:8] of Src1 Alpha</td> </tr> </table> | Project: | All                     | Format:                          | MDP_DW_SIMD8 [CHV, BSW] | Slots[7:0] or [15:8] of Src1 Alpha |  |
| Project:   | All                     |  |          |                         |                                  |                         |                                    |  |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |                         |                                  |                         |                                    |  |
| Slots[7:0] or [15:8] of Src1 Alpha                         |                         |  |          |                         |                                  |                         |                                    |  |

## SIMD8 LOD Message Address Payload Control

| <b>MACR_LOD_SIMD8 - SIMD8 LOD Message Address Payload Control</b> |  |                              |
|---|--|------------------------------|
| Project:  | CHV, BSW   |                              |
| Source:   | PRM  |                              |
| Size (in bits):   | 256  |                              |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |                              |
| DWord   | Bit  | Description                  |
| 0.0   | 31:0   | <b>Slot0 LOD</b>             |
|   |  | Project: All                 |
|   |  | Format: MACD_LOD [CHV, BSW]  |
|   |  | Specifies the LOD for slot 0 |
| 0.1   | 31:0   | <b>Slot1 LOD</b>             |
|   |  | Project: All                 |
|   |  | Format: MACD_LOD [CHV, BSW]  |
|   |  | Specifies the LOD for slot 1 |
| 0.2   | 31:0   | <b>Slot2 LOD</b>             |
|   |  | Project: All                 |
|   |  | Format: MACD_LOD [CHV, BSW]  |
|   |  | Specifies the LOD for slot 2 |
| 0.3   | 31:0   | <b>Slot3 LOD</b>             |
|   |  | Project: All                 |
|   |  | Format: MACD_LOD [CHV, BSW]  |
|   |  | Specifies the LOD for slot 3 |
| 0.4   | 31:0   | <b>Slot4 LOD</b>             |
|   |  | Project: All                 |
|   |  | Format: MACD_LOD [CHV, BSW]  |
|   |  | Specifies the LOD for slot 4 |
| 0.5   | 31:0   | <b>Slot5 LOD</b>             |
|   |  | Project: All                 |
|   |  | Format: MACD_LOD [CHV, BSW]  |
|   |  | Specifies the LOD for slot 5 |

| <b>MACR_LOD_SIMD8 - SIMD8 LOD Message Address Payload Control</b> |                     |  |          |     |         |                     |
|---|---------------------|--|----------|-----|---------|---------------------|
| 0.6   | 31:0                | <p><b>Slot6 LOD</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACD_LOD [CHV, BSW]</td> </tr> </table> <p>Specifies the LOD for slot 6</p> | Project: | All | Format: | MACD_LOD [CHV, BSW] |
| Project:  | All                 |  |          |     |         |                     |
| Format:   | MACD_LOD [CHV, BSW] |  |          |     |         |                     |
| 0.7   | 31:0                | <p><b>Slot7 LOD</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACD_LOD [CHV, BSW]</td> </tr> </table> <p>Specifies the LOD for slot 7</p> | Project: | All | Format: | MACD_LOD [CHV, BSW] |
| Project:  | All                 |  |          |     |         |                     |
| Format:   | MACD_LOD [CHV, BSW] |  |          |     |         |                     |

## SIMD8 Render Target Data Payload

| MDP_RTW_8 - SIMD8 Render Target Data Payload |  |                                 |
|--|--|---------------------------------|
| Project:                                     | All  |                                 |
| Source:                                      | PRM  |                                 |
| Size (in bits):                              | 1024   |                                 |
| Default Value:                               | 0x00000000, 0x00000000 |                                 |
| DWord  | Bit  | Description                     |
| 0.0-0.7                                      | 255:0  | <b>Red</b>                      |
|  |  | Project: All                    |
|  |  | Format: MDP_DW_SIMD8 [CHV, BSW] |
|  |  | Slots [7:0] Red                 |
| 1.0-1.7                                      | 255:0  | <b>Green</b>                    |
|  |  | Project: All                    |
|  |  | Format: MDP_DW_SIMD8 [CHV, BSW] |
|  |  | Slots [7:0] Green               |
| 2.0-2.7                                      | 255:0  | <b>Blue</b>                     |
|  |  | Project: All                    |
|  |  | Format: MDP_DW_SIMD8 [CHV, BSW] |
|  |  | Slots [7:0] Blue                |
| 3.0-3.7                                      | 255:0  | <b>Alpha</b>                    |
|  |  | Project: All                    |
|  |  | Format: MDP_DW_SIMD8 [CHV, BSW] |
|  |  | Slots [7:0] Alpha               |

## SIMD8 Typed Surface 32-Bit Address Payload

| <b>MAP32B_TS_SIMD8 - SIMD8 Typed Surface 32-Bit Address Payload</b> |  |  |          |     |         |                           |
|---|--|--|----------|-----|---------|---------------------------|
| Project:  | CHV, BSW   |  |          |     |         |                           |
| Source:   | PRM  |  |          |     |         |                           |
| Size (in bits):   | 1024   |  |          |     |         |                           |
| Default Value:  | 0x00000000, 0x00000000 |  |          |     |         |                           |
| DWord   | Bit  | Description  |          |     |         |                           |
| 0.0-0.7   | 255:0  | <p><b>U</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> <p>Specifies the U channel for slots [7:0]</p>   | Project: | All | Format: | MACR_32b [CHV, BSW]       |
| Project:  | All  |  |          |     |         |                           |
| Format:   | MACR_32b [CHV, BSW]  |  |          |     |         |                           |
| 1.0-1.7   | 255:0  | <p><b>V</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> <p>Specifies the V channel for slots [7:0]</p>   | Project: | All | Format: | MACR_32b [CHV, BSW]       |
| Project:  | All  |  |          |     |         |                           |
| Format:   | MACR_32b [CHV, BSW]  |  |          |     |         |                           |
| 2.0-2.7   | 255:0  | <p><b>R</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> <p>Specifies the R channel for slots [7:0]</p>   | Project: | All | Format: | MACR_32b [CHV, BSW]       |
| Project:  | All  |  |          |     |         |                           |
| Format:   | MACR_32b [CHV, BSW]  |  |          |     |         |                           |
| 3.0-3.7   | 255:0  | <p><b>LOD</b></p> <table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_LOD_SIMD8 [CHV, BSW]</td> </tr> </table> <p>Specifies the LOD for slots [7:0]</p> | Project: | All | Format: | MACR_LOD_SIMD8 [CHV, BSW] |
| Project:  | All  |  |          |     |         |                           |
| Format:   | MACR_LOD_SIMD8 [CHV, BSW]  |  |          |     |         |                           |



## SIMD8 Untyped BUFFER Surface 32-Bit Address Payload

| <b>MAP32B_USU_SIMD8 - SIMD8 Untyped BUFFER Surface 32-Bit Address Payload</b> |  |  |          |     |         |                     |
|---|--|--|----------|-----|---------|---------------------|
| Project:  | All  |  |          |     |         |                     |
| Source:   | PRM  |  |          |     |         |                     |
| Size (in bits):   | 256  |  |          |     |         |                     |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |         |                     |
| DWord   | Bit  | Description  |          |     |         |                     |
| 0.0-0.7   | 255:0  | <b>U</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> Specifies the U channel for slots [7:0] | Project: | All | Format: | MACR_32b [CHV, BSW] |
| Project:  | All  |  |          |     |         |                     |
| Format:   | MACR_32b [CHV, BSW]  |  |          |     |         |                     |

## SIMD8 Untyped BUFFER Surface 64-Bit Address Payload

| <b>MAP64B_USU_SIMD8 - SIMD8 Untyped BUFFER Surface 64-Bit Address Payload</b> |  |   |          |     |         |                     |
|---|--|---|----------|-----|---------|---------------------|
| Project:  | All  |   |          |     |         |                     |
| Source:   | PRM  |   |          |     |         |                     |
| Size (in bits):   | 512  |   |          |     |         |                     |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |     |         |                     |
| DWord   | Bit  | Description   |          |     |         |                     |
| 0.0-0.7   | 255:0  | <b>U3_U0</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> Specifies the U channel for slots [3:0] | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:  | All  |   |          |     |         |                     |
| Format:   | MACR_64b [CHV, BSW]  |   |          |     |         |                     |
| 1.0-1.7   | 255:0  | <b>U7_U4</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> Specifies the U channel for slots [7:4] | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:  | All  |   |          |     |         |                     |
| Format:   | MACR_64b [CHV, BSW]  |   |          |     |         |                     |

## SIMD8 Untyped STRBUF Surface 32-Bit Address Payload

| MAP32B_USUV_SIMD8 - SIMD8 Untyped STRBUF Surface 32-Bit Address Payload |  |  |
|---|--|--|
| Project:  | All  |  |
| Source:   | PRM  |  |
| Size (in bits):   | 512  |  |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord   | Bit  | Description  |
| 0.0-0.7   | 255:0  | <b>U</b>   |
|   |  | Project: All   |
|   |  | Format: MACR_32b [CHV, BSW]<br>Specifies the U channel for slots [7:0] |
| 1.0-1.7   | 255:0  | <b>V</b>   |
|   |  | Project: All   |
|   |  | Format: MACR_32b [CHV, BSW]<br>Specifies the V channel for slots [7:0] |



| <b>MDP_RTW_16 - SIMD16 Render Target Data Payload</b> |                         |   |          |                         |                  |                         |                    |  |
|---|-------------------------|---|----------|-------------------------|------------------|-------------------------|--------------------|--|
|   |                         | <table border="1"> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots [7:0] Blue</td> </tr> </table>   | Format:  | MDP_DW_SIMD8 [CHV, BSW] | Slots [7:0] Blue |                         |                    |  |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |                         |                  |                         |                    |  |
| Slots [7:0] Blue                                      |                         |   |          |                         |                  |                         |                    |  |
| 5.0-5.7   | 255:0                   | <b>Blue[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots [15:8] Blue</td> </tr> </table>   | Project: | All                     | Format:          | MDP_DW_SIMD8 [CHV, BSW] | Slots [15:8] Blue  |  |
| Project:  | All                     |   |          |                         |                  |                         |                    |  |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |                         |                  |                         |                    |  |
| Slots [15:8] Blue                                     |                         |   |          |                         |                  |                         |                    |  |
| 6.0-6.7   | 255:0                   | <b>Alpha[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots [7:0] Alpha</td> </tr> </table>   | Project: | All                     | Format:          | MDP_DW_SIMD8 [CHV, BSW] | Slots [7:0] Alpha  |  |
| Project:  | All                     |   |          |                         |                  |                         |                    |  |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |                         |                  |                         |                    |  |
| Slots [7:0] Alpha                                     |                         |   |          |                         |                  |                         |                    |  |
| 7.0-7.7   | 255:0                   | <b>Alpha[15:7]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> <tr> <td colspan="2">Slots [15:7] Alpha</td> </tr> </table> | Project: | All                     | Format:          | MDP_DW_SIMD8 [CHV, BSW] | Slots [15:7] Alpha |  |
| Project:  | All                     |   |          |                         |                  |                         |                    |  |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |                         |                  |                         |                    |  |
| Slots [15:7] Alpha                                    |                         |   |          |                         |                  |                         |                    |  |

## SIMD16 Untyped BUFFER Surface 32-Bit Address Payload

| <b>MAP32B_USU_SIMD16 - SIMD16 Untyped BUFFER Surface 32-Bit Address Payload</b> |  |  |          |     |         |                     |
|---|--|--|----------|-----|---------|---------------------|
| Project:  | All  |  |          |     |         |                     |
| Source:   | PRM  |  |          |     |         |                     |
| Size (in bits):   | 512  |  |          |     |         |                     |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |         |                     |
| DWord   | Bit  | Description  |          |     |         |                     |
| 0.0-0.7   | 255:0  | <b>U[7:0]</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> Specifies the U channel for slots [7:0]   | Project: | All | Format: | MACR_32b [CHV, BSW] |
| Project:  | All  |  |          |     |         |                     |
| Format:   | MACR_32b [CHV, BSW]  |  |          |     |         |                     |
| 1.0-1.7   | 255:0  | <b>U[15:8]</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> Specifies the U channel for slots [15:8] | Project: | All | Format: | MACR_32b [CHV, BSW] |
| Project:  | All  |  |          |     |         |                     |
| Format:   | MACR_32b [CHV, BSW]  |  |          |     |         |                     |

## SIMD16 Untyped BUFFER Surface 64-Bit Address Payload

| MAP64B_USU_SIMD16 - SIMD16 Untyped BUFFER Surface 64-Bit Address Payload |  |  |          |     |         |                     |
|--|--|--|----------|-----|---------|---------------------|
| Project:   | All  |  |          |     |         |                     |
| Source:  | PRM  |  |          |     |         |                     |
| Size (in bits):  | 1024   |  |          |     |         |                     |
| Default Value:   | 0x00000000, 0x00000000 |  |          |     |         |                     |
| DWord  | Bit  | Description  |          |     |         |                     |
| 0.0-0.7  | 255:0  | <b>U3_U0</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> Specifies the U channel for slots [3:0]     | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:   | All  |  |          |     |         |                     |
| Format:  | MACR_64b [CHV, BSW]  |  |          |     |         |                     |
| 1.0-1.7  | 255:0  | <b>U7_U4</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> Specifies the U channel for slots [7:4]     | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:   | All  |  |          |     |         |                     |
| Format:  | MACR_64b [CHV, BSW]  |  |          |     |         |                     |
| 2.0-2.7  | 255:0  | <b>U11_U8</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> Specifies the U channel for slots [11:8]   | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:   | All  |  |          |     |         |                     |
| Format:  | MACR_64b [CHV, BSW]  |  |          |     |         |                     |
| 3.0-3.7  | 255:0  | <b>U15_U12</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> Specifies the U channel for slots [15:12] | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:   | All  |  |          |     |         |                     |
| Format:  | MACR_64b [CHV, BSW]  |  |          |     |         |                     |

## SIMD16 Untyped STRBUF Surface 32-Bit Address Payload

| MAP32B_USUV_SIMD16 - SIMD16 Untyped STRBUF Surface 32-Bit Address Payload |  |   |          |     |         |                     |
|---|--|---|----------|-----|---------|---------------------|
| Project:  | All  |   |          |     |         |                     |
| Source:   | PRM  |   |          |     |         |                     |
| Size (in bits):   | 1024   |   |          |     |         |                     |
| Default Value:  | 0x00000000, 0x00000000 |   |          |     |         |                     |
| DWord   | Bit  | Description   |          |     |         |                     |
| 0.0-0.7   | 255:0  | <p><b>U7_U0</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> <p>Specifies the U channel for slots [7:0]</p>   | Project: | All | Format: | MACR_32b [CHV, BSW] |
| Project:  | All  |   |          |     |         |                     |
| Format:   | MACR_32b [CHV, BSW]  |   |          |     |         |                     |
| 1.0-1.7   | 255:0  | <p><b>U15_U8</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> <p>Specifies the U channel for slots [15:8]</p> | Project: | All | Format: | MACR_32b [CHV, BSW] |
| Project:  | All  |   |          |     |         |                     |
| Format:   | MACR_32b [CHV, BSW]  |   |          |     |         |                     |
| 2.0-2.7   | 255:0  | <p><b>V7_V0</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> <p>Specifies the V channel for slots [7:0]</p>   | Project: | All | Format: | MACR_32b [CHV, BSW] |
| Project:  | All  |   |          |     |         |                     |
| Format:   | MACR_32b [CHV, BSW]  |   |          |     |         |                     |
| 3.0-3.7   | 255:0  | <p><b>V15_V8</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> <p>Specifies the V channel for slots [15:8]</p> | Project: | All | Format: | MACR_32b [CHV, BSW] |
| Project:  | All  |   |          |     |         |                     |
| Format:   | MACR_32b [CHV, BSW]  |   |          |     |         |                     |



## SIMD 32-Bit Address Payload Control

| MACR_32B - SIMD 32-Bit Address Payload Control |  |   |
|--|--|---|
| Project:                                       | CHV, BSW   |   |
| Source:  | PRM  |   |
| Size (in bits):                                | 256  |   |
| Default Value:                                 | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |
| DWord  | Bit  | Description   |
| 0.0  | 31:0   | <b>Offset0</b>  |
|  |  | Project: All  |
|  |  | Format: U32   |
|  |  | Specifies the address offset for slot 0 in this payload register. |
| 0.1  | 31:0   | <b>Offset1</b>  |
|  |  | Project: All  |
|  |  | Format: U32   |
|  |  | Specifies the address offset for slot 1 in this payload register. |
| 0.2  | 31:0   | <b>Offset2</b>  |
|  |  | Project: All  |
|  |  | Format: U32   |
|  |  | Specifies the address offset for slot 2 in this payload register. |
| 0.3  | 31:0   | <b>Offset3</b>  |
|  |  | Project: All  |
|  |  | Format: U32   |
|  |  | Specifies the address offset for slot 3 in this payload register. |
| 0.4  | 31:0   | <b>Offset4</b>  |
|  |  | Project: All  |
|  |  | Format: U32   |
|  |  | Specifies the address offset for slot 4 in this payload register. |
| 0.5  | 31:0   | <b>Offset5</b>  |
|  |  | Project: All  |
|  |  | Format: U32   |
|  |  | Specifies the address offset for slot 5 in this payload register. |

| <b>MACR_32B - SIMD 32-Bit Address Payload Control</b> |      |  |          |     |         |     |
|---|------|--|----------|-----|---------|-----|
| 0.6   | 31:0 | <p><b>Offset6</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the address offset for slot 6 in this payload register.</p> | Project: | All | Format: | U32 |
| Project:  | All  |  |          |     |         |     |
| Format:   | U32  |  |          |     |         |     |
| 0.7   | 31:0 | <p><b>Offset7</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U32</td> </tr> </table> <p>Specifies the address offset for slot 7 in this payload register.</p> | Project: | All | Format: | U32 |
| Project:  | All  |  |          |     |         |     |
| Format:   | U32  |  |          |     |         |     |

## SIMD 64-Bit Address Payload Control

| MACR_64B - SIMD 64-Bit Address Payload Control |  |   |     |
|--|--|---|-----|
| Project:                                       | CHV, BSW   |   |     |
| Source:  | PRM  |   |     |
| Size (in bits):                                | 256  |   |     |
| Default Value:                                 | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |     |
| DWord  | Bit  | Description   |     |
| 0.0-0.1  | 63:0   | <b>Offset0</b>  |     |
|  |  | Project:  | All |
|  |  | Format:   | U64 |
|  |  | Specifies the address offset for slot 0 in this payload register. |     |
| 0.2-0.3  | 63:0   | <b>Offset1</b>  |     |
|  |  | Project:  | All |
|  |  | Format:   | U64 |
|  |  | Specifies the address offset for slot 1 in this payload register. |     |
| 0.4-0.5  | 63:0   | <b>Offset2</b>  |     |
|  |  | Project:  | All |
|  |  | Format:   | U64 |
|  |  | Specifies the address offset for slot 2 in this payload register. |     |
| 0.6-0.7  | 63:0   | <b>Offset3</b>  |     |
|  |  | Project:  | All |
|  |  | Format:   | U64 |
|  |  | Specifies the address offset for slot 3 in this payload register. |     |

## SIMD8 32-Bit Address Payload

| <b>MAP32B_SIMD8 - SIMD8 32-Bit Address Payload</b> |   |  |          |     |         |                     |
|--|---|--|----------|-----|---------|---------------------|
| Project:   | CHV, BSW  |  |          |     |         |                     |
| Source:  | PRM   |  |          |     |         |                     |
| Size (in bits):                                    | 256   |  |          |     |         |                     |
| Default Value:                                     | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |  |          |     |         |                     |
| DWord  | Bit   | Description  |          |     |         |                     |
| 0.0-0.7  | 255:0   | <b>Offset[7:0]</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_32b [CHV, BSW]</td> </tr> </table> Specifies the address offset for Slots [7:0]. | Project: | All | Format: | MACR_32b [CHV, BSW] |
| Project:   | All   |  |          |     |         |                     |
| Format:  | MACR_32b [CHV, BSW]   |  |          |     |         |                     |

## SIMD8 64-Bit Address Payload

| MAP64B_SIMD8 - SIMD8 64-Bit Address Payload |  |   |
|---|--|---|
| Project:                                    | CHV, BSW   |   |
| Source:                                     | PRM  |   |
| Size (in bits):                             | 512  |   |
| Default Value:                              | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |
| DWord                                       | Bit  | Description                                   |
| 0.0-0.7                                     | 255:0  | <b>Offset[3:0]</b>                            |
|   |  | Project: All                                  |
|   |  | Format: MACR_64b [CHV, BSW]                   |
|   |  | Specifies the address offset for slots [3:0]. |
| 1.0-1.7                                     | 255:0  | <b>Offset[7:4]</b>                            |
|   |  | Project: All                                  |
|   |  | Format: MACR_64b [CHV, BSW]                   |
|   |  | Specifies the address offset for slots [7:4]. |

## SIMD16 32-Bit Address Payload

| MAP32B_SIMD16 - SIMD16 32-Bit Address Payload |  |  |
|---|--|--|
| Project:                                      | CHV, BSW   |  |
| Source:                                       | PRM  |  |
| Size (in bits):                               | 512  |  |
| Default Value:                                | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord   | Bit  | Description                                    |
| 0.0-0.7                                       | 255:0  | <b>Offset[7:0]</b>                             |
|   |  | Project: All                                   |
|   |  | Format: MACR_32b [CHV, BSW]                    |
|   |  | Specifies the address offset for slots [7:0].  |
| 1.0-1.7                                       | 255:0  | <b>Offset[15:8]</b>                            |
|   |  | Project: All                                   |
|   |  | Format: MACR_32b [CHV, BSW]                    |
|   |  | Specifies the address offset for slots [15:8]. |

## SIMD16 64-Bit Address Payload

| MAP64B_SIMD16 - SIMD16 64-Bit Address Payload |  |  |          |     |         |                     |
|---|--|--|----------|-----|---------|---------------------|
| Project:                                      | CHV, BSW   |  |          |     |         |                     |
| Source:                                       | PRM  |  |          |     |         |                     |
| Size (in bits):                               | 1024   |  |          |     |         |                     |
| Default Value:                                | 0x00000000, 0x00000000 |  |          |     |         |                     |
| DWord   | Bit  | Description  |          |     |         |                     |
| 0.0-0.7                                       | 255:0  | <p><b>Offset[3:0]</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> <p>Specifies the address offsets for slots [3:0].</p>     | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:                                      | All  |  |          |     |         |                     |
| Format:                                       | MACR_64b [CHV, BSW]  |  |          |     |         |                     |
| 1.0-1.7                                       | 255:0  | <p><b>Offset[7:4]</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> <p>Specifies the address offsets for slots [7:4].</p>     | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:                                      | All  |  |          |     |         |                     |
| Format:                                       | MACR_64b [CHV, BSW]  |  |          |     |         |                     |
| 2.0-2.7                                       | 255:0  | <p><b>Offset[11:8]</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> <p>Specifies the address offsets for slots [11:8].</p>   | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:                                      | All  |  |          |     |         |                     |
| Format:                                       | MACR_64b [CHV, BSW]  |  |          |     |         |                     |
| 3.0-3.7                                       | 255:0  | <p><b>Offset[15:12]</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MACR_64b [CHV, BSW]</td> </tr> </table> <p>Specifies the address offsets for slots [15:12].</p> | Project: | All | Format: | MACR_64b [CHV, BSW] |
| Project:                                      | All  |  |          |     |         |                     |
| Format:                                       | MACR_64b [CHV, BSW]  |  |          |     |         |                     |

## SIMD Mode 2 Message Descriptor Control Field

| MDC_SM2 - SIMD Mode 2 Message Descriptor Control Field |            |  |             |
|--|------------|--|-------------|
| Project:   | CHV, BSW   |  |             |
| Source:  | PRM        |  |             |
| Size (in bits):  | 1          |  |             |
| Default Value:   | 0x00000000 |  |             |
| DWord  | Bit        | Description  |             |
| 0  | 0          | <b>SIMD Mode</b>   |             |
|  |            | Project:   | All         |
|  |            | Format:  | Enumeration |
|  |            | Specifies the SIMD mode of the message (number of slots processed) |             |
|  |            | Value  | Name        |
|  |            | Description  | Project     |
|  |            | 00h  | SIMD8       |
|  |            | SIMD8  | All         |
|  |            | 01h  | SIMD16      |
|  |            | SIMD16   | All         |



## SIMD Mode 3 Message Descriptor Control Field

| <b>MDC_SM3 - SIMD Mode 3 Message Descriptor Control Field</b> |            |  |             |             |         |
|---|------------|--|-------------|-------------|---------|
| Project:  | CHV, BSW   |  |             |             |         |
| Source:   | PRM        |  |             |             |         |
| Size (in bits):   | 2          |  |             |             |         |
| Default Value:  | 0x00000000 |  |             |             |         |
| DWord   | Bit        | Description  |             |             |         |
| 0   | 1:0        | <b>SIMD Mode</b>   |             |             |         |
|   |            | Format:  | Enumeration |             |         |
|   |            | Specifies the SIMD mode of the message (number of slots processed) |             |             |         |
|   |            | Value  | Name        | Description | Project |
|   |            | 00h  | SIMD4x2     | SIMD4x2     |         |
|   |            | 01h  | SIMD16      | SIMD16      |         |
| 02h   | SIMD8      | SIMD8  |             |             |         |
| 03h   | Reserved   | Ignored  |             |             |         |

## SLM Surface Pixel Mask Message Header

| <b>MH1_SLM_PSM - SLM Surface Pixel Mask Message Header</b> |   |  |         |         |
|--|---|--|---------|---------|
| Project:   | CHV, BSW  |  |         |         |
| Source:  | DataPort 1  |  |         |         |
| Size (in bits):  | 256   |  |         |         |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x0000FFFF |  |         |         |
| DWord  | Bit   | Description  |         |         |
| 0-6  | 223:0   | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>   | Format: | Ignore  |
| Format:  | Ignore  |  |         |         |
| 7  | 31:0  | <p><b>Pixel Sample Mask</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>MHC_PSM</td> </tr> </table> <p>Specifies the 16-bit Pixel/Sample Mask used with SIMD16 and SIMD8 surfaces.</p> | Format: | MHC_PSM |
| Format:  | MHC_PSM   |  |         |         |

## Slot Group 2 Message Descriptor Control Field

| <b>MDC_SG2 - Slot Group 2 Message Descriptor Control Field</b> |            |   |             |
|--|------------|---|-------------|
| Project:   | CHV, BSW   |   |             |
| Source:  | PRM        |   |             |
| Size (in bits):  | 1          |   |             |
| Default Value:   | 0x00000000 |   |             |
| DWord  | Bit        | Description   |             |
| 0  | 0          | <b>SIMD Mode</b>  |             |
|  |            | Project:  | All         |
|  |            | Format:   | Enumeration |
|  |            | Controls which 8 bits of Pixel/Sample Mask in the message header are ANDed with the execution mask to determine which slots are accessed. This field is ignored if the header is not present. |             |
|  |            | Value   | Name        |
|  |            | Description   | Project     |
|  |            | 00h   | SG8L        |
|  |            | Use low 8 slots   | All         |
|  |            | 01h   | SG8U        |
|  |            | Use high 8 slots  | All         |

## Slot Group 3 Message Descriptor Control Field

| <b>MDC_SG3 - Slot Group 3 Message Descriptor Control Field</b> |            |   |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
|--|------------|---|---------|------|-------------|---------|-----|-------|---------|--|-----|------|-----------------|--|-----|------|------------------|--|-----|----------|---------|--|--|
| Project:   | CHV, BSW   |   |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
| Source:  | PRM        |   |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
| Size (in bits):  | 2          |   |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
| Default Value:   | 0x00000000 |   |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
| DWord  | Bit        | Description   |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
| 0  | 1:0        | <b>SIMD Mode</b><br>Format: Enumeration<br>Controls which 8 bits of Pixel/Sample Mask in the message header are ANDed with the execution mask to determine which slots are accessed. This field is ignored if the header is not present.  |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
|  |            | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h</td> <td>SG4x2</td> <td>SIMD4x2</td> <td></td> </tr> <tr> <td>01h</td> <td>SG8L</td> <td>Use low 8 slots</td> <td></td> </tr> <tr> <td>02h</td> <td>SG8U</td> <td>Use high 8 slots</td> <td></td> </tr> <tr> <td>03h</td> <td>Reserved</td> <td>Ignored</td> <td></td> </tr> </tbody> </table> | Value   | Name | Description | Project | 00h | SG4x2 | SIMD4x2 |  | 01h | SG8L | Use low 8 slots |  | 02h | SG8U | Use high 8 slots |  | 03h | Reserved | Ignored |  |  |
| Value  | Name       | Description   | Project |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
| 00h  | SG4x2      | SIMD4x2   |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
| 01h  | SG8L       | Use low 8 slots   |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
| 02h  | SG8U       | Use high 8 slots  |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |
| 03h  | Reserved   | Ignored   |         |      |             |         |     |       |         |  |     |      |                 |  |     |      |                  |  |     |          |         |  |  |

## Slot Group Select Render Cache Message Descriptor Control Field

| <b>MDC_RT_SGS - Slot Group Select Render Cache Message Descriptor Control Field</b> |            |  |         |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |
|---|------------|--|---------|----------|-----|-------|------|-------------|---------|-----|------------|-------------------------------------|-----|-----|------------|--------------------------------------|-----|
| Project:  | CHV, BSW   |  |         |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |
| Source:   | PRM        |  |         |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |
| Size (in bits):   | 1          |  |         |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |
| Default Value:  | 0x00000000 |  |         |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |
| DWord   | Bit        | Description  |         |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |
| 0   | 0          | <p><b>Slot Group Select</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> </table> <p>This field selects whether slots 15:0 or slots 31:16 are used for bypassed data. Bypassed data includes the antialias alpha, multisample coverage mask, and if the header is not present also includes the X/Y addresses and pixel enables. For 8- and 16-pixel dispatches, SLOTGRP_LO must be selected on every message. For 32-pixel dispatches, this field must be set correctly for each message based on which slots are currently being processed.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">00h</td> <td>SLOTGRP_LO</td> <td>Choose bypassed data for slots 15:0</td> <td style="text-align: center;">All</td> </tr> <tr> <td style="text-align: center;">01h</td> <td>SLOTGRP_HI</td> <td>Choose bypassed data for slots 31:16</td> <td style="text-align: center;">All</td> </tr> </tbody> </table> |         | Project: | All | Value | Name | Description | Project | 00h | SLOTGRP_LO | Choose bypassed data for slots 15:0 | All | 01h | SLOTGRP_HI | Choose bypassed data for slots 31:16 | All |
| Project:  | All        |  |         |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |
| Value   | Name       | Description  | Project |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |
| 00h   | SLOTGRP_LO | Choose bypassed data for slots 15:0  | All     |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |
| 01h   | SLOTGRP_HI | Choose bypassed data for slots 31:16   | All     |          |     |       |      |             |         |     |            |                                     |     |     |            |                                      |     |

## SO\_DECL

| <b>SO_DECL</b>   |  |   |                 |
|--|--|---|-----------------|
| Project:   | CHV, BSW   |   |                 |
| Source:  | RenderCS   |   |                 |
| Size (in bits):  | 16   |   |                 |
| Default Value:   | 0x00000000   |   |                 |
| <p>A list of SO_DECL structures are passed in the 3DSTATE_SO_DECL_LIST command. Each structure specifies either (a) the source and destination of an up-to-4-DWord appending write into an SO buffer, or (b) how many DWords to skip over in the destination SO buffer (i.e., a "hole" where the previous buffer contents are maintained).</p> |  |   |                 |
| DWord  | Bit  | Description   |                 |
| 0  | 15:14  | <b>Reserved</b>   |                 |
|  |  | Project:  | All             |
|  |  | Format:   | MBZ             |
|  | 13:12  | <b>Output Buffer Slot</b>   |                 |
|  |  | Project:  | All             |
|  |  | Format:   | U2 Buffer Index |
|  | This field selects the destination output buffer slot. |   |                 |
|  | 11   | <b>Hole Flag</b>  |                 |
|  |  | Project:  | All             |
|  |  | Format:   | Flag            |
|  |  | If set, the Component Mask field indirectly specifies a number of 32-bit locations to skip over (leave unmodified in memory) in the selected output buffer. The Register Index field is ignored. The only permitted Component Mask values are as follows: |                 |
|  |  | 0x0 No Dwords are skipped over (SO_DECL performs no operation)  |                 |
| 0x1 (X) Skip 1 DWord   |  |   |                 |
| 10   | <b>Reserved</b>  |   |                 |
|  | Project:   | All   |                 |
|  | Format:  | MBZ   |                 |
|  | 9:4  | <b>Register Index</b>   |                 |
|  |  | Project:  | All             |
| Format:  |  | U6 128-bit granular offset into the source vertex read data   |                 |

| <b>SO_DECL</b>  |  |         |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
|---|--|---------|----------|------|---------|-----------------|-------|------------------|---------|----|------------------|--|-------|--------------------|-----|-------|--------------------|-----|-------|--------------------|-----|-------|--------------------|-----|
| <p>If Hole Flag is clear, this field specifies the 128-bit offset into the source vertex data which supplies the source data to be written to the destination buffer, where the individual 32-component destination locations are selected by Component Mask. e.g., Register Index 0 corresponds with the first 128 bits of the data read from the vertex URB entry (as per corresponding Vertex Read Offset state)</p> <p>There is only enough internal storage for the 128-bit vertex header and 32 128-bit vertex attributes.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Value</th> <th style="width: 50%; text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td>[0,32]</td> <td></td> </tr> <tr> <td>0h</td> <td style="text-align: center;"><b>[Default]</b></td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p>It is the responsibility of software to map any API-visible source data specifications (e.g., vertex register number) into 128-bit granular URB read offsets.</p> |  |         | Value    | Name | [0,32]  |                 | 0h    | <b>[Default]</b> |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| Value   | Name   |         |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| [0,32]  |  |         |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| 0h  | <b>[Default]</b>   |         |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| 3:0   | <p><b>Component Mask</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 40%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MASK 4-bit Mask</td> </tr> </tbody> </table> <p>This field is a 4-bit bitmask that selects which contiguous 32-bit component(s) are either written or skipped-over in the destination buffer. If this field is zero the SO_DECL operation is effectively a no-op. No data will be appended to the destination and the destination buffer's write pointer will not be advanced. If the <b>Hole Flag</b> is set, this field (if non-zero) indirectly specifies how much the destination buffer's write pointer should be advanced. See <b>Hole Flag</b> description above for restrictions on this field. If the <b>Hole Flag</b> is clear, this field (if non-zero) selects which source components are to be written to the destination buffer. The components must be contiguous, e.g. YZW is legal, but XZW is not. The selected source components are written to the destination buffer starting at the current write pointer, and then the write pointer is advanced past the written data. E.g., if YZW is specified, the three (YZW) components of the source register will be written to the destination buffer at the current write pointer, and the write pointer will be advanced by 3 DWords.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%; text-align: center;">Value</th> <th style="width: 55%; text-align: center;">Name</th> <th style="width: 25%; text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>0h</td> <td style="text-align: center;"><b>[Default]</b></td> <td></td> </tr> <tr> <td>xxx1b</td> <td>SO_DECL_COMPMASK_X</td> <td>All</td> </tr> <tr> <td>xx1xb</td> <td>SO_DECL_COMPMASK_Y</td> <td>All</td> </tr> <tr> <td>x1xxb</td> <td>SO_DECL_COMPMASK_Z</td> <td>All</td> </tr> <tr> <td>1xxxb</td> <td>SO_DECL_COMPMASK_W</td> <td>All</td> </tr> </tbody> </table> |         | Project: | All  | Format: | MASK 4-bit Mask | Value | Name             | Project | 0h | <b>[Default]</b> |  | xxx1b | SO_DECL_COMPMASK_X | All | xx1xb | SO_DECL_COMPMASK_Y | All | x1xxb | SO_DECL_COMPMASK_Z | All | 1xxxb | SO_DECL_COMPMASK_W | All |
| Project:  | All  |         |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| Format:   | MASK 4-bit Mask  |         |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| Value   | Name   | Project |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| 0h  | <b>[Default]</b>   |         |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| xxx1b   | SO_DECL_COMPMASK_X   | All     |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| xx1xb   | SO_DECL_COMPMASK_Y   | All     |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| x1xxb   | SO_DECL_COMPMASK_Z   | All     |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |
| 1xxxb   | SO_DECL_COMPMASK_W   | All     |          |      |         |                 |       |                  |         |    |                  |  |       |                    |     |       |                    |     |       |                    |     |       |                    |     |

## SO\_DECL\_ENTRY

| <b>SO_DECL_ENTRY</b> |   |   |                    |                    |
|----------------------|---|---|--------------------|--------------------|
| Project:             | CHV, BSW  |   |                    |                    |
| Source:              | RenderCS  |   |                    |                    |
| Size (in bits):      | 64  |   |                    |                    |
| Default Value:       | 0x00000000, 0x00000000  |   |                    |                    |
| DWord                | Bit   | Description   |                    |                    |
| 0..1                 | 63:48   | <b>Stream 3 Decl</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>SO_DECL [CHV, BSW]</td> </tr> </table> This field contains Stream 3 SO_DECL [n] | Format:            | SO_DECL [CHV, BSW] |
|                      | Format:   | SO_DECL [CHV, BSW]  |                    |                    |
|                      | 47:32   | <b>Stream 2 Decl</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>SO_DECL [CHV, BSW]</td> </tr> </table> This field contains Stream 2 SO_DECL [n] | Format:            | SO_DECL [CHV, BSW] |
|                      | Format:   | SO_DECL [CHV, BSW]  |                    |                    |
| 31:16                | <b>Stream 1 Decl</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>SO_DECL [CHV, BSW]</td> </tr> </table> This field contains Stream 1 SO_DECL [n] | Format:   | SO_DECL [CHV, BSW] |                    |
| Format:              | SO_DECL [CHV, BSW]  |   |                    |                    |
| 15:0                 | <b>Stream 0 Decl</b><br><table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Format:</td> <td>SO_DECL [CHV, BSW]</td> </tr> </table> This field contains Stream 0 SO_DECL [n] | Format:   | SO_DECL [CHV, BSW] |                    |
| Format:              | SO_DECL [CHV, BSW]  |   |                    |                    |



## SplitBaseAddress4KByteAligned

| <b>SplitBaseAddress4KByteAligned</b>                                       |                                |                         |
|--|--------------------------------|-------------------------|
| Source:  | PRM                            |                         |
| Size (in bits):  | 64                             |                         |
| Default Value:   | 0x00000000, 0x00000000         |                         |
| Specifies a 64-bit (48-bit canonical) 4K-byte aligned memory base address. |                                |                         |
| DWord  | Bit                            | Description             |
| 0<br><b>Project:</b> All   | 31:12                          | <b>Base Address Low</b> |
|  |                                | Project: All            |
|  | Format: GraphicsAddress[31:12] |                         |
|  | 11:0                           | <b>Reserved</b>         |
| Project: All   |                                |                         |
| Format: MBZ  |                                |                         |
| 1<br><b>Project:</b> CHV, BSW  | 31:0                           | <b>Reserved</b>         |
|  |                                | Project: CHV, BSW       |
| Format: MBZ  |                                |                         |

## SplitBaseAddress64ByteAligned

| <b>SplitBaseAddress64ByteAligned</b>                                       |                        |                               |
|--|------------------------|-------------------------------|
| Source:  | PRM                    |                               |
| Size (in bits):  | 64                     |                               |
| Default Value:   | 0x00000000, 0x00000000 |                               |
| Specifies a 64-bit (48-bit canonical) 64-byte aligned memory base address. |                        |                               |
| DWord  | Bit                    | Description                   |
| 0<br><b>Project:</b> All   | 31:6                   | <b>Base Address Low</b>       |
|  |                        | Project: All                  |
|  |                        | Format: GraphicsAddress[31:6] |
|  | 5:0                    | <b>Reserved</b>               |
| Project: All   |                        |                               |
| Format: MBZ  |                        |                               |
| 1<br><b>Project:</b> CHV, BSW  | 31:0                   | <b>Reserved</b>               |
|  |                        | Project: CHV, BSW             |
|  |                        | Format: MBZ                   |

## SrcRegNum

| <b>SrcRegNum</b>   |                                      |   |       |      |             |       |                                      |  |        |                                      |   |
|--|--------------------------------------|---|-------|------|-------------|-------|--------------------------------------|--|--------|--------------------------------------|---|
| Project:   | CHV, BSW                             |   |       |      |             |       |                                      |  |        |                                      |   |
| Source:  | Eulsa                                |   |       |      |             |       |                                      |  |        |                                      |   |
| Size (in bits):  | 8                                    |   |       |      |             |       |                                      |  |        |                                      |   |
| Default Value:   | 0x00000000                           |   |       |      |             |       |                                      |  |        |                                      |   |
| Description  |                                      | Project   |       |      |             |       |                                      |  |        |                                      |   |
| <p>Register Number The register number for the operand. For a GRF register, is the part of a register address that aligns to a 256-bit (32-byte) boundary. For an ARF register, this field is encoded such that MSBs identify the architecture register type and LSBs provide the register number. An ARF register can only be dst or src0. Any src1 or src2 operands cannot be ARF registers. RegNum and SubRegNum together provide the byte-aligned address for the origin of a register region. RegNum provides bits 12:5 of that address. For one-source and two-source instructions, SubregNum provides bits 4:0. For three-source instructions, the address must be DWord-aligned; SubRegNum provides bits 4:2 of the address and bits 1:0 are zero. This field is present for the direct addressing mode and not present for indirect addressing. This field applies to both source and destination operands.</p> |                                      | CHV, BSW  |       |      |             |       |                                      |  |        |                                      |   |
| DWord  | Bit                                  | Description   |       |      |             |       |                                      |  |        |                                      |   |
| 0  | 7:0                                  | <p><b>Source Register Number</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0-127</td> <td>If {Dst/Src0/Src1/Src2}.RegFile==GRF</td> <td></td> </tr> <tr> <td style="text-align: center;">0-0ffh</td> <td>If {Dst/Src0/Src1/Src2}.RegFile==ARF</td> <td>This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details.</td> </tr> </tbody> </table> | Value | Name | Description | 0-127 | If {Dst/Src0/Src1/Src2}.RegFile==GRF |  | 0-0ffh | If {Dst/Src0/Src1/Src2}.RegFile==ARF | This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details. |
| Value  | Name                                 | Description   |       |      |             |       |                                      |  |        |                                      |   |
| 0-127  | If {Dst/Src0/Src1/Src2}.RegFile==GRF |   |       |      |             |       |                                      |  |        |                                      |   |
| 0-0ffh   | If {Dst/Src0/Src1/Src2}.RegFile==ARF | This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details.   |       |      |             |       |                                      |  |        |                                      |   |

## SrcSubRegNum

| <b>SrcSubRegNum</b>   |                                      |  |       |      |             |      |                                      |  |        |                                      |   |
|---|--------------------------------------|--|-------|------|-------------|------|--------------------------------------|--|--------|--------------------------------------|---|
| Project:  | CHV, BSW                             |  |       |      |             |      |                                      |  |        |                                      |   |
| Source:   | Eulsa                                |  |       |      |             |      |                                      |  |        |                                      |   |
| Size (in bits):   | 5                                    |  |       |      |             |      |                                      |  |        |                                      |   |
| Default Value:  | 0x00000000                           |  |       |      |             |      |                                      |  |        |                                      |   |
| Description   |                                      | Project  |       |      |             |      |                                      |  |        |                                      |   |
| <p>Subregister Number The subregister number for the operand. For a GRF register, is the byte address within a 256-bit (32-byte) register. For an ARF register, determines the sub-register number according to the specified encoding for the given architecture register. RegNum and SubRegNum together provide the byte-aligned address for the origin of a GRF register region. RegNum provides bits 12:5 of that address. For one-source and two-source instructions, SubregNum provides bits 4:0. For three-source instructions, the address must be DWord-aligned; SubRegNum provides bits 4:2 of the address and bits 1:0 are zero.</p> |                                      | CHV, BSW   |       |      |             |      |                                      |  |        |                                      |   |
| Programming Notes   |                                      |  |       |      |             |      |                                      |  |        |                                      |   |
| <p>Note: The recommended instruction syntax uses subregister numbers within the GRF in units of actual data element size, corresponding to the data type used. For example for the F (Float) type, the assembler syntax uses subregister numbers 0 to 7, corresponding to subregister byte addresses of 0 to 28 in steps of 4, the element size.</p>  |                                      |  |       |      |             |      |                                      |  |        |                                      |   |
| DWord   | Bit                                  | Description  |       |      |             |      |                                      |  |        |                                      |   |
| 0   | 4:0                                  | <p><b>Source Sub Register Number</b></p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0-31</td> <td>If {Dst/Src0/Src1/Src2}.RegFile==GRF</td> <td></td> </tr> <tr> <td>0-0ffh</td> <td>If {Dst/Src0/Src1/Src2}.RegFile==ARF</td> <td>This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details.</td> </tr> </tbody> </table> | Value | Name | Description | 0-31 | If {Dst/Src0/Src1/Src2}.RegFile==GRF |  | 0-0ffh | If {Dst/Src0/Src1/Src2}.RegFile==ARF | This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details. |
| Value   | Name                                 | Description  |       |      |             |      |                                      |  |        |                                      |   |
| 0-31  | If {Dst/Src0/Src1/Src2}.RegFile==GRF |  |       |      |             |      |                                      |  |        |                                      |   |
| 0-0ffh  | If {Dst/Src0/Src1/Src2}.RegFile==ARF | This field is used to encode the architecture register as well as providing the register number. See GEN Execution Environment chapter for details.  |       |      |             |      |                                      |  |        |                                      |   |

## Stateless Binding Table Index Message Descriptor Control Field

| <b>MDC_STATELESS - Stateless Binding Table Index Message Descriptor Control Field</b>             |                             |   |             |
|---|-----------------------------|---|-------------|
| Project:  | CHV, BSW                    |   |             |
| Source:   | PRM                         |   |             |
| Size (in bits):   | 8                           |   |             |
| Default Value:  | 0x000000FF                  |   |             |
| DWord   | Bit                         | Description   |             |
| 0   | 7:0                         | <b>Binding Table Index</b>  |             |
|   |                             | Project:  | All         |
|   |                             | Format:   | Enumeration |
|   |                             | Specifies the message is Stateless  |             |
| Value   | Name                        | Description   | Project     |
| 0FFh  | A32_A64<br><b>[Default]</b> | Specifies a A32 or A64 Stateless access that is locally coherent (coherent within a thread group) | All         |
| 0FDh  | A32_A64_NC                  | Specifies a A32 or A64 Stateless access that is non-coherent (coherent within a thread).          | All         |
| Others  | Reserved                    | Ignored   | All         |
| Restriction   |                             |   |             |
| When using A32_A64_NC, SW must ensure that 2 threads do not both access the same cache line (64B) |                             |   |             |

## Stateless Block Message Header

| <b>MH_A32_GO - Stateless Block Message Header</b>  |  |  |
|--|--|--|
| Project:   | CHV, BSW   |  |
| Source:  | DataPort 0   |  |
| Size (in bits):  | 256  |  |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |
| DWord  | Bit  | Description  |
| 0-1  | 63:0   | <b>Reserved</b>  |
|  |  | Project: All   |
|  |  | Format: Ignore   |
|  |  | Ignored  |
| 2  | 31:0   | <b>Global Offset</b>   |
|  |  | Project: All   |
|  |  | Format: U32  |
|  |  | Specifies the global element index into the buffer, in units of Owords, Dwords, or Bytes (depending on the message). |
|  |  | <b>Programming Notes</b>   |
| If the address offset calculated with the Buffer Base Address and Global Offset is greater than the PTSS size or the GeneralStateBufferSize, then the access is Out-of-Bounds. |  |  |
| 3  | 31:0   | <b>Per Thread Scratch Space</b>  |
|  |  | Project: All   |
|  |  | Format: MHC_PTSS [CHV, BSW]  |
|  |  | Specifies amount of scratch space used by this thread, for Stateless bounds checking.                                |
| 4  | 31:0   | <b>Reserved</b>  |
|  |  | Project: All   |
|  |  | Format: Ignore   |
|  |  | Ignored  |
| 5  | 31:0   | <b>Buffer Base Address</b>   |
|  |  | Project: All   |
|  |  | Format: MHC_A32_BBA [CHV, BSW]   |
|  |  | Specifies the surface address offset page [31:10] for A32 stateless messages.  |
| 6-7  | 63:0   | <b>Reserved</b>  |
|  |  | Project: All   |

## MH\_A32\_GO - Stateless Block Message Header

|  |         |        |
|--|---------|--------|
|  | Format: | Ignore |
|  | Ignored |        |

## Stateless Surface Message Header

| <b>MH1_A32 - Stateless Surface Message Header</b> |   |   |
|---|---|---|
| Project:  | CHV, BSW  |   |
| Source:   | DataPort 1  |   |
| Size (in bits):                                   | 256   |   |
| Default Value:                                    | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |   |
| DWord   | Bit   | Description   |
| 0-4   | 159:0   | <b>Reserved</b>   |
|   |   | Project: All  |
|   |   | Format: Ignore  |
|   |   | Ignored   |
| 5   | 31:0  | <b>Buffer Base Address</b>  |
|   |   | Project: All  |
|   |   | Format: MHC_A32_BBA [CHV, BSW]  |
|   |   | Specifies the surface address offset page [31:10] for A32 stateless messages. |
| 6-7   | 63:0  | <b>Reserved</b>   |
|   |   | Project: All  |
|   |   | Format: Ignore  |
|   |   | Ignored   |



## Stateless Surface Pixel Mask Message Header

| <b>MH1_A32_PSM - Stateless Surface Pixel Mask Message Header</b> |  |   |
|--|--|---|
| Project:   | CHV, BSW   |   |
| Source:  | DataPort 1   |   |
| Size (in bits):  | 256  |   |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x0000FFFF |   |
| DWord  | Bit  | Description   |
| 0-4  | 159:0  | <b>Reserved</b>   |
|  |  | Format: Ignore<br>Ignored   |
| 5  | 31:0   | <b>Buffer Base Address</b>  |
|  |  | Format: MHC_A32_BBA [CHV, BSW]<br>Specifies the surface address offset page [31:10] for A32 stateless messages. |
| 6  | 31:0   | <b>Reserved</b>   |
|  |  | Format: Ignore<br>Ignored   |
| 7  | 31:0   | <b>Pixel Sample Mask</b>  |
|  |  | Project:  |
|  |  | Format: MHC_PSM<br>Specifies the 16-bit Pixel/Sample Mask used with SIMD16 and SIMD8 surfaces.                  |

## Subset Atomic Integer Trinary Operation Message Descriptor Control Field

| <b>MDC_AOP3S - Subset Atomic Integer Trinary Operation Message Descriptor Control Field</b> |                            |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
|---|----------------------------|---|---------|----------|-----|--|--|---------|-------------|--|--|--|--|--|--|-------|------|-------------|---------|-----|----------------------------|--|-----|--------|----------|---------|-----|
| Project:  | CHV, BSW                   |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| Source:   | PRM                        |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| Size (in bits):   | 4                          |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| Default Value:  | 0x0000000E                 |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| DWord   | Bit                        | Description   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| 0   | 3:0                        | <b>Atomic Integer Operation Type</b><br><table border="1"> <tr> <td>Project:</td> <td colspan="3">All</td> </tr> <tr> <td>Format:</td> <td colspan="3">Enumeration</td> </tr> <tr> <td colspan="4">Specifies the atomic integer trinary operation to be performed</td> </tr> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> <tr> <td>0Eh</td> <td>AOP_CMPWR <b>[Default]</b></td> <td>new_dst = (src0 == old_dst) ? src1 : old_dst</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </table> |         | Project: | All |  |  | Format: | Enumeration |  |  | Specifies the atomic integer trinary operation to be performed |  |  |  | Value | Name | Description | Project | 0Eh | AOP_CMPWR <b>[Default]</b> | new_dst = (src0 == old_dst) ? src1 : old_dst | All | Others | Reserved | Ignored | All |
| Project:  | All                        |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| Format:   | Enumeration                |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| Specifies the atomic integer trinary operation to be performed                              |                            |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| Value   | Name                       | Description   | Project |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| 0Eh   | AOP_CMPWR <b>[Default]</b> | new_dst = (src0 == old_dst) ? src1 : old_dst  | All     |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| Others  | Reserved                   | Ignored   | All     |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| <b>Programming Notes</b>  |                            |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |
| When Return Data Control is set, old_dst is returned.                                       |                            |   |         |          |     |  |  |         |             |  |  |  |  |  |  |       |      |             |         |     |                            |  |     |        |          |         |     |

## Subset Reversed SIMD Mode 2 Message Descriptor Control Field

| <b>MDC_SM2RS - Subset Reversed SIMD Mode 2 Message Descriptor Control Field</b> |                        |  |             |
|---|------------------------|--|-------------|
| Project:  | CHV, BSW               |  |             |
| Source:   | PRM                    |  |             |
| Size (in bits):   | 1                      |  |             |
| Default Value:  | 0x00000001             |  |             |
| DWord   | Bit                    | Description  |             |
| 0   | 0                      | <b>SIMD Mode</b>   |             |
|   |                        | Project:   | All         |
|   |                        | Format:  | Enumeration |
|   |                        | Specifies the SIMD mode of the message (number of slots processed) |             |
| Value   | Name                   | Description  | Project     |
| 0h  | Reserved               | Not used   | All         |
| 01h   | SIMD8 <b>[Default]</b> | SIMD8  | All         |

## Subset SIMD Mode 2 Message Descriptor Control Field

| <b>MDC_SM2S - Subset SIMD Mode 2 Message Descriptor Control Field</b> |     |  |                |
|---|-----|--|----------------|
| Project:  |     | CHV, BSW   |                |
| Source:   |     | PRM  |                |
| Size (in bits):   |     | 1  |                |
| Default Value:  |     | 0x00000000   |                |
| DWord   | Bit | Description  |                |
| 0   | 0   | <b>SIMD Mode</b>   |                |
|   |     | Project:   | All            |
|   |     | Format:  | Enumeration    |
|   |     | Specifies the SIMD mode of the message (number of slots processed) |                |
|   |     | <b>Value</b>   | <b>Name</b>    |
|   |     | <b>Description</b>   | <b>Project</b> |
|   |     | 00h  | SIMD8          |
|   |     | 01h  | Reserved       |
|   |     |  | Ignored        |
|   |     |  | All            |

## Subset SIMD Mode 3 Message Descriptor Control Field

| <b>MDC_SM3S - Subset SIMD Mode 3 Message Descriptor Control Field</b> |            |  |             |             |         |
|---|------------|--|-------------|-------------|---------|
| Project:  | CHV, BSW   |  |             |             |         |
| Source:   | PRM        |  |             |             |         |
| Size (in bits):   | 2          |  |             |             |         |
| Default Value:  | 0x00000000 |  |             |             |         |
| DWord   | Bit        | Description  |             |             |         |
| 0   | 1:0        | <b>SIMD Mode</b>   |             |             |         |
|   |            | Project:   | All         |             |         |
|   |            | Format:  | Enumeration |             |         |
|   |            | Specifies the SIMD mode of the message (number of slots processed) |             |             |         |
|   |            | Value  | Name        | Description | Project |
|   |            | 00h  | SIMD4x2     | SIMD4x2     |         |
|   |            | 01h  | Reserved    | Ignored     |         |
| 02h   | SIMD8      | SIMD8  |             |             |         |
| 03h   | Reserved   | Ignored  |             |             |         |

## Subspan Render Target Message Header Control

| <b>MHC_RT_SUBSPAN - Subspan Render Target Message Header Control</b> |   |   |          |         |         |
|--|---|---|----------|---------|---------|
| Project:   | CHV, BSW  |   |          |         |         |
| Source:  | PRM   |   |          |         |         |
| Size (in bits):  | 32  |   |          |         |         |
| Default Value:   | 0x00000000  |   |          |         |         |
| DWord  | Bit   | Description   |          |         |         |
| 0  | 31:16   | <b>Y</b>  |          |         |         |
|  |   | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>Y coordinate for upper-left pixel of this subspan</p> | Project: | All     | Format: |
|  | Project:  | All   |          |         |         |
|  | Format:   | U16   |          |         |         |
| 15:0   | <b>X</b>  |   |          |         |         |
|  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U16</td> </tr> </table> <p>X coordinate for upper-left pixel of this subspan</p> | Project:  | All      | Format: | U16     |
| Project:   | All   |   |          |         |         |
| Format:  | U16   |   |          |         |         |

## Surface Binding Table Index Message Descriptor Control Field

| <b>MDC_BTS - Surface Binding Table Index Message Descriptor Control Field</b> |            |   |             |
|---|------------|---|-------------|
| Project:  | CHV, BSW   |   |             |
| Source:   | PRM        |   |             |
| Size (in bits):   | 8          |   |             |
| Default Value:  | 0x00000000 |   |             |
| DWord   | Bit        | Description   |             |
| 0   | 7:0        | <b>Binding Table Index</b>  |             |
|   |            | Project:  | All         |
|   |            | Format:   | Enumeration |
|   |            | Specifies the Binding Table index for the message, which must be a Surface State Model. |             |
| Value   | Name       | Description   | Project     |
| 00h-0EFh  | BTS        | Index of Binding Table State Surfaces   | All         |
| F0h-0FBh  | Reserved   | Reserved for future use   | All         |
| 0FCh  | Reserved   | Reserved for future use   | CHV, BSW    |
| Others  | Reserved   | Ignored   | All         |

## Surface or Stateless Binding Table Index Message Descriptor Control Field

| MDC_BTS_A32 - Surface or Stateless Binding Table Index Message Descriptor Control Field |            |   |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
|---|------------|---|-------------|------|-------------|---------|----------|-----|---------------------------------------|-----|----------|----------|-------------------------|-----|------|----------|-------------------------|----------|------|---------|---|-----|------|------------|--|-----|--------|----------|---------|-----|--|
| Project:  | CHV, BSW   |   |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| Source:   | PRM        |   |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| Size (in bits):   | 8          |   |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| Default Value:  | 0x00000000 |   |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| DWord   | Bit        | Description   |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| 0   | 7:0        | <b>Binding Table Index</b>  |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
|   |            | Project:  | All         |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
|   |            | Format:   | Enumeration |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
|   |            | Specifies the surface for the message, either Surface State Model or Stateless.   |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
|   |            | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h-0EFh</td> <td>BTS</td> <td>Index of Binding Table State Surfaces</td> <td>All</td> </tr> <tr> <td>F0h-0FBh</td> <td>Reserved</td> <td>Reserved for future use</td> <td>All</td> </tr> <tr> <td>0FCh</td> <td>Reserved</td> <td>Reserved for future use</td> <td>CHV, BSW</td> </tr> <tr> <td>0FFh</td> <td>A32_A64</td> <td>Specifies a A32 or A64 Stateless access that is locally coherent (coherent within a thread group)</td> <td>All</td> </tr> <tr> <td>0FDh</td> <td>A32_A64_NC</td> <td>Specifies a A32 or A64 Stateless access that is non-coherent (coherent within a thread).</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </tbody> </table> | Value       | Name | Description | Project | 00h-0EFh | BTS | Index of Binding Table State Surfaces | All | F0h-0FBh | Reserved | Reserved for future use | All | 0FCh | Reserved | Reserved for future use | CHV, BSW | 0FFh | A32_A64 | Specifies a A32 or A64 Stateless access that is locally coherent (coherent within a thread group) | All | 0FDh | A32_A64_NC | Specifies a A32 or A64 Stateless access that is non-coherent (coherent within a thread). | All | Others | Reserved | Ignored | All |  |
| Value   | Name       | Description   | Project     |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| 00h-0EFh  | BTS        | Index of Binding Table State Surfaces   | All         |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| F0h-0FBh  | Reserved   | Reserved for future use   | All         |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| 0FCh  | Reserved   | Reserved for future use   | CHV, BSW    |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| 0FFh  | A32_A64    | Specifies a A32 or A64 Stateless access that is locally coherent (coherent within a thread group)   | All         |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| 0FDh  | A32_A64_NC | Specifies a A32 or A64 Stateless access that is non-coherent (coherent within a thread).  | All         |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
| Others  | Reserved   | Ignored   | All         |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
|   |            | <b>Restriction</b>  |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |
|   |            | When using A32_A64_NC, SW must ensure that 2 threads do not both access the same cache line (64B)   |             |      |             |         |          |     |                                       |     |          |          |                         |     |      |          |                         |          |      |         |   |     |      |            |  |     |        |          |         |     |  |



## Surface Pixel Mask Message Header

| <b>MH1_BTS_PSM - Surface Pixel Mask Message Header</b> |   |   |          |        |         |         |
|--|---|---|----------|--------|---------|---------|
| Project:   | CHV, BSW  |   |          |        |         |         |
| Source:  | DataPort 1  |   |          |        |         |         |
| Size (in bits):  | 256   |   |          |        |         |         |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x0000FFFF |   |          |        |         |         |
| DWord  | Bit   | Description   |          |        |         |         |
| 0-6  | 223:0   | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Format:</td> <td>Ignore</td> </tr> </table> <p>Ignored</p>  | Format:  | Ignore |         |         |
| Format:  | Ignore  |   |          |        |         |         |
| 7  | 31:0  | <p><b>Pixel Sample Mask</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Project:</td> <td></td> </tr> <tr> <td>Format:</td> <td>MHC_PSM</td> </tr> </table> <p>Specifies the 16-bit Pixel/Sample Mask used with SIMD16 and SIMD8 surfaces.</p> | Project: |        | Format: | MHC_PSM |
| Project:   |   |   |          |        |         |         |
| Format:  | MHC_PSM   |   |          |        |         |         |

## SW Generated BINDING\_TABLE\_STATE

| SW Generated BINDING_TABLE_STATE  |            |  |                   |         |
|---|------------|--|-------------------|---------|
| Project:  | CHV, BSW   |  |                   |         |
| Source:   | PRM        |  |                   |         |
| Size (in bits):   | 32         |  |                   |         |
| Default Value:  | 0x00000000 |  |                   |         |
| DWord   | Bit        | Description  |                   |         |
| 0   | 31:5       | <b>Surface State Pointer</b><br>Format: SurfaceStateOffset[31:5]<br>This 32-byte aligned address points to a surface state block. This pointer is relative to the <b>Surface State Base Address</b>  |                   |         |
|   |            | <table border="1"> <thead> <tr> <th>Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>Bit 5 of this pointer must be zero (i.e. <b>Surface State Pointer</b> must be 64-byte aligned).</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Programming Notes | Project |
| Programming Notes   | Project    |  |                   |         |
| Bit 5 of this pointer must be zero (i.e. <b>Surface State Pointer</b> must be 64-byte aligned). | CHV, BSW   |  |                   |         |
|   | 4:0        | <b>Reserved</b><br>Format: MBZ   |                   |         |
|   |            |  |                   |         |

## SZ OM S0A SIMD8 Render Target Data Payload

| MDP_RTW_ZMA8 - SZ OM S0A SIMD8 Render Target Data Payload |  |   |          |     |         |                         |
|---|--|---|----------|-----|---------|-------------------------|
| Project:  | All  |   |          |     |         |                         |
| Source:   | PRM  |   |          |     |         |                         |
| Size (in bits):   | 1792   |   |          |     |         |                         |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, |   |          |     |         |                         |
| DWord   | Bit  | Description   |          |     |         |                         |
| 0.0-0.7   | 255:0  | <b>Source 0 Alpha</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source 0 Alpha  | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |   |          |     |         |                         |
| 1.0-1.7   | 255:0  | <b>oMask</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDPR_OMASK [CHV, BSW]</td> </tr> </table> Slots [7:0] oMask. Upper half ignored. | Project: | All | Format: | MDPR_OMASK [CHV, BSW]   |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDPR_OMASK [CHV, BSW]  |   |          |     |         |                         |
| 2.0-2.7   | 255:0  | <b>Red</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Red                        | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |   |          |     |         |                         |
| 3.0-3.7   | 255:0  | <b>Green</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Green                    | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |   |          |     |         |                         |
| 4.0-4.7   | 255:0  | <b>Blue</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table>                                       | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |   |          |     |         |                         |

## MDP\_RTW\_ZMA8 - SZ OM S0A SIMD8 Render Target Data Payload

|         |       |                          |                         |
|---------|-------|--------------------------|-------------------------|
|         |       | Slots [7:0] Blue         |                         |
| 5.0-5.7 | 255:0 | <b>Alpha</b>             |                         |
|         |       | Project:                 | All                     |
|         |       | Format:                  | MDP_DW_SIMD8 [CHV, BSW] |
|         |       | Slots [7:0] Alpha        |                         |
| 6.0-6.7 | 255:0 | <b>Source Depth</b>      |                         |
|         |       | Project:                 | All                     |
|         |       | Format:                  | MDP_DW_SIMD8 [CHV, BSW] |
|         |       | Slots [7:0] Source Depth |                         |



| MDP_RTW_ZMA16 - SZ OM S0A SIMD16 Render Target Data Payload |       |                                  |
|---|-------|----------------------------------|
| 5.0-6.7   | 511:0 | <b>Green</b>                     |
|   |       | Project: All                     |
|   |       | Format: MDP_DW_SIMD16 [CHV, BSW] |
|   |       | Slots [15:0] Green               |
| 7.0-8.7   | 511:0 | <b>Blue</b>                      |
|   |       | Project: All                     |
|   |       | Format: MDP_DW_SIMD16 [CHV, BSW] |
|   |       | Slots [15:0] Blue                |
| 9.0-10.7  | 511:0 | <b>Alpha</b>                     |
|   |       | Project: All                     |
|   |       | Format: MDP_DW_SIMD16 [CHV, BSW] |
|   |       | Slots [15:0] Alpha               |
| 11.0-12.7   | 511:0 | <b>Source Depth</b>              |
|   |       | Project: All                     |
|   |       | Format: MDP_DW_SIMD16 [CHV, BSW] |
|   |       | Slots [15:0] Source Depth        |



| MDP_RTW_ZM8DS - SZ OM SIMD8 Dual Source Render Target Data Payload |                         |  |          |     |         |                         |
|--|-------------------------|--|----------|-----|---------|-------------------------|
| 4.0-4.7  | 255:0                   | <p><b>Src0 Alpha</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> <p>Slots[7:0] or [15:8] of Src0 Alpha</p>      | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |     |         |                         |
| 5.0-5.7  | 255:0                   | <p><b>Src1 Red</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> <p>Slots[7:0] or [15:8] of Src1 Red</p>          | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |     |         |                         |
| 6.0-6.7  | 255:0                   | <p><b>Src1 Green</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> <p>Slots[7:0] or [15:8] of Src1 Green</p>      | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |     |         |                         |
| 7.0-7.7  | 255:0                   | <p><b>Src1 Blue</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> <p>Slots[7:0] or [15:8] of Src1 Blue</p>        | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |     |         |                         |
| 8.0-8.7  | 255:0                   | <p><b>Src1 Alpha</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> <p>Slots[7:0] or [15:8] of Src1 Alpha</p>      | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |     |         |                         |
| 9.0-9.7  | 255:0                   | <p><b>Source Depth</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> <p>Slots [7:0] or [15:8] of Source Depth</p> | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |     |         |                         |



## SZ OM SIMD8 Render Target Data Payload

| MDP_RTW_ZM8 - SZ OM SIMD8 Render Target Data Payload |   |   |          |     |         |                         |
|--|---|---|----------|-----|---------|-------------------------|
| Project:   | All   |   |          |     |         |                         |
| Source:  | PRM   |   |          |     |         |                         |
| Size (in bits):                                      | 1536  |   |          |     |         |                         |
| Default Value:                                       | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |     |         |                         |
| DWord  | Bit   | Description   |          |     |         |                         |
| 0.0-0.7  | 255:0   | <b>oMask</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDPR_OMASK [CHV, BSW]</td> </tr> </table> Slots [7:0] oMask. Upper half ignored. | Project: | All | Format: | MDPR_OMASK [CHV, BSW]   |
| Project:   | All   |   |          |     |         |                         |
| Format:  | MDPR_OMASK [CHV, BSW]   |   |          |     |         |                         |
| 1.0-1.7  | 255:0   | <b>Red</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Red                        | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All   |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW]   |   |          |     |         |                         |
| 2.0-2.7  | 255:0   | <b>Green</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Green                    | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All   |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW]   |   |          |     |         |                         |
| 3.0-3.7  | 255:0   | <b>Blue</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue                      | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All   |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW]   |   |          |     |         |                         |
| 4.0-4.7  | 255:0   | <b>Alpha</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Alpha                    | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All   |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW]   |   |          |     |         |                         |

| MDP_RTW_ZM8 - SZ OM SIMD8 Render Target Data Payload |                         |  |          |     |         |                         |
|--|-------------------------|--|----------|-----|---------|-------------------------|
| 5.0-5.7  | 255:0                   | <b>Source Depth</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source Depth | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |  |          |     |         |                         |



| <b>MDP_RTW_ZM16 - SZ OM SIMD16 Render Target Data Payload</b> |                         |   |          |     |         |                         |
|---|-------------------------|---|----------|-----|---------|-------------------------|
| 4.0-4.7   | 255:0                   | <b>Green[15:7]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Green               | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 5.0-5.7   | 255:0                   | <b>Blue[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue                   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 6.0-6.7   | 255:0                   | <b>Blue[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Blue                 | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 7.0-7.7   | 255:0                   | <b>Alpha[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Alpha                 | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 8.0-8.7   | 255:0                   | <b>Alpha[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Alpha               | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 9.0-9.7   | 255:0                   | <b>Source Depth[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source Depth   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 10.0-10.7   | 255:0                   | <b>Source Depth[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Source Depth | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |   |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |

## SZ S0A SIMD8 Render Target Data Payload

| MDP_RTW_ZA8 - SZ S0A SIMD8 Render Target Data Payload |  |  |          |     |         |                         |
|---|--|--|----------|-----|---------|-------------------------|
| Project:  | All  |  |          |     |         |                         |
| Source:   | PRM  |  |          |     |         |                         |
| Size (in bits):                                       | 1536   |  |          |     |         |                         |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |         |                         |
| DWord   | Bit  | Description  |          |     |         |                         |
| 0.0-0.7   | 255:0  | <b>Source 0 Alpha</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source 0 Alpha | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |  |          |     |         |                         |
| 1.0-1.7   | 255:0  | <b>Red</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Red                       | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |  |          |     |         |                         |
| 2.0-2.7   | 255:0  | <b>Green</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Green                   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |  |          |     |         |                         |
| 3.0-3.7   | 255:0  | <b>Blue</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue                     | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |  |          |     |         |                         |
| 4.0-4.7   | 255:0  | <b>Alpha</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Alpha                   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All  |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]  |  |          |     |         |                         |

| MDP_RTW_ZA8 - SZ S0A SIMD8 Render Target Data Payload |                         |  |          |     |         |                         |
|---|-------------------------|--|----------|-----|---------|-------------------------|
| 5.0-5.7   | 255:0                   | <b>Source Depth</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source Depth | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All                     |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW] |  |          |     |         |                         |



| <b>MDP_RTW_ZA16 - SZ S0A SIMD16 Render Target Data Payload</b> |                         |   |          |     |         |                         |
|--|-------------------------|---|----------|-----|---------|-------------------------|
|  |                         | Slots [15:8] Red  |          |     |         |                         |
| 4.0-4.7  | 255:0                   | <b>Green[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Green               | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 5.0-5.7  | 255:0                   | <b>Green[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Green             | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 6.0-6.7  | 255:0                   | <b>Blue[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue                 | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 7.0-7.7  | 255:0                   | <b>Blue[15:7]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Blue               | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 8.0-8.7  | 255:0                   | <b>Alpha[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Alpha               | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 9.0-9.7  | 255:0                   | <b>Alpha[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Alpha             | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 10.0-10.7  | 255:0                   | <b>Source Depth[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source Depth | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 11.0-11.7  | 255:0                   | <b>Source Depth[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> </table>  | Project: | All |         |                         |
| Project:   | All                     |   |          |     |         |                         |



## MDP\_RTW\_ZA16 - SZ S0A SIMD16 Render Target Data Payload

|  |  |                           |                         |
|--|--|---------------------------|-------------------------|
|  |  | Format:                   | MDP_DW_SIMD8 [CHV, BSW] |
|  |  | Slots [15:8] Source Depth |                         |

## SZ SIMD8 Dual Source Render Target Data Payload

| MDP_RTW_Z8DS - SZ SIMD8 Dual Source Render Target Data Payload |   |  |          |     |         |                         |
|--|---|--|----------|-----|---------|-------------------------|
| Project:   | All   |  |          |     |         |                         |
| Source:  | PRM   |  |          |     |         |                         |
| Size (in bits):  | 2304  |  |          |     |         |                         |
| Default Value:   | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |         |                         |
| DWord  | Bit   | Description  |          |     |         |                         |
| 0.0-0.7  | 255:0   | <b>Src0 Red</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots[7:0] or [15:8] of Src0 Red     | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All   |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 1.0-1.7  | 255:0   | <b>Src0 Green</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots[7:0] or [15:8] of Src0 Green | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All   |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 2.0-2.7  | 255:0   | <b>Src0 Blue</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots[7:0] or [15:8] of Src0 Blue   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All   |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 3.0-3.7  | 255:0   | <b>Src0 Alpha</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots[7:0] or [15:8] of Src0 Alpha | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All   |  |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |

| MDP_RTW_Z8DS - SZ SIMD8 Dual Source Render Target Data Payload |       |                                       |
|--|-------|---------------------------------------|
| 4.0-4.7  | 255:0 | <b>Src1 Red</b>                       |
|  |       | Project: All                          |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]       |
|  |       | Slots[7:0] or [15:8] of Src1 Red      |
| 5.0-5.7  | 255:0 | <b>Src1 Green</b>                     |
|  |       | Project: All                          |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]       |
|  |       | Slots[7:0] or [15:8] of Src1 Green    |
| 6.0-6.7  | 255:0 | <b>Src1 Blue</b>                      |
|  |       | Project: All                          |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]       |
|  |       | Slots[7:0] or [15:8] of Src1 Blue     |
| 7.0-7.7  | 255:0 | <b>Src1 Alpha</b>                     |
|  |       | Project: All                          |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]       |
|  |       | Slots[7:0] or [15:8] of Src1 Alpha    |
| 8.0-8.7  | 255:0 | <b>Source Depth</b>                   |
|  |       | Project: All                          |
|  |       | Format: MDP_DW_SIMD8 [CHV, BSW]       |
|  |       | Slots [7:0] or [15:8] of Source Depth |

## SZ SIMD8 Render Target Data Payload

| <b>MDP_RTW_Z8 - SZ SIMD8 Render Target Data Payload</b> |   |  |          |     |         |                         |
|---|---|--|----------|-----|---------|-------------------------|
| Project:  | All   |  |          |     |         |                         |
| Source:   | PRM   |  |          |     |         |                         |
| Size (in bits):   | 1280  |  |          |     |         |                         |
| Default Value:  | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000, 0x00000000, 0x00000000 |  |          |     |         |                         |
| DWord   | Bit   | Description  |          |     |         |                         |
| 0.0-0.7   | 255:0   | <b>Red</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Red                   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 1.0-1.7   | 255:0   | <b>Green</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Green               | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 2.0-2.7   | 255:0   | <b>Blue</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue                 | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 3.0-3.7   | 255:0   | <b>Alpha</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Alpha               | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |
| 4.0-4.7   | 255:0   | <b>Source Depth</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source Depth | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:  | All   |  |          |     |         |                         |
| Format:   | MDP_DW_SIMD8 [CHV, BSW]   |  |          |     |         |                         |



| MDP_RTW_Z16 - SZ SIMD16 Render Target Data Payload |                         |   |          |     |         |                         |
|--|-------------------------|---|----------|-----|---------|-------------------------|
| 4.0-4.7  | 255:0                   | <b>Blue[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Blue                   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 5.0-5.7  | 255:0                   | <b>Blue[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Blue                 | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 6.0-6.7  | 255:0                   | <b>Alpha[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Alpha                 | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 7.0-7.7  | 255:0                   | <b>Alpha[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Alpha               | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 8.0-8.7  | 255:0                   | <b>Source Depth[7:0]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [7:0] Source Depth   | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |
| 9.0-9.7  | 255:0                   | <b>Source Depth[15:8]</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDP_DW_SIMD8 [CHV, BSW]</td> </tr> </table> Slots [15:8] Source Depth | Project: | All | Format: | MDP_DW_SIMD8 [CHV, BSW] |
| Project:   | All                     |   |          |     |         |                         |
| Format:  | MDP_DW_SIMD8 [CHV, BSW] |   |          |     |         |                         |

## Thread Spawn Message Descriptor

| Thread Spawn Message Descriptor   |  |   |   |  |
|---|--|---|---|--|
| Project:  | All  |   |   |  |
| Source:   | RenderCS   |   |   |  |
| Size (in bits):   | 32   |   |   |  |
| Default Value:  | 0x00000000   |   |   |  |
| DWord   | Bit  | Description   |   |  |
| 0   | 31:20  | <b>Reserved</b>   |   |  |
|   |  | Format:   | MBZ   |  |
|   | 19   | <b>Header Present</b>   |   |  |
|   |  | Format:   | MBZ   |  |
|   |  | <b>Programming Notes</b>  |   |  |
|   |  |   | This bit MBZ for all Thread Spawner messages. |  |
|   | 18:5   | <b>Reserved</b>   |   |  |
|   |  | Format:   | MBZ   |  |
|   | 4  | <b>Resource Select</b>  |   |  |
|   |  | This field specifies the resource associated with the action taken by the Opcode. |   |  |
| <b>Value</b>  |  | <b>Name</b>   | <b>Description</b>                            |  |
| 0   |  | Spawn Child   | Spawn a Child Thread                          |  |
| 1   |  | Spawn Root  | Spawn a Root Thread                           |  |
| 0   |  | Dereference Resource  | The URB Handle is Dereferenced                |  |
| 1   | Keep Resource  | The URBHandle is NOT Dereferenced   |   |  |
| 3:2   | <b>Reserved</b>  |   |   |  |
|   | Format:  | MBZ   |   |  |
| 1   | <b>Requester Type</b>  |   |   |  |
|   | This field indicates whether the requesting thread is a root thread or a child thread. If it is a root thread, when Opcode is 0, FF managed resources are dereferenced. If it is a child thread and Opcode is 0, no resource is dereferenced; no action is required by the TS. |   |   |  |
|   | <b>Value</b>   | <b>Name</b>   |   |  |
| 0   | Root Thread  |   |   |  |
| 1   | Child Thread   |   |   |  |
| 0   | <b>Opcode</b>  |   |   |  |
| Indicates the operation performed by the message. A root thread must terminate with a message to TS (Opcode == 0 and EOT == 1). A child thread should also terminate with such a message. A thread cannot terminate with an Opcode of "spawn thread". |  |   |   |  |

## Thread Spawn Message Descriptor

| Value | Name                 | Description                 |
|-------|----------------------|-----------------------------|
| 0     | Dereference Resource | also used for end of thread |
| 1     | Spawn Thread         |                             |



## TileW SIMD8 Data Control Dword

| MDCD_TILEW - TileW SIMD8 Data Control Dword                   |            |                 |
|---|------------|-----------------|
| Project:  | CHV, BSW   |                 |
| Source:   | PRM        |                 |
| Size (in bits):   | 32         |                 |
| Default Value:  | 0x00000000 |                 |
| DWord   | Bit        | Description     |
| 0   | 31:8       | <b>Reserved</b> |
|   |            | Project: All    |
|   |            | Format: Ignore  |
|   | Ignored    |                 |
|   | 7:0        | <b>Red</b>      |
|   |            | Project: All    |
| Format: U8  |            |                 |
| Specifies the value of the red channel to be read or written. |            |                 |

## TileW SIMD8 Data Payload

| <b>MDP_TILEW_SIMD8 - TileW SIMD8 Data Payload</b> |  |   |          |     |         |                       |
|---|--|---|----------|-----|---------|-----------------------|
| Project:  | CHV, BSW   |   |          |     |         |                       |
| Source:   | PRM  |   |          |     |         |                       |
| Size (in bits):                                   | 256  |   |          |     |         |                       |
| Default Value:                                    | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000 |   |          |     |         |                       |
| DWord   | Bit  | Description   |          |     |         |                       |
| 0.0   | 31:0   | <b>Red Slot0</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCD_TileW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot 0 red channel data</p> | Project: | All | Format: | MDCD_TileW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                       |
| Format:   | MDCD_TileW [CHV, BSW]  |   |          |     |         |                       |
| 0.1   | 31:0   | <b>Red Slot1</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCD_TileW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot 1 red channel data</p> | Project: | All | Format: | MDCD_TileW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                       |
| Format:   | MDCD_TileW [CHV, BSW]  |   |          |     |         |                       |
| 0.2   | 31:0   | <b>Red Slot2</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCD_TileW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot 2 red channel data</p> | Project: | All | Format: | MDCD_TileW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                       |
| Format:   | MDCD_TileW [CHV, BSW]  |   |          |     |         |                       |
| 0.3   | 31:0   | <b>Red Slot3</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCD_TileW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot 3 red channel data</p> | Project: | All | Format: | MDCD_TileW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                       |
| Format:   | MDCD_TileW [CHV, BSW]  |   |          |     |         |                       |
| 0.4   | 31:0   | <b>Red Slot4</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCD_TileW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot 4 red channel data</p> | Project: | All | Format: | MDCD_TileW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                       |
| Format:   | MDCD_TileW [CHV, BSW]  |   |          |     |         |                       |
| 0.5   | 31:0   | <b>Red Slot5</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCD_TileW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot 5 red channel data</p> | Project: | All | Format: | MDCD_TileW [CHV, BSW] |
| Project:  | All  |   |          |     |         |                       |
| Format:   | MDCD_TileW [CHV, BSW]  |   |          |     |         |                       |

| <b>MDP_TILEW_SIMD8 - TileW SIMD8 Data Payload</b> |                       |  |          |     |         |                       |
|---|-----------------------|--|----------|-----|---------|-----------------------|
| 0.6   | 31:0                  | <p><b>Red Slot6</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCD_TileW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot 6 red channel data</p> | Project: | All | Format: | MDCD_TileW [CHV, BSW] |
| Project:  | All                   |  |          |     |         |                       |
| Format:   | MDCD_TileW [CHV, BSW] |  |          |     |         |                       |
| 0.7   | 31:0                  | <p><b>Red Slot7</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MDCD_TileW [CHV, BSW]</td> </tr> </table> <p>Specifies the Slot 7 red channel data</p> | Project: | All | Format: | MDCD_TileW [CHV, BSW] |
| Project:  | All                   |  |          |     |         |                       |
| Format:   | MDCD_TileW [CHV, BSW] |  |          |     |         |                       |

## Transpose Message Header

| <b>MH_T - Transpose Message Header</b> |   |   |
|--|---|---|
| Project:                               | CHV, BSW  |   |
| Source:                                | DataPort 1  |   |
| Size (in bits):                        | 256   |   |
| Default Value:                         | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |   |
| DWord                                  | Bit   | Description   |
| 0                                      | 31:0  | <b>X Offset</b>   |
|  |   | Project: All  |
|  |   | Format: S31   |
|  |   | X offset (in bytes) of the upper left corner of the block into the surface.       |
|  |   | <b>Programming Notes</b>  |
|  |   | This field must be a multiple of the Block Width in bytes. Must be DWORD aligned. |
| 1                                      | 31:0  | <b>Y Offset</b>   |
|  |   | Project: All  |
|  |   | Format: S31   |
|  |   | Y offset (in rows) of the upper left corner of the block into the surface.        |
|  |   | <b>Programming Notes</b>  |
|  |   | This field must be a multiple of the Block Height.                                |
| 2                                      | 31:0  | <b>Block Dimensions</b>   |
|  |   | Project: All  |
|  |   | Format: MHC_BDIM [CHV, BSW]   |
|  |   | The height and width of the block to transpose.                                   |
| 3-7                                    | 159:0   | <b>Reserved</b>   |
|  |   | Project: All  |
|  |   | Format: Ignore  |
|  |   | Ignored   |

## Untyped Write Channel Mask Message Descriptor Control Field

| <b>MDC_UW_CMASK - Untyped Write Channel Mask Message Descriptor Control Field</b> |                       |   |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
|---|-----------------------|---|---------|----------|-----|---------|-------------|-------|------|-------------|---------|-----|-----------------------|--|-----|-----|-----|-----------------------------------|-----|-----|----|----------------------------|-----|-----|---|-----------------|-----|--------|----------|---------|-----|
| Project:  | CHV, BSW              |   |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| Source:   | PRM                   |   |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| Size (in bits):   | 4                     |   |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| Default Value:  | 0x00000000            |   |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| DWord   | Bit                   | Description   |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| 0   | 3:0                   | <b>Mask</b><br><table border="1" style="width: 100%;"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enumeration</td> </tr> </table> <p>For untyped surface write messages, indicates which channels are included in the message payload and written to the surface.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>00h</td> <td>RGBA <b>[Default]</b></td> <td>Red, Green, Blue, and Alpha are included</td> <td>All</td> </tr> <tr> <td>08h</td> <td>RGB</td> <td>Red, Green, and Blue are included</td> <td>All</td> </tr> <tr> <td>0Ch</td> <td>RG</td> <td>Red and Green are included</td> <td>All</td> </tr> <tr> <td>0Eh</td> <td>R</td> <td>Red is included</td> <td>All</td> </tr> <tr> <td>Others</td> <td>Reserved</td> <td>Ignored</td> <td>All</td> </tr> </tbody> </table> |         | Project: | All | Format: | Enumeration | Value | Name | Description | Project | 00h | RGBA <b>[Default]</b> | Red, Green, Blue, and Alpha are included | All | 08h | RGB | Red, Green, and Blue are included | All | 0Ch | RG | Red and Green are included | All | 0Eh | R | Red is included | All | Others | Reserved | Ignored | All |
| Project:  | All                   |   |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| Format:   | Enumeration           |   |         |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| Value   | Name                  | Description   | Project |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| 00h   | RGBA <b>[Default]</b> | Red, Green, Blue, and Alpha are included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| 08h   | RGB                   | Red, Green, and Blue are included   | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| 0Ch   | RG                    | Red and Green are included  | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| 0Eh   | R                     | Red is included   | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |
| Others  | Reserved              | Ignored   | All     |          |     |         |             |       |      |             |         |     |                       |  |     |     |     |                                   |     |     |    |                            |     |     |   |                 |     |        |          |         |     |

## Upper Oword Block Data Payload

| <b>MDP_OW1U - Upper Oword Block Data Payload</b>   |       |  |
|--|-------|--|
| Project: CHV, BSW  |       |  |
| Source: PRM  |       |  |
| Size (in bits): 256  |       |  |
| Default Value: 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000 |       |  |
| DWord  | Bit   | Description                            |
| 0.0-0.3  | 127:0 | <b>Reserved</b>                        |
|  |       | Project: All                           |
|  |       | Format: Ignore                         |
|  |       | Ignored                                |
| 0.4-0.7  | 127:0 | <b>Oword</b>                           |
|  |       | Project: All                           |
|  |       | Format: U128                           |
|  |       | Specifies the upper Oword data element |

## VC1

| VC1             |  |  |  |     |
|-----------------|--|--|--|-----|
| Project:        | CHV, BSW   |  |  |     |
| Source:         | VideoCS  |  |  |     |
| Size (in bits): | 16   |  |  |     |
| Default Value:  | 0x00000000   |  |  |     |
| DWord           | Bit  | Description  |  |     |
| 0               | 15:8   | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 100px;"></td><td>MBZ</td></tr></table> |  | MBZ |
|                 |  | MBZ  |  |     |
|                 | 7  | <b>Syncmarker Error</b><br>This flag indicates missing sync marker SEs coded in the bit-stream.  |  |     |
|                 | 6  | <b>Mbmode SE Error</b><br>This flag indicates inconsistent Macroblock SEs coded in the bit-stream.   |  |     |
|                 | 5  | <b>Transformtype SE Error</b><br>This flag indicates inconsistent transform type SEs coded in the bit-stream.  |  |     |
|                 | 4  | <b>Coefficient Error</b><br>This flag indicates inconsistent Coefficient SEs coded in the bit-stream.  |  |     |
|                 | 3  | <b>Motion Vector SE Error</b><br>This flag indicates inconsistent Motion Vector SEs coded in the bit-stream.   |  |     |
|                 | 2  | <b>Coded Block Pattern CY SE Error</b><br>This flag indicates inconsistent CBPCY SEs coded in the bit-stream.  |  |     |
|                 | 1  | <b>Mquant Error</b><br>This flag indicates inconsistent MQUANT SEs coded in the bit-stream.  |  |     |
| 0               | <b>MB Concealment Flag</b><br>. Each pulse from this flag indicates one MB is concealed by hardware. |  |  |     |

## VCS Hardware-Detected Error Bit Definitions

| VCS Hardware-Detected Error Bit Definitions   |   |  |      |             |   |  |                            |
|---|---|--|------|-------------|---|--|----------------------------|
| Project:  | CHV, BSW  |  |      |             |   |  |                            |
| Source:   | VideoCS   |  |      |             |   |  |                            |
| Size (in bits):   | 16  |  |      |             |   |  |                            |
| Default Value:  | 0x00000000  |  |      |             |   |  |                            |
| DWord   | Bit   | Description  |      |             |   |  |                            |
| 0   | 15:3  | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>  |      | MBZ         |   |  |                            |
|   |   | MBZ  |      |             |   |  |                            |
|   | 2   | <b>Command Privilege Violation Error</b><br>Project: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>CHV, BSW</td></tr></table><br>This bit is set if a command classified as privileged is parsed in a non-privileged batch buffer. The command will be converted to a NOOP and parsing will continue. |      | CHV, BSW    |   |  |                            |
|   |   | CHV, BSW   |      |             |   |  |                            |
| 1   | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>   |  | MBZ  |             |   |  |                            |
|   | MBZ   |  |      |             |   |  |                            |
| 0   | <b>Instruction Error</b><br>This bit is set when the Renderer Instruction Parser detects an error while parsing an instruction. Instruction errors include: <ul style="list-style-type: none"> <li>Client ID value (Bits 31:29 of the Header) is not supported (only MI, 2D and 3D are supported).</li> <li>Defeatured MI Instruction Opcodes:</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 20%;">Name</th> <th style="width: 65%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td> </td> <td>Instruction Error detected</td> </tr> </tbody> </table> | Value  | Name | Description | 1 |  | Instruction Error detected |
| Value   | Name  | Description  |      |             |   |  |                            |
| 1   |   | Instruction Error detected   |      |             |   |  |                            |
| <b>Programming Notes</b>  |   |  |      |             |   |  |                            |
| This error indications cannot be cleared except by reset (i.e., it is a fatal error). |   |  |      |             |   |  |                            |



## VEBOX\_CAPTURE\_PIPE\_STATE

| VEBOX_CAPTURE_PIPE_STATE   |   |  |          |         |         |           |           |
|--|---|--|----------|---------|---------|-----------|-----------|
| Project:   | CHV, BSW  |  |          |         |         |           |           |
| Source:  | VideoEnhancementCS  |  |          |         |         |           |           |
| Size (in bits):  | 96  |  |          |         |         |           |           |
| Default Value:   | 0x0F12644B, 0xA064AF0A, 0xE6FD4000  |  |          |         |         |           |           |
| This command contains variables for controlling Demosaic and the White Balance Statistics. |   |  |          |         |         |           |           |
| DWord  | Bit   | Description  |          |         |         |           |           |
| 0  | 31:30   | <b>Reserved</b>  |          |         |         |           |           |
|  |   | Project:   | CHV, BSW |         |         |           |           |
|  |   | Format:  | MBZ      |         |         |           |           |
|  | 29:24   | <b>Good Pixel Threshold</b>  |          |         |         |           |           |
|  |   | Format:  | U6       |         |         |           |           |
|  |   | The difference threshold between adjacent pixels for a pixel to be considered "good".  |          |         |         |           |           |
|  |   | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>Fh</td> <td>[Default]</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Value    | Name    | Project | Fh        | [Default] |
|  | Value   | Name   | Project  |         |         |           |           |
|  | Fh  | [Default]  | CHV, BSW |         |         |           |           |
|  | 23  | <b>Reserved</b>  |          |         |         |           |           |
| Format:  |   | MBZ  |          |         |         |           |           |
| 22:20  | <b>Shift Min Cost</b>   |  |          |         |         |           |           |
|  | Default Value:  | 1h   |          |         |         |           |           |
|  | Format:   | U3   |          |         |         |           |           |
| The amount to shift the H2/V2 versions of min_cost.  |   |  |          |         |         |           |           |
| 19:16  | <b>Scale For Average Min Cost</b>   |  |          |         |         |           |           |
|  | Default Value:  | 2h   |          |         |         |           |           |
|  | Project:  | CHV, BSW   |          |         |         |           |           |
|  | Format:   | U4   |          |         |         |           |           |
| The amount to scale the min_cost difference during the Avg interpolation decision          |   |  |          |         |         |           |           |
| 15:8   | <b>Average Color Threshold</b>  |  |          |         |         |           |           |
|  | Format:   | U8   |          |         |         |           |           |
|  | The threshold between two colors in a pixel for the Avg interpolation to be considered.   |  |          |         |         |           |           |
|  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>64h</td> <td>[Default]</td> <td>CHV, BSW</td> </tr> </tbody> </table> | Value  | Name     | Project | 64h     | [Default] | CHV, BSW  |
| Value  | Name  | Project  |          |         |         |           |           |
| 64h  | [Default]   | CHV, BSW   |          |         |         |           |           |
| 7:0  | <b>Average Min Cost Threshold</b>   |  |          |         |         |           |           |
|  | Default Value:  | 4Bh  |          |         |         |           |           |
|  | Project:  | CHV, BSW   |          |         |         |           |           |

| <b>VEBOX_CAPTURE_PIPE_STATE</b>  |   |                |  |   |  |  |                |   |          |
|--|---|----------------|--|---|--|--|----------------|---|----------|
|  | <table border="1"> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">The threshold for the H and V Min_cost beyond which the Avg interpolation will be used.</td> </tr> </table>   | Format:        | U8   | The threshold for the H and V Min_cost beyond which the Avg interpolation will be used.   |  |  |                |   |          |
| Format:  | U8  |                |  |   |  |  |                |   |          |
| The threshold for the H and V Min_cost beyond which the Avg interpolation will be used.  |   |                |  |   |  |  |                |   |          |
| 1  | <b>31:28 Scale For Min Cost</b><br><table border="1"> <tr> <td>Default Value:</td> <td>Ah</td> </tr> <tr> <td colspan="2">The amount to scale the min_cost difference during the confidence check.</td> </tr> </table>  | Default Value: | Ah   | The amount to scale the min_cost difference during the confidence check.  |  |  |                |   |          |
|  | Default Value:  | Ah             |  |   |  |  |                |   |          |
|  | The amount to scale the min_cost difference during the confidence check.  |                |  |   |  |  |                |   |          |
|  | <b>27:24 Reserved</b><br><table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project:       | CHV, BSW   | Format:   | MBZ  |  |                |   |          |
|  | Project:  | CHV, BSW       |  |   |  |  |                |   |          |
|  | Format:   | MBZ            |  |   |  |  |                |   |          |
|  | <b>23:16 Bad Color Threshold 1</b><br><table border="1"> <tr> <td>Default Value:</td> <td>64h</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Color value threshold used during the bad pixel check.</td> </tr> </table>  | Default Value: | 64h  | Format:   | U8   | Color value threshold used during the bad pixel check. |                |   |          |
| Default Value:   | 64h   |                |  |   |  |  |                |   |          |
| Format:  | U8  |                |  |   |  |  |                |   |          |
| Color value threshold used during the bad pixel check.   |   |                |  |   |  |  |                |   |          |
| <b>15:8 Bad Color Threshold 2</b><br><table border="1"> <tr> <td>Default Value:</td> <td>AFh</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> <tr> <td colspan="2">Color value threshold used during the bad pixel check.</td> </tr> </table>  | Default Value:  | AFh            | Format:  | U8  | Color value threshold used during the bad pixel check. |  |                |   |          |
| Default Value:   | AFh   |                |  |   |  |  |                |   |          |
| Format:  | U8  |                |  |   |  |  |                |   |          |
| Color value threshold used during the bad pixel check.   |   |                |  |   |  |  |                |   |          |
| <b>7:4 Reserved</b><br><table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project:  | CHV, BSW       | Format:  | MBZ   |  |  |                |   |          |
| Project:   | CHV, BSW  |                |  |   |  |  |                |   |          |
| Format:  | MBZ   |                |  |   |  |  |                |   |          |
| <b>3:0 Bad Color Threshold 3</b><br><table border="1"> <tr> <td>Default Value:</td> <td>Ah</td> </tr> <tr> <td>Format:</td> <td>U4</td> </tr> <tr> <td colspan="2">Color value threshold used during the bad pixel check.</td> </tr> </table>  | Default Value:  | Ah             | Format:  | U4  | Color value threshold used during the bad pixel check. |  |                |   |          |
| Default Value:   | Ah  |                |  |   |  |  |                |   |          |
| Format:  | U4  |                |  |   |  |  |                |   |          |
| Color value threshold used during the bad pixel check.   |   |                |  |   |  |  |                |   |          |
| 2  | <b>31:24 Y Bright Value</b><br><table border="1"> <tr> <td>Default Value:</td> <td>E6h</td> </tr> <tr> <td colspan="2">The whitepoint threshold percentile in the Y histogram. Any pixel with Y value above this could be a whitepoint. This is the larger of the calculated Ybright value and the Ythreshold value, which is the minimum Y required to be considered a white point.</td> </tr> <tr> <td style="text-align: center;"><b>Programming Notes</b></td> <td style="text-align: center;"><b>Project</b></td> </tr> <tr> <td>"0000" is appended to the LSBs before comparing with Y.</td> <td>CHV, BSW</td> </tr> </table> | Default Value: | E6h  | The whitepoint threshold percentile in the Y histogram. Any pixel with Y value above this could be a whitepoint. This is the larger of the calculated Ybright value and the Ythreshold value, which is the minimum Y required to be considered a white point. |  | <b>Programming Notes</b>                               | <b>Project</b> | "0000" is appended to the LSBs before comparing with Y. | CHV, BSW |
|  | Default Value:  | E6h            |  |   |  |  |                |   |          |
| The whitepoint threshold percentile in the Y histogram. Any pixel with Y value above this could be a whitepoint. This is the larger of the calculated Ybright value and the Ythreshold value, which is the minimum Y required to be considered a white point.  |   |                |  |   |  |  |                |   |          |
| <b>Programming Notes</b>   | <b>Project</b>  |                |  |   |  |  |                |   |          |
| "0000" is appended to the LSBs before comparing with Y.  | CHV, BSW  |                |  |   |  |  |                |   |          |
| <b>23:16 Y Outlier Value</b><br><table border="1"> <tr> <td>Default Value:</td> <td>FDh</td> </tr> <tr> <td colspan="2">The outlier threshold percentile in the Y histogram. Any pixel with Y value above this either clipped or an outlier in the image. These points will not be included in the white patch</td> </tr> </table> | Default Value:  | FDh            | The outlier threshold percentile in the Y histogram. Any pixel with Y value above this either clipped or an outlier in the image. These points will not be included in the white patch |   |  |  |                |   |          |
| Default Value:   | FDh   |                |  |   |  |  |                |   |          |
| The outlier threshold percentile in the Y histogram. Any pixel with Y value above this either clipped or an outlier in the image. These points will not be included in the white patch   |   |                |  |   |  |  |                |   |          |

| <b>VEBOX_CAPTURE_PIPE_STATE</b>                         |  |  |                   |         |   |          |  |                                      |    |                  |                   |
|---|--|--|-------------------|---------|---|----------|--|--------------------------------------|----|------------------|-------------------|
|   |  | calculation.<br><table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Programming Notes</th> <th style="text-align: center;">Project</th> </tr> </thead> <tbody> <tr> <td>"0000" is appended to the LSBs before comparing with Y.</td> <td>CHV, BSW</td> </tr> </tbody> </table>  | Programming Notes | Project | "0000" is appended to the LSBs before comparing with Y. | CHV, BSW |  |                                      |    |                  |                   |
| Programming Notes                                       | Project  |  |                   |         |   |          |  |                                      |    |                  |                   |
| "0000" is appended to the LSBs before comparing with Y. | CHV, BSW   |  |                   |         |   |          |  |                                      |    |                  |                   |
| 15:8  | <b>UV Threshold Value</b><br>The value denotes the maximum threshold of the ratio between U+V to Y can have to be considered a gray point. | <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td>[255,0]</td> <td></td> <td>Encode a value from 255/256 to 0/256</td> </tr> <tr> <td>64</td> <td><b>[Default]</b></td> <td><math>0.25 * 255 = 64</math></td> </tr> </tbody> </table> | Value             | Name    | Description   | [255,0]  |  | Encode a value from 255/256 to 0/256 | 64 | <b>[Default]</b> | $0.25 * 255 = 64$ |
| Value   | Name   | Description  |                   |         |   |          |  |                                      |    |                  |                   |
| [255,0]   |  | Encode a value from 255/256 to 0/256   |                   |         |   |          |  |                                      |    |                  |                   |
| 64  | <b>[Default]</b>   | $0.25 * 255 = 64$  |                   |         |   |          |  |                                      |    |                  |                   |
| 7:0   | <b>Reserved</b><br>Project:<br>Format:   | CHV, BSW<br>MBZ  |                   |         |   |          |  |                                      |    |                  |                   |

## VEBOX\_Ch\_Dir\_Filter\_Coefficient

| VEBOX_Ch_Dir_Filter_Coefficient |   |   |                     |
|---------------------------------|---|---|---------------------|
| Project:                        | All   |   |                     |
| Source:                         | PRM   |   |                     |
| Size (in bits):                 | 64  |   |                     |
| Default Value:                  | 0x00000000, 0x00000000  |   |                     |
| DWord                           | Bit   | Description   |                     |
| 0..1                            | 63:56   | <b>Filter Coefficient[7]</b><br>Format: <table border="1"><tr><td>S1.6 2's Complement</td></tr></table><br><b>Range:</b> [-2, +2) | S1.6 2's Complement |
|                                 | S1.6 2's Complement   |   |                     |
|                                 | 55:48   | <b>Filter Coefficient[6]</b><br>Format: <table border="1"><tr><td>S1.6 2's Complement</td></tr></table><br><b>Range:</b> [-2, +2) | S1.6 2's Complement |
|                                 | S1.6 2's Complement   |   |                     |
|                                 | 47:40   | <b>Filter Coefficient[5]</b><br>Format: <table border="1"><tr><td>S1.6 2's Complement</td></tr></table><br><b>Range:</b> [-2, +2) | S1.6 2's Complement |
|                                 | S1.6 2's Complement   |   |                     |
|                                 | 39:32   | <b>Filter Coefficient[4]</b><br>Format: <table border="1"><tr><td>S1.6 2's Complement</td></tr></table><br><b>Range:</b> [-2, +2) | S1.6 2's Complement |
|                                 | S1.6 2's Complement   |   |                     |
|                                 | 31:24   | <b>Filter Coefficient[3]</b><br>Format: <table border="1"><tr><td>S1.6 2's Complement</td></tr></table><br><b>Range:</b> [-2, +2) | S1.6 2's Complement |
| S1.6 2's Complement             |   |   |                     |
| 23:16                           | <b>Filter Coefficient[2]</b><br>Format: <table border="1"><tr><td>S1.6 2's Complement</td></tr></table><br><b>Range:</b> [-2, +2) | S1.6 2's Complement   |                     |
| S1.6 2's Complement             |   |   |                     |
| 15:8                            | <b>Filter Coefficient[1]</b><br>Format: <table border="1"><tr><td>S1.6 2's Complement</td></tr></table><br><b>Range:</b> [-2, +2) | S1.6 2's Complement   |                     |
| S1.6 2's Complement             |   |   |                     |
| 7:0                             | <b>Filter Coefficient[0]</b><br>Format: <table border="1"><tr><td>S1.6 2's Complement</td></tr></table><br><b>Range:</b> [-2, +2) | S1.6 2's Complement   |                     |
| S1.6 2's Complement             |   |   |                     |



## VEBOX\_DNDI\_STATE

| VEBOX_DNDI_STATE   |  |   |       |        |           |
|--|--|---|-------|--------|-----------|
| Project:   | CHV, BSW   |   |       |        |           |
| Source:  | VideoEnhancementCS   |   |       |        |           |
| Size (in bits):  | 320  |   |       |        |           |
| Default Value:   | 0x00000800, 0x00000000, 0x04950100, 0x407D0000, 0x00000000, 0x00000000, 0x00000000, 0x105064A5, 0x00000000, 0x00000000                     |   |       |        |           |
| <p>This state table is used by the <i>Denoise and Deinterlacer Functions</i>. When DN is used in 12-bit mode with the Capture Pipe all the DN pixel thresholds (<b>temporal_diff_th</b>, <b>temp_diff_low</b>, <b>good_neighbor_th</b>) are compared with the 8 MSBs of the 12-bit pixels.</p> |  |   |       |        |           |
| DWord  | Bit  | Description   |       |        |           |
| 0  | 31:24  | <b>Denoise STAD Threshold</b>   |       |        |           |
|  |  | Format: U8<br>Threshold for denoise sum of temporal absolute differences.   |       |        |           |
|  | 23:16  | <b>Denoise Maximum History</b>  |       |        |           |
|  |  | Format: U8<br>Maximum allowed value for denoise history.  |       |        |           |
|  |  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>[128,240]</td> <td></td> </tr> </tbody> </table> | Value | Name   | [128,240] |
|  | Value  | Name  |       |        |           |
| [128,240]  |  |   |       |        |           |
| 15:12  | <b>Reserved</b>  |   |       |        |           |
|  | Format: MBZ  |   |       |        |           |
| 11:8   | <b>Denoise History increase</b>  |   |       |        |           |
|  | Default Value: 8h  |   |       |        |           |
|  | Format: U4<br>Amount that denoise_history is increased MAX:15  |   |       |        |           |
| 7:0  | <b>Denoise ASD Threshold</b>   |   |       |        |           |
|  | Format: U8<br>Threshold for denoise absolute sum of differences.   |   |       |        |           |
|  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>[0,63]</td> <td></td> </tr> </tbody> </table> | Value   | Name  | [0,63] |           |
| Value  | Name   |   |       |        |           |
| [0,63]   |  |   |       |        |           |
| 1  | 31:30  | <b>Reserved</b>   |       |        |           |
|  |  | Format: MBZ   |       |        |           |
|  | 29:24  | <b>Temporal Difference Threshold</b>  |       |        |           |
|  |  | Format: U6  |       |        |           |

| <b>VEBOX_DNDI_STATE</b> |           |  |         |     |       |      |             |       |           |                                    |
|-------------------------|-----------|--|---------|-----|-------|------|-------------|-------|-----------|------------------------------------|
|                         |           | <p style="text-align: center;"><b>Programming Notes</b></p> <p><b>Temporal Difference Threshold minus Low Temporal Difference Threshold</b> must be larger than 0 and less than or equal to 16, except when both thresholds are set to 0.</p>  |         |     |       |      |             |       |           |                                    |
|                         | 23:22     | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format: | MBZ |       |      |             |       |           |                                    |
| Format:                 | MBZ       |  |         |     |       |      |             |       |           |                                    |
|                         | 21:16     | <p><b>Low Temporal Difference Threshold</b></p> <table border="1"> <tr> <td>Format:</td> <td>U6</td> </tr> </table> <p style="text-align: center;"><b>Programming Notes</b></p> <p><b>Temporal Difference Threshold minus Low Temporal Difference Threshold</b> must be larger than 0 and less than or equal to 16, except when both thresholds are set to 0.</p>  | Format: | U6  |       |      |             |       |           |                                    |
| Format:                 | U6        |  |         |     |       |      |             |       |           |                                    |
|                         | 15:13     | <p><b>STMM C2</b></p> <table border="1"> <tr> <td>Format:</td> <td>U3</td> </tr> </table> <p>Bias for divisor in STMM equation.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>[0,7]</td> <td></td> <td>Representing values [1,8]</td> </tr> </tbody> </table>  | Format: | U3  | Value | Name | Description | [0,7] |           | Representing values [1,8]          |
| Format:                 | U3        |  |         |     |       |      |             |       |           |                                    |
| Value                   | Name      | Description  |         |     |       |      |             |       |           |                                    |
| [0,7]                   |           | Representing values [1,8]  |         |     |       |      |             |       |           |                                    |
|                         | 12:8      | <p><b>Denoise Moving Pixel Threshold</b></p> <table border="1"> <tr> <td>Format:</td> <td>U5</td> </tr> </table> <p>Threshold for number of moving pixels to declare a block to be moving.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>[0,16]</td> <td></td> </tr> </tbody> </table>  | Format: | U5  | Value | Name | [0,16]      |       |           |                                    |
| Format:                 | U5        |  |         |     |       |      |             |       |           |                                    |
| Value                   | Name      |  |         |     |       |      |             |       |           |                                    |
| [0,16]                  |           |  |         |     |       |      |             |       |           |                                    |
|                         | 7:0       | <p><b>Denoise Threshold for Sum of Complexity Measure</b></p> <table border="1"> <tr> <td>Format:</td> <td>U8</td> </tr> </table>  | Format: | U8  |       |      |             |       |           |                                    |
| Format:                 | U8        |  |         |     |       |      |             |       |           |                                    |
| 2                       | 31:30     | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Format: | MBZ |       |      |             |       |           |                                    |
| Format:                 | MBZ       |  |         |     |       |      |             |       |           |                                    |
|                         | 29:24     | <p><b>Good Neighbor Threshold</b></p> <table border="1"> <tr> <td>Format:</td> <td>U6</td> </tr> </table> <p>Difference from current pixel for neighboring pixels to be considered a good neighbor.<br/>MAX:63</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>[Default]</td> <td>Depending on GNE of previous frame</td> </tr> </tbody> </table> | Format: | U6  | Value | Name | Description | 4     | [Default] | Depending on GNE of previous frame |
| Format:                 | U6        |  |         |     |       |      |             |       |           |                                    |
| Value                   | Name      | Description  |         |     |       |      |             |       |           |                                    |
| 4                       | [Default] | Depending on GNE of previous frame   |         |     |       |      |             |       |           |                                    |
|                         | 23:20     | <p><b>Content Adaptive Threshold Slope</b></p> <table border="1"> <tr> <td>Format:</td> <td>U4</td> </tr> </table> <p>Determines the slope of the Content Adaptive Threshold. +1 added internally to get CAT_slope.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>9</td> <td>[Default]</td> <td>CAT_slope value = 10</td> </tr> </tbody> </table>          | Format: | U4  | Value | Name | Description | 9     | [Default] | CAT_slope value = 10               |
| Format:                 | U4        |  |         |     |       |      |             |       |           |                                    |
| Value                   | Name      | Description  |         |     |       |      |             |       |           |                                    |
| 9                       | [Default] | CAT_slope value = 10   |         |     |       |      |             |       |           |                                    |

| <b>VEBOX_DNDI_STATE</b> |  |  |                |         |         |        |   |   |   |   |
|-------------------------|--|--|----------------|---------|---------|--------|---|---|---|---|
|                         | 19:16  | <b>SAD Tight Threshold</b><br><table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: center;">5</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U4</td> </tr> </table>   | Default Value: | 5       | Format: | U4     |   |   |   |   |
|                         | Default Value:   | 5  |                |         |         |        |   |   |   |   |
|                         | Format:  | U4   |                |         |         |        |   |   |   |   |
|                         | 15:14  | <b>Smooth MV Threshold</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">U2</td> </tr> </table>   | Format:        | U2      |         |        |   |   |   |   |
|                         | Format:  | U2   |                |         |         |        |   |   |   |   |
|                         | 13:12  | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">MBZ</td> </tr> </table>   | Format:        | MBZ     |         |        |   |   |   |   |
|                         | Format:  | MBZ  |                |         |         |        |   |   |   |   |
|                         | 11:8   | <b>Block Noise Estimate Edge Threshold</b><br><table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U4</td> </tr> </table> <p>Threshold for detecting an edge in block noise estimate. MAX:15</p>  | Default Value: | 1       | Format: | U4     |   |   |   |   |
|                         | Default Value:   | 1  |                |         |         |        |   |   |   |   |
|                         | Format:  | U4   |                |         |         |        |   |   |   |   |
| 7:0                     | <b>Block Noise Estimate Noise Threshold</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>Threshold for noise maximum/minimum.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">[0,31]</td> <td></td> </tr> </tbody> </table> | Format:  | U8             | Value   | Name    | [0,31] |   |   |   |   |
| Format:                 | U8   |  |                |         |         |        |   |   |   |   |
| Value                   | Name   |  |                |         |         |        |   |   |   |   |
| [0,31]                  |  |  |                |         |         |        |   |   |   |   |
| 3                       | 31   | <b>STMM Blending Constant Select</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">U1</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Use the blending constant for small values of STMM for stmm_md_th</td> </tr> <tr> <td style="text-align: center;">1</td> <td>Use the blending constant for large values of STMM for stmm_md_th</td> </tr> </tbody> </table> | Format:        | U1      | Value   | Name   | 0 | Use the blending constant for small values of STMM for stmm_md_th | 1 | Use the blending constant for large values of STMM for stmm_md_th |
|                         | Format:  | U1   |                |         |         |        |   |   |   |   |
|                         | Value  | Name   |                |         |         |        |   |   |   |   |
|                         | 0  | Use the blending constant for small values of STMM for stmm_md_th  |                |         |         |        |   |   |   |   |
|                         | 1  | Use the blending constant for large values of STMM for stmm_md_th  |                |         |         |        |   |   |   |   |
|                         | 30:24  | <b>Blending constant across time for large values of STMM</b><br><table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: center;">64</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U7</td> </tr> </table>   | Default Value: | 64      | Format: | U7     |   |   |   |   |
|                         | Default Value:   | 64   |                |         |         |        |   |   |   |   |
|                         | Format:  | U7   |                |         |         |        |   |   |   |   |
| 23:16                   | <b>Blending constant across time for small values of STMM</b><br><table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: center;">125</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table>  | Default Value:   | 125            | Format: | U8      |        |   |   |   |   |
| Default Value:          | 125  |  |                |         |         |        |   |   |   |   |
| Format:                 | U8   |  |                |         |         |        |   |   |   |   |
| 15:14                   | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">MBZ</td> </tr> </table>   | Format:  | MBZ            |         |         |        |   |   |   |   |
| Format:                 | MBZ  |  |                |         |         |        |   |   |   |   |
| 13:8                    | <b>Multiplier for VECM</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">U6</td> </tr> </table> <p>Determines the strength of the vertical edge complexity measure.</p>   | Format:  | U6             |         |         |        |   |   |   |   |
| Format:                 | U6   |  |                |         |         |        |   |   |   |   |
| 7:0                     | <b>Maximum STMM</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table>  | Format:  | U8             |         |         |        |   |   |   |   |
| Format:                 | U8   |  |                |         |         |        |   |   |   |   |



| <b>VEBOX_DNDI_STATE</b>   |   |   |      |            |   |            |   |            |   |          |
|---|---|---|------|------------|---|------------|---|------------|---|----------|
|   | Largest allowed STMM in blending equations  |   |      |            |   |            |   |            |   |          |
| 4   | <b>31:24 Minimum STMM</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 150px;"></td><td style="width: 50px; text-align: center;">U8</td></tr></table><br>Smallest allowed STMM in blending equations                                       |   | U8   |            |   |            |   |            |   |          |
|   |   | U8  |      |            |   |            |   |            |   |          |
|   | <b>23:22 STMM Shift Down</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 150px;"></td><td style="width: 50px; text-align: center;">U2</td></tr></table><br>Amount to shift STMM down (quantize to fewer bits)                             |   | U2   |            |   |            |   |            |   |          |
|   |   | U2  |      |            |   |            |   |            |   |          |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Value</th> <th style="width: 50%; text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Shift by 4</td> </tr> <tr> <td style="text-align: center;">1</td> <td>Shift by 5</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Shift by 6</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Reserved</td> </tr> </tbody> </table> | Value   | Name  | 0    | Shift by 4 | 1 | Shift by 5 | 2 | Shift by 6 | 3 | Reserved |
| Value   | Name  |   |      |            |   |            |   |            |   |          |
| 0   | Shift by 4  |   |      |            |   |            |   |            |   |          |
| 1   | Shift by 5  |   |      |            |   |            |   |            |   |          |
| 2   | Shift by 6  |   |      |            |   |            |   |            |   |          |
| 3   | Reserved  |   |      |            |   |            |   |            |   |          |
| <b>21:20 STMM Shift Up</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 150px;"></td><td style="width: 50px; text-align: center;">U2</td></tr></table><br>Amount to shift STMM up (set range).   |   | U2  |      |            |   |            |   |            |   |          |
|   | U2  |   |      |            |   |            |   |            |   |          |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Value</th> <th style="width: 50%; text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Shift by 6</td> </tr> <tr> <td style="text-align: center;">1</td> <td>Shift by 7</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Shift by 8</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Reserved</td> </tr> </tbody> </table> | Value   | Name  | 0    | Shift by 6 | 1 | Shift by 7 | 2 | Shift by 8 | 3 | Reserved |
| Value   | Name  |   |      |            |   |            |   |            |   |          |
| 0   | Shift by 6  |   |      |            |   |            |   |            |   |          |
| 1   | Shift by 7  |   |      |            |   |            |   |            |   |          |
| 2   | Shift by 8  |   |      |            |   |            |   |            |   |          |
| 3   | Reserved  |   |      |            |   |            |   |            |   |          |
| 19:16   | <b>STMM Output Shift</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 150px;"></td><td style="width: 50px; text-align: center;">U4</td></tr></table><br>Amount to shift output of STMM blend equation                                      |   | U4   |            |   |            |   |            |   |          |
|   |   | U4  |      |            |   |            |   |            |   |          |
|   | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Value</th> <th style="width: 50%; text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">[0, 16]</td> <td></td> </tr> </tbody> </table> | Value   | Name | [0, 16]    |   |            |   |            |   |          |
| Value   | Name  |   |      |            |   |            |   |            |   |          |
| [0, 16]   |   |   |      |            |   |            |   |            |   |          |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; color: blue;">Programming Notes</th> </tr> </thead> <tbody> <tr> <td>The value of this field must satisfy the following equation: <math>stmm\_max - stmm\_min = 2^{\wedge} stmm\_output\_shift</math></td> </tr> </tbody> </table>   | Programming Notes   | The value of this field must satisfy the following equation: $stmm\_max - stmm\_min = 2^{\wedge} stmm\_output\_shift$ |      |            |   |            |   |            |   |          |
| Programming Notes   |   |   |      |            |   |            |   |            |   |          |
| The value of this field must satisfy the following equation: $stmm\_max - stmm\_min = 2^{\wedge} stmm\_output\_shift$   |   |   |      |            |   |            |   |            |   |          |
| 15:8  | <b>SDI Threshold</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 150px;"></td><td style="width: 50px; text-align: center;">U8</td></tr></table><br>Threshold for angle detection in SDI algorithm.  |   | U8   |            |   |            |   |            |   |          |
|   |   | U8  |      |            |   |            |   |            |   |          |
| <b>7:0 SDI Delta</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 150px;"></td><td style="width: 50px; text-align: center;">U8</td></tr></table><br>Delta value for angle detection in SDI algorithm.  |   | U8  |      |            |   |            |   |            |   |          |
|   | U8  |   |      |            |   |            |   |            |   |          |

| VEBOX_DNDI_STATE |  |  |        |
|------------------|--|--|--------|
| 5                | 31:24  | <b>SDI Fallback Mode 1 T1 Constant</b>                           |        |
|                  |  | Format:  | U8     |
|                  | 23:16  | <b>SDI Fallback Mode 1 T2 Constant</b>                           |        |
|                  |  | Format:  | U8     |
| 6                | 15:8   | <b>SDI Fallback Mode 2 Constant (Angle2x1)</b>                   |        |
|                  |  | Format:  | U8     |
|                  | 7:0  | <b>FMD Temporal Difference Threshold</b>                         |        |
|                  |  | Format:  | U8     |
| 6                | 31:24  | <b>FMD #1 Vertical Difference Threshold</b>                      |        |
|                  |  | Format:  | U8     |
|                  | 23:16  | <b>FMD #2 Vertical Difference Threshold</b>                      |        |
|                  |  | Format:  | U8     |
|                  | 15:14  | <b>CAT Threshold</b>   |        |
|                  |  | Default Value:   | 0      |
|                  |  | Format:  | U2     |
|                  | 13:8   | <b>FMD Tear Threshold</b>  |        |
|                  |  | Format:  | U6     |
|                  | 7  | <b>MCDI Enable</b>   |        |
|                  | Use Motion Compensated Deinterlace algorithm.  |  |        |
|                  | <b>Programming Notes</b>   |  |        |
|                  | This bit is Ignored if DI Enable is off.   |  |        |
| 6                | <b>Progressive DN</b>  |  |        |
|                  |  | Format:  | Enable |
|                  | Indicates that the denoise algorithm should assume progressive input when filtering neighboring pixels. <b>DI Enable</b> must be disabled when this field is enabled |  |        |
|                  | <b>Value</b>   | <b>Name</b>  |        |
|                  | 0  | DN assumes interlaced video and filters alternate lines together |        |
| 1                | DN assumes progressive video and filters neighboring lines together  |  |        |
| 5:4              | <b>Reserved</b>  |  |        |
|                  |  | Format:  | MBZ    |
| 3                | <b>DN/DI Top First</b>   |  |        |
|                  |  | Format:  | Enable |
|                  | Indicates the top field is first in sequence, otherwise bottom is first  |  |        |
|                  | <b>Value</b>   | <b>Name</b>  |        |
|                  | 0  | Bottom field occurs first in sequence                            |        |

| <b>VEBOX_DNDI_STATE</b> |   |  |  |                             |
|-------------------------|---|--|--|-----------------------------|
|                         |   | 1  | Top field occurs first in sequence           |                             |
|                         | 2:0   | <b>Reserved</b>  |  |                             |
|                         |   | Format:  | MBZ  |                             |
| 7                       | 31:29   | <b>Reserved</b>  |  |                             |
|                         |   | Format:  | MBZ  |                             |
|                         | 28:23   | <b>Initial Denoise History</b>   |  |                             |
|                         |   | Default Value:   | 32   |                             |
|                         |   | Format:  | U6   |                             |
|                         |   | Initial value for Denoise history for both Luma and Chroma.<br>(Dnmh_history_init * 4) <= (Dnmh_history_max) |  |                             |
|                         | 22:19   | <b>Neighbor Pixel Threshold</b>  |  |                             |
|                         |   | Default Value:   | 10   |                             |
|                         |   | Format:  | U4   |                             |
|                         | 18  | <b>Reserved</b>  |  |                             |
|                         | Format:   | MBZ  |  |                             |
| 17:16                   | <b>Progressive Cadence Reconstruction For 2nd Field Of Previous Frame</b> |  |  |                             |
|                         |   | Format:  | U2   |                             |
|                         |   | <b>Value</b>   | <b>Name</b>                                  | <b>Description</b>          |
|                         |   | 0  | Deinterlace                                  |                             |
|                         |   | 1  | Put together with previous field in sequence | 1st field of previous frame |
|                         | 2   | Put together with next field in sequence   | 1st field of current frame                   |                             |
| 15:10                   | <b>MC Pixel Consistency Threshold</b>                                     |  |  |                             |
|                         |   | Default Value:   | 25   |                             |
|                         |   | Format:  | U6   |                             |
| 9:8                     | <b>Progressive Cadence Reconstruction for 1st Field of Current Frame</b>  |  |  |                             |
|                         |   | Format:  | U2   |                             |
|                         |   | <b>Value</b>   | <b>Name</b>                                  | <b>Description</b>          |
|                         |   | 0  | Deinterlace                                  |                             |
|                         |   | 1  | Put together with previous field in sequence | 2nd field of previous frame |
|                         | 2   | Put together with next field in sequence   | 2nd field of current frame                   |                             |
| 7:4                     | <b>SAD THB</b>  |  |  |                             |
|                         |   | Default Value:   | 10   |                             |
|                         |   | Format:  | U4   |                             |

| <b>VEBOX_DNDI_STATE</b>  |   |   |   |             |      |   |   |   |   |
|--------------------------|---|---|---|-------------|------|---|---|---|---|
|                          | 3:0   | <b>SAD THA</b>  | Default Value: 5  |             |      |   |   |   |   |
|                          |   | Format:   | U4  |             |      |   |   |   |   |
| 8                        | 31:24   | <b>Reserved</b>   | Format: MBZ   |             |      |   |   |   |   |
|                          | 23:16   | <b>Chroma Denoise STAD Threshold</b>  | Format: U8<br>Threshold for denoise sum of temporal absolute differences.   |             |      |   |   |   |   |
|                          | 15:13   | <b>Reserved</b>   | Format: MBZ   |             |      |   |   |   |   |
|                          | 12  | <b>Chroma Denoise Enable</b>  | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>The U and V chroma channels will be denoise filtered.</td> </tr> <tr> <td>0</td> <td>The U and V channels will be passed to the next stage after DN unchanged.</td> </tr> </tbody> </table> | Value       | Name | 1 | The U and V chroma channels will be denoise filtered. | 0 | The U and V channels will be passed to the next stage after DN unchanged. |
|                          | Value   | Name  |   |             |      |   |   |   |   |
|                          | 1   | The U and V chroma channels will be denoise filtered.   |   |             |      |   |   |   |   |
|                          | 0   | The U and V channels will be passed to the next stage after DN unchanged.   |   |             |      |   |   |   |   |
| 11:6                     | <b>Chroma Temporal Difference Threshold</b>   | Format: U6  |   |             |      |   |   |   |   |
|                          |   | <b>Programming Notes</b>  |   |             |      |   |   |   |   |
|                          |   | 0 < [Chroma Temporal Difference Threshold - Chroma Low Temporal Difference Threshold] < 16 (Larger than 0 and less than or equal to 16) |   |             |      |   |   |   |   |
| 5:0                      | <b>Chroma Low Temporal Difference Threshold</b>   | Format: U6  |   |             |      |   |   |   |   |
|                          | <b>Programming Notes</b>  |   |   |             |      |   |   |   |   |
|                          | 0 < [Chroma Temporal Difference Threshold - Chroma Low Temporal Difference Threshold] < 16 (Larger than 0 and less than or equal to 16) |   |   |             |      |   |   |   |   |
| 9                        | 31:12   | <b>Reserved</b>   | Format: MBZ   |             |      |   |   |   |   |
|                          | 11:8  | <b>Hot Pixel Count</b>  | Format: U4<br>Number of neighboring pixels different more than <b>HotPixThr</b> before a pixel is considered hot.   |             |      |   |   |   |   |
|                          |   | <b>Value</b>  |   | <b>Name</b> |      |   |   |   |   |
|                          |   | [0,8]   |   |             |      |   |   |   |   |
| <b>Programming Notes</b> |   | 0 will cause all pixels to be considered hot and will perform a median filter on the entire image.                                      |   |             |      |   |   |   |   |

| <b>VEBOX_DNDI_STATE</b>  |  |         |                            |  |  |         |    |  |  |
|--|--|---------|----------------------------|--|--|---------|----|--|--|
|  | <table border="1" style="width: 100%;"> <tr> <td style="width: 10%; text-align: center;">7:0</td> <td><b>Hot Pixel Threshold</b></td> </tr> <tr> <td></td> <td> <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U8</td> </tr> </table> </td> </tr> <tr> <td colspan="2">Threshold for a difference from the value of a neighboring pixel. Is shifted up to 12-bits before compare.</td> </tr> </table> | 7:0     | <b>Hot Pixel Threshold</b> |  | <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U8</td> </tr> </table> | Format: | U8 | Threshold for a difference from the value of a neighboring pixel. Is shifted up to 12-bits before compare. |  |
| 7:0  | <b>Hot Pixel Threshold</b>   |         |                            |  |  |         |    |  |  |
|  | <table border="1" style="width: 100%;"> <tr> <td style="width: 70%;">Format:</td> <td style="width: 30%;">U8</td> </tr> </table>   | Format: | U8                         |  |  |         |    |  |  |
| Format:  | U8   |         |                            |  |  |         |    |  |  |
| Threshold for a difference from the value of a neighboring pixel. Is shifted up to 12-bits before compare. |  |         |                            |  |  |         |    |  |  |

## VEBOX\_Filter\_Coefficient

| VEBOX_Filter_Coefficient |                     |  |         |                     |
|--------------------------|---------------------|--|---------|---------------------|
| Project:                 | All                 |  |         |                     |
| Source:                  | PRM                 |  |         |                     |
| Size (in bits):          | 8                   |  |         |                     |
| Default Value:           | 0x00000000          |  |         |                     |
| DWord                    | Bit                 | Description  |         |                     |
| 0                        | 7:0                 | <b>2's Complement Filter Coefficient</b><br><table border="1"> <tr> <td>Format:</td> <td>S1.6 2's Complement</td> </tr> </table> <b>Range:</b> [-2, +2) | Format: | S1.6 2's Complement |
| Format:                  | S1.6 2's Complement |  |         |                     |

## VEBOX\_FORWARD\_GAMMA\_CORRECTION\_STATE

| VEBOX_FORWARD_GAMMA_CORRECTION_STATE                              |   |                              |                   |         |  |
|---|---|------------------------------|-------------------|---------|--|
| Project:  | CHV, BSW  |                              |                   |         |  |
| Source:   | VideoEnhancementCS  |                              |                   |         |  |
| Size (in bits):   | 384   |                              |                   |         |  |
| Default Value:  | 0x4F371E00, 0xA28D7A65, 0xEDDBC8B5, 0x21140A03, 0x755C4331, 0x00D7B493, 0x0048001A, 0x0097006B, 0x00F300C3, 0x01510131, 0x01BD0194, 0x022B01F2  |                              |                   |         |  |
| This state structure contains the Forward Gamma Correction state. |   |                              |                   |         |  |
| DWord   | Bit   | Description                  |                   |         |  |
| 0   | 31:24   | <b>PWL_Fwd_Gamma_Point 3</b> |                   |         |  |
|   |   | Default Value:               | 79                |         |  |
|   |   | Format:                      | U8                |         |  |
|   | 23:16   | <b>PWL_Fwd_Gamma_Point 2</b> |                   |         |  |
|   |   | Default Value:               | 55                |         |  |
|   |   | Format:                      | U8                |         |  |
|   | 15:8  | <b>PWL_Fwd_Gamma_Point 1</b> |                   |         |  |
|   |   | Default Value:               | 30                |         |  |
|   |   | Format:                      | U8                |         |  |
|   | 7:1   | <b>Reserved</b>              |                   |         |  |
|   | Format:   | MBZ                          |                   |         |  |
| 0   | <b>Forward Gamma Correction Enable</b>  |                              |                   |         |  |
|   | Format:   | Enable                       |                   |         |  |
|   | <table border="1"> <thead> <tr> <th>Programming Notes</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td><b>Demosaic</b> must also be enabled if this is enabled.</td> <td>CHV, BSW</td> </tr> </tbody> </table> |                              | Programming Notes | Project | <b>Demosaic</b> must also be enabled if this is enabled. |
| Programming Notes   | Project   |                              |                   |         |  |
| <b>Demosaic</b> must also be enabled if this is enabled.          | CHV, BSW  |                              |                   |         |  |
| 1   | 31:24   | <b>PWL_Fwd_Gamma_Point 7</b> |                   |         |  |
|   |   | Default Value:               | 162               |         |  |
|   |   | Format:                      | U8                |         |  |
|   | 23:16   | <b>PWL_Fwd_Gamma_Point 6</b> |                   |         |  |
|   |   | Default Value:               | 141               |         |  |
|   |   | Format:                      | U8                |         |  |
|   | 15:8  | <b>PWL_Fwd_Gamma_Point 5</b> |                   |         |  |
|   |   | Default Value:               | 122               |         |  |
|   |   | Format:                      | U8                |         |  |
|   | 7:0   | <b>PWL_Fwd_Gamma_Point 4</b> |                   |         |  |
|   |   | Default Value:               | 101               |         |  |

| <b>VEBOX_FORWARD_GAMMA_CORRECTION_STATE</b> |       |                               |     |
|---|-------|-------------------------------|-----|
|   |       | Format:                       | U8  |
| 2   | 31:24 | <b>PWL_Fwd_Gamma_Point 11</b> |     |
|   |       | Default Value:                | 237 |
|   |       | Format:                       | U8  |
|   | 23:16 | <b>PWL_Fwd_Gamma_Point 10</b> |     |
|   |       | Default Value:                | 219 |
|   |       | Format:                       | U8  |
|   | 15:8  | <b>PWL_Fwd_Gamma_Point 9</b>  |     |
|   |       | Default Value:                | 200 |
|   |       | Format:                       | U8  |
|   | 7:0   | <b>PWL_Fwd_Gamma_Point 8</b>  |     |
|   |       | Default Value:                | 181 |
|   |       | Format:                       | U8  |
| 3   | 31:24 | <b>PWL_Fwd_Gamma_Bias_4</b>   |     |
|   |       | Default Value:                | 33  |
|   |       | Format:                       | U8  |
|   | 23:16 | <b>PWL_Fwd_Gamma_Bias_3</b>   |     |
|   |       | Default Value:                | 20  |
|   |       | Format:                       | U8  |
|   | 15:8  | <b>PWL_Fwd_Gamma_Bias_2</b>   |     |
|   |       | Default Value:                | 10  |
|   |       | Format:                       | U8  |
|   | 7:0   | <b>PWL_Fwd_Gamma_Bias_1</b>   |     |
|   |       | Default Value:                | 3   |
|   |       | Format:                       | U8  |
| 4   | 31:24 | <b>PWL_Fwd_Gamma_Bias_8</b>   |     |
|   |       | Default Value:                | 117 |
|   |       | Format:                       | U8  |
|   | 23:16 | <b>PWL_Fwd_Gamma_Bias_7</b>   |     |
|   |       | Default Value:                | 92  |
|   |       | Format:                       | U8  |
|   | 15:8  | <b>PWL_Fwd_Gamma_Bias_6</b>   |     |
|   |       | Default Value:                | 67  |
|   |       | Format:                       | U8  |
|   | 7:0   | <b>PWL_Fwd_Gamma_Bias_5</b>   |     |
|   |       | Default Value:                |     |
|   |       | Format:                       | U8  |



| VEBOX_FORWARD_GAMMA_CORRECTION_STATE |                             |                              |              |
|--------------------------------------|-----------------------------|------------------------------|--------------|
|                                      |                             | Default Value:               | 49           |
|                                      |                             | Format:                      | U8           |
| 5                                    | 31:24                       | <b>Reserved</b>              |              |
|                                      |                             | Format:                      | MBZ          |
|                                      | 23:16                       | <b>PWL_Fwd_Gamma_Bias_11</b> |              |
|                                      |                             | Default Value:               | 215          |
|                                      |                             | Format:                      | U8           |
|                                      | 15:8                        | <b>PWL_Fwd_Gamma_Bias_10</b> |              |
|                                      |                             | Default Value:               | 180          |
|                                      |                             | Format:                      | U8           |
| 7:0                                  | <b>PWL_Fwd_Gamma_Bias_9</b> |                              |              |
|                                      | Default Value:              | 147                          |              |
|                                      | Format:                     | U8                           |              |
| 6                                    | 31:28                       | <b>Reserved</b>              |              |
|                                      |                             | Format:                      | MBZ          |
|                                      | 27:16                       | <b>PWL_Fwd_Gamma_Slope_1</b> |              |
|                                      |                             | Default Value:               | 048h 72/256  |
|                                      |                             | Format:                      | U4.8         |
|                                      | 15:12                       | <b>Reserved</b>              |              |
|                                      |                             | Format:                      | MBZ          |
|                                      | 11:0                        | <b>PWL_Fwd_Gamma_Slope_0</b> |              |
| Default Value:                       |                             | 01Ah 26/256                  |              |
|                                      | Format:                     | U4.8                         |              |
| 7                                    | 31:28                       | <b>Reserved</b>              |              |
|                                      |                             | Format:                      | MBZ          |
|                                      | 27:16                       | <b>PWL_Fwd_Gamma_Slope_3</b> |              |
|                                      |                             | Default Value:               | 097h 151/256 |
|                                      |                             | Format:                      | U4.8         |
|                                      | 15:12                       | <b>Reserved</b>              |              |
|                                      |                             | Format:                      | MBZ          |
|                                      | 11:0                        | <b>PWL_Fwd_Gamma_Slope_2</b> |              |
| Default Value:                       |                             | 06Bh 107/256                 |              |
|                                      | Format:                     | U4.8                         |              |
| 8                                    | 31:28                       | <b>Reserved</b>              |              |
|                                      |                             | Format:                      | MBZ          |

| VEBOX_FORWARD_GAMMA_CORRECTION_STATE |       |                               |
|--------------------------------------|-------|-------------------------------|
|                                      | 27:16 | <b>PWL_Fwd_Gamma_Slope_5</b>  |
|                                      |       | Default Value: 0F3h 243/256   |
|                                      |       | Format: U4.8                  |
|                                      | 15:12 | <b>Reserved</b>               |
|                                      |       | Format: MBZ                   |
|                                      |       | 11:0                          |
| Default Value: 0C3h 195/256          |       |                               |
| Format: U4.8                         |       |                               |
| 9                                    | 31:28 | <b>Reserved</b>               |
|                                      |       | Format: MBZ                   |
|                                      | 27:16 | <b>PWL_Fwd_Gamma_Slope_7</b>  |
|                                      |       | Default Value: 151h 337/256   |
|                                      |       | Format: U4.8                  |
|                                      | 15:12 | <b>Reserved</b>               |
| Format: MBZ                          |       |                               |
|                                      | 11:0  | <b>PWL_Fwd_Gamma_Slope_6</b>  |
|                                      |       | Default Value: 131h 305/256   |
|                                      |       | Format: U4.8                  |
| 10                                   | 31:28 | <b>Reserved</b>               |
|                                      |       | Format: MBZ                   |
|                                      | 27:16 | <b>PWL_Fwd_Gamma_Slope_9</b>  |
|                                      |       | Default Value: 1BDh 445/256   |
|                                      |       | Format: U4.8                  |
|                                      | 15:12 | <b>Reserved</b>               |
| Format: MBZ                          |       |                               |
|                                      | 11:0  | <b>PWL_Fwd_Gamma_Slope_8</b>  |
|                                      |       | Default Value: 194h 404/256   |
|                                      |       | Format: U4.8                  |
| 11                                   | 31:28 | <b>Reserved</b>               |
|                                      |       | Format: MBZ                   |
|                                      | 27:16 | <b>PWL_Fwd_Gamma_Slope_11</b> |
|                                      |       | Default Value: 22Bh 555/256   |
|                                      |       | Format: U4.8                  |
|                                      | 15:12 | <b>Reserved</b>               |
| Format: MBZ                          |       |                               |
|                                      | 11:0  | <b>PWL_Fwd_Gamma_Slope_10</b> |

### VEBOX\_FORWARD\_GAMMA\_CORRECTION\_STATE

|  |  |                |              |
|--|--|----------------|--------------|
|  |  | Default Value: | 1F2h 498/256 |
|  |  | Format:        | U4.8         |

## VEBOX\_GAMUT\_STATE

| VEBOX_GAMUT_STATE |  |   |       |      |   |              |   |            |
|-------------------|--|---|-------|------|---|--------------|---|------------|
| Project:          | CHV, BSW   |   |       |      |   |              |   |            |
| Source:           | VideoEnhancementCS   |   |       |      |   |              |   |            |
| Size (in bits):   | 1216   |   |       |      |   |              |   |            |
| Default Value:    | 0x01B40000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x09050201, 0x412A1A10, 0x00BB8860, 0x3526170D, 0x8B725B47, 0x00DFC1A5, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x654F371E, 0x00000000, 0x00EDDBC8, 0x21140A03, 0x755C4331, 0x00D7B493, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x0CD2911F, 0xB0000334, 0x00000000 |   |       |      |   |              |   |            |
| DWord             | Bit  | Description   |       |      |   |              |   |            |
| 0                 | 31:25  | <b>Reserved</b><br>Format: MBZ  |       |      |   |              |   |            |
|                   | 24:16  | <b>A(r)</b><br>Default Value: 436<br>Format: U9<br>Gain_factor_R (default: 436, preferred range: 256-511)   |       |      |   |              |   |            |
|                   | 15   | <b>Global Mode Enable</b><br>The gain factor derived from state CM(w) <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Advance Mode</td> </tr> <tr> <td>1</td> <td>Basic Mode</td> </tr> </tbody> </table> | Value | Name | 0 | Advance Mode | 1 | Basic Mode |
|                   | Value  | Name  |       |      |   |              |   |            |
|                   | 0  | Advance Mode  |       |      |   |              |   |            |
|                   | 1  | Basic Mode  |       |      |   |              |   |            |
| 14:10             | <b>Reserved</b><br>Format: MBZ   |   |       |      |   |              |   |            |
| 9:0               | <b>CM(w)</b><br>Format: U10<br>WeightingFactorForGain_factor (only enabled when the GlobalModeEnable is on)  |   |       |      |   |              |   |            |
| 1                 | 31:26  | <b>Reserved</b><br>Format: MBZ  |       |      |   |              |   |            |
|                   | 25:16  | <b>CM(s)</b><br>Format: U2.8<br>AccurateColorComponentScaling (default: 640/256, preferred range: [512-1023]/256)<br>The default is 640/256   |       |      |   |              |   |            |
|                   |  |   |       |      |   |              |   |            |

| <b>VEBOX_GAMUT_STATE</b> |       |  |   |
|--------------------------|-------|--|---|
|                          | 15    | <b>Reserved</b><br>Format: MBZ   |   |
|                          | 14:8  | <b>A(g)</b><br>Format: U7<br>Gain_factor_G (default: 26/256, preferred range: [26-127]/256)<br>The default is 26/256 |   |
|                          |       | 7  | <b>Reserved</b><br>Format: MBZ  |
|                          |       | 6:0  | <b>A(b)</b><br>Format: U7<br>Gain_factor_B (default: 26/256, preferred range: [26-127]/256)<br>The default is 26/256                    |
|                          | 2     | 31:26  | <b>Reserved</b><br>Format: MBZ  |
|                          |       | 25:16  | <b>R(s)</b><br>Format: U2.8<br>RedScaling (default: 768/256, preferred range: [512-1023]/256)<br>The default is 768/256                 |
| 15:8                     |       |  | <b>CM(i)</b><br>Format: U0.8<br>AccurateColorComponentOffset (default: 192/256, preferred range: [0-192]/256)<br>The default is 192/256 |
| 7:0                      |       | <b>R(i)</b><br>Format: U0.8<br>RedOffset (default: 128/256, preferred range: [0-128]/256)<br>The default is 128/256  |   |
| 3                        | 31    | <b>Reserved</b><br>Format: MBZ   |   |
|                          | 30:16 | <b>C1</b><br>Format: S2.12<br>Coefficient of 3x3 Transform matrix  |   |

| <b>VEBOX_GAMUT_STATE</b> |                                     |                                     |
|--------------------------|-------------------------------------|-------------------------------------|
|                          |                                     | The default is 1141/4096            |
|                          | 15                                  | <b>Reserved</b>                     |
|                          |                                     | Format: MBZ                         |
|                          | 14:0                                | <b>C0</b>                           |
|                          |                                     | Format: S2.12                       |
|                          |                                     | Coefficient of 3x3 Transform matrix |
|                          |                                     | The default is 2792/4096            |
| 4                        | 31                                  | <b>Reserved</b>                     |
|                          |                                     | Format: MBZ                         |
|                          | 30:16                               | <b>C3</b>                           |
|                          |                                     | Format: S2.12                       |
|                          |                                     | Coefficient of 3x3 Transform matrix |
|                          |                                     | The default is 71/4096              |
|                          | 15                                  | <b>Reserved</b>                     |
|                          |                                     | Format: MBZ                         |
|                          | 14:0                                | <b>C2</b>                           |
|                          |                                     | Format: S2.12                       |
|                          | Coefficient of 3x3 Transform matrix |                                     |
|                          | The default is 34/4096              |                                     |
| 5                        | 31                                  | <b>Reserved</b>                     |
|                          |                                     | Format: MBZ                         |
|                          | 30:16                               | <b>C5</b>                           |
|                          |                                     | Format: S2.12                       |
|                          |                                     | Coefficient of 3x3 Transform matrix |
|                          |                                     | The default is -52/4096             |
|                          | 15                                  | <b>Reserved</b>                     |
|                          |                                     | Format: MBZ                         |
|                          | 14:0                                | <b>C4</b>                           |
|                          |                                     | Format: S2.12                       |
|                          | Coefficient of 3x3 Transform matrix |                                     |
|                          | The default is 3663/4096            |                                     |
| 6                        | 31                                  | <b>Reserved</b>                     |

| <b>VEBOX_GAMUT_STATE</b> |                          |                                      |
|--------------------------|--------------------------|--------------------------------------|
|                          |                          | Format: MBZ                          |
|                          | 30:16                    | <b>C7</b>                            |
|                          |                          | Format: S2.12                        |
|                          |                          | Coefficient of 3x3 Transform matrix  |
|                          |                          | The default is 168/4096              |
|                          | 15                       | <b>Reserved</b>                      |
|                          |                          | Format: MBZ                          |
|                          | 14:0                     | <b>C6</b>                            |
|                          |                          | Format: S2.12                        |
|                          |                          | Coefficient of 3x3 Transform matrix  |
|                          |                          | The default is -12/4096              |
| 7                        | 31:15                    | <b>Reserved</b>                      |
|                          |                          | Format: MBZ                          |
|                          | 14:0                     | <b>C8</b>                            |
|                          |                          | Format: S2.12                        |
|                          |                          | Coefficient of 3x3 Transform matrix  |
|                          |                          | The default is 3434/4096             |
| 8                        | 31:24                    | <b>PWL_Gamma_Point 4</b>             |
|                          |                          | Default Value: 9                     |
|                          |                          | Format: U8                           |
|                          |                          | Point 4 for PWL for gamma correction |
|                          | 23:16                    | <b>PWL_Gamma_Point 3</b>             |
|                          |                          | Default Value: 5                     |
|                          |                          | Format: U8                           |
|                          |                          | Point 3 for PWL for gamma correction |
|                          | 15:8                     | <b>PWL_Gamma_Point 2</b>             |
|                          |                          | Default Value: 2                     |
|                          |                          | Format: U8                           |
|                          |                          | Point 2 for PWL for gamma correction |
| 7:0                      | <b>PWL_Gamma_Point 1</b> |                                      |
|                          | Default Value: 1         |                                      |
|                          | Format: U8               |                                      |
|                          |                          |                                      |

| <b>VEBOX_GAMUT_STATE</b> |   |   |
|--------------------------|---|---|
|                          |   | Point 1 for PWL for gamma correction                                      |
| 9                        | 31:24   | <b>PWL_Gamma_Point 8</b>  |
|                          |   | Default Value: 65<br>Point 8 for PWL for gamma correction                 |
|                          | 23:16   | <b>PWL_Gamma_Point 7</b>  |
|                          |   | Default Value: 42<br>Point 7 for PWL for gamma correction                 |
| 15:8                     | <b>PWL_Gamma_Point 6</b>  |   |
|                          | Default Value: 26<br>Point 6 for PWL for gamma correction                 |   |
| 7:0                      | <b>PWL_Gamma_Point 5</b>  |   |
|                          | Default Value: 16<br>Point 5 for PWL for gamma correction                 |   |
| 10                       | 31:24   | <b>Reserved</b>   |
|                          |   | Format: MBZ   |
|                          | 23:16   | <b>PWL_Gamma_Point 11</b>   |
|                          |   | Default Value: 187<br>Format: U8<br>Point 11 for PWL for gamma correction |
| 15:8                     | <b>PWL_Gamma_Point 10</b>   |   |
|                          | Default Value: 136<br>Format: U8<br>Point 10 for PWL for gamma correction |   |
| 7:0                      | <b>PWL_Gamma_Point 9</b>  |   |
|                          | Default Value: 96<br>Format: U8<br>Point 9 for PWL for gamma correction   |   |
| 11                       | 31:24   | <b>PWL_Gamma_Bias_4</b>   |
|                          |   | Default Value: 53   |
|                          |   | Format: U8<br>Bias 4 for PWL for gamma correction                         |



| <b>VEBOX_GAMUT_STATE</b> |       |   |
|--------------------------|-------|---|
|                          | 23:16 | <b>PWL_Gamma_Bias_3</b>                           |
|                          |       | Default Value: 38                                 |
|                          |       | Format: U8<br>Bias 3 for PWL for gamma correction |
|                          | 15:8  | <b>PWL_Gamma_Bias_2</b>                           |
|                          |       | Default Value: 23                                 |
|                          |       | Format: U8<br>Bias 2 for PWL for gamma correction |
|                          | 7:0   | <b>PWL_Gamma_Bias_1</b>                           |
|                          |       | Default Value: 13                                 |
|                          |       | Format: U8<br>Bias 1 for PWL for gamma correction |
| 12                       | 31:24 | <b>PWL_Gamma_Bias_8</b>                           |
|                          |       | Default Value: 139                                |
|                          |       | Format: U8<br>Bias 8 for PWL for gamma correction |
|                          | 23:16 | <b>PWL_Gamma_Bias_7</b>                           |
|                          |       | Default Value: 114                                |
|                          |       | Format: U8<br>Bias 7 for PWL for gamma correction |
|                          | 15:8  | <b>PWL_Gamma_Bias_6</b>                           |
|                          |       | Default Value: 91                                 |
|                          |       | Format: U8<br>Bias 6 for PWL for gamma correction |
|                          | 7:0   | <b>PWL_Gamma_Bias_5</b>                           |
|                          |       | Default Value: 71                                 |
|                          |       | Format: U8<br>Bias 5 for PWL for gamma correction |
| 13                       | 31:24 | <b>Reserved</b>                                   |
|                          |       | Format: MBZ                                       |
|                          | 23:16 | <b>PWL_Gamma_Bias_11</b>                          |

| <b>VEBOX_GAMUT_STATE</b> |                          |   |                 |
|--------------------------|--------------------------|---|-----------------|
|                          |                          | Default Value: 223  |                 |
|                          |                          | Format: U8  |                 |
|                          |                          | Bias 11 for PWL for gamma correction                            |                 |
|                          | 15:8                     | <b>PWL_Gamma_Bias_10</b>  |                 |
|                          |                          | Default Value: 193  |                 |
|                          |                          | Format: U8  |                 |
|                          | 7:0                      | <b>PWL_Gamma_Bias_9</b>   |                 |
|                          |                          | Default Value: 165  |                 |
|                          |                          | Format: U8  |                 |
| 14                       | 31:28                    | <b>Reserved</b>   |                 |
|                          |                          | Format: MBZ   |                 |
|                          | 27:16                    | <b>PWL_Gamma_Slope_1</b>  |                 |
|                          |                          | Format: U4.8  |                 |
|                          |                          | Slope 1 for PWL for gamma correction<br>The default is 2560/256 |                 |
|                          | 15:12                    | <b>Reserved</b>   |                 |
|                          |                          | Format: MBZ   |                 |
|                          | 11:0                     | <b>PWL_Gamma_Slope_0</b>  |                 |
|                          |                          | Format: U4.8  |                 |
|                          |                          | Slope 0 for PWL for gamma correction<br>The default is 3328/256 |                 |
|                          | 15                       | 31:28   | <b>Reserved</b> |
|                          |                          |   | Format: MBZ     |
| 27:16                    |                          | <b>PWL_Gamma_Slope_3</b>  |                 |
|                          |                          | Format: U4.8  |                 |
|                          |                          | Slope 3 for PWL for gamma correction<br>The default is 960/256  |                 |
| 15:12                    |                          | <b>Reserved</b>   |                 |
|                          |                          | Format: MBZ   |                 |
| 11:0                     | <b>PWL_Gamma_Slope_2</b> |   |                 |

| <b>VEBOX_GAMUT_STATE</b>             |  |  |                          |         |                                      |                                      |                                      |                        |                        |
|--------------------------------------|--|--|--------------------------|---------|--------------------------------------|--------------------------------------|--------------------------------------|------------------------|------------------------|
|                                      |  | <table border="1"> <tr> <td>Format:</td> <td>U4.8</td> </tr> <tr> <td colspan="2">Slope 2 for PWL for gamma correction</td> </tr> <tr> <td colspan="2">The default is 1280/256</td> </tr> </table>   | Format:                  | U4.8    | Slope 2 for PWL for gamma correction |                                      | The default is 1280/256              |                        |                        |
| Format:                              | U4.8   |  |                          |         |                                      |                                      |                                      |                        |                        |
| Slope 2 for PWL for gamma correction |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| The default is 1280/256              |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| 16                                   | 31:28  | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | <b>Reserved</b>          |         | Format:                              | MBZ                                  |                                      |                        |                        |
|                                      | <b>Reserved</b>  |  |                          |         |                                      |                                      |                                      |                        |                        |
|                                      | Format:  | MBZ  |                          |         |                                      |                                      |                                      |                        |                        |
|                                      | 27:16  | <table border="1"> <tr> <td colspan="2"><b>PWL_Gamma_Slope_5</b></td> </tr> <tr> <td>Format:</td> <td>U4.8</td> </tr> <tr> <td colspan="2">Slope 5 for PWL for gamma correction</td> </tr> <tr> <td colspan="2">The default is 512/256</td> </tr> </table> | <b>PWL_Gamma_Slope_5</b> |         | Format:                              | U4.8                                 | Slope 5 for PWL for gamma correction |                        | The default is 512/256 |
| <b>PWL_Gamma_Slope_5</b>             |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| Format:                              | U4.8   |  |                          |         |                                      |                                      |                                      |                        |                        |
| Slope 5 for PWL for gamma correction |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| The default is 512/256               |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| 15:12                                | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | <b>Reserved</b>  |                          | Format: | MBZ                                  |                                      |                                      |                        |                        |
| <b>Reserved</b>                      |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| Format:                              | MBZ  |  |                          |         |                                      |                                      |                                      |                        |                        |
| 11:0                                 | <table border="1"> <tr> <td colspan="2"><b>PWL_Gamma_Slope_4</b></td> </tr> <tr> <td>Format:</td> <td>U4.8</td> </tr> <tr> <td colspan="2">Slope 4 for PWL for gamma correction</td> </tr> <tr> <td colspan="2">The default is 658/256</td> </tr> </table> | <b>PWL_Gamma_Slope_4</b>   |                          | Format: | U4.8                                 | Slope 4 for PWL for gamma correction |                                      | The default is 658/256 |                        |
| <b>PWL_Gamma_Slope_4</b>             |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| Format:                              | U4.8   |  |                          |         |                                      |                                      |                                      |                        |                        |
| Slope 4 for PWL for gamma correction |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| The default is 658/256               |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| 17                                   | 31:28  | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | <b>Reserved</b>          |         | Format:                              | MBZ                                  |                                      |                        |                        |
|                                      | <b>Reserved</b>  |  |                          |         |                                      |                                      |                                      |                        |                        |
|                                      | Format:  | MBZ  |                          |         |                                      |                                      |                                      |                        |                        |
|                                      | 27:16  | <table border="1"> <tr> <td colspan="2"><b>PWL_Gamma_Slope_7</b></td> </tr> <tr> <td>Format:</td> <td>U4.8</td> </tr> <tr> <td colspan="2">Slope 7 for PWL for gamma correction</td> </tr> <tr> <td colspan="2">The default is 278/256</td> </tr> </table> | <b>PWL_Gamma_Slope_7</b> |         | Format:                              | U4.8                                 | Slope 7 for PWL for gamma correction |                        | The default is 278/256 |
| <b>PWL_Gamma_Slope_7</b>             |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| Format:                              | U4.8   |  |                          |         |                                      |                                      |                                      |                        |                        |
| Slope 7 for PWL for gamma correction |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| The default is 278/256               |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| 15:12                                | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | <b>Reserved</b>  |                          | Format: | MBZ                                  |                                      |                                      |                        |                        |
| <b>Reserved</b>                      |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| Format:                              | MBZ  |  |                          |         |                                      |                                      |                                      |                        |                        |
| 11:0                                 | <table border="1"> <tr> <td colspan="2"><b>PWL_Gamma_Slope_6</b></td> </tr> <tr> <td>Format:</td> <td>U4.8</td> </tr> <tr> <td colspan="2">Slope 6 for PWL for gamma correction</td> </tr> <tr> <td colspan="2">The default is 368/256</td> </tr> </table> | <b>PWL_Gamma_Slope_6</b>   |                          | Format: | U4.8                                 | Slope 6 for PWL for gamma correction |                                      | The default is 368/256 |                        |
| <b>PWL_Gamma_Slope_6</b>             |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| Format:                              | U4.8   |  |                          |         |                                      |                                      |                                      |                        |                        |
| Slope 6 for PWL for gamma correction |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| The default is 368/256               |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| 18                                   | 31:28  | <table border="1"> <tr> <td colspan="2"><b>Reserved</b></td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | <b>Reserved</b>          |         | Format:                              | MBZ                                  |                                      |                        |                        |
|                                      | <b>Reserved</b>  |  |                          |         |                                      |                                      |                                      |                        |                        |
| Format:                              | MBZ  |  |                          |         |                                      |                                      |                                      |                        |                        |
| 27:16                                | <table border="1"> <tr> <td colspan="2"><b>PWL_Gamma_Slope_9</b></td> </tr> <tr> <td>Format:</td> <td>U4.8</td> </tr> </table>   | <b>PWL_Gamma_Slope_9</b>   |                          | Format: | U4.8                                 |                                      |                                      |                        |                        |
| <b>PWL_Gamma_Slope_9</b>             |  |  |                          |         |                                      |                                      |                                      |                        |                        |
| Format:                              | U4.8   |  |                          |         |                                      |                                      |                                      |                        |                        |

| <b>VEBOX_GAMUT_STATE</b>   |       |  |
|--|-------|--|
|  |       | <p>Slope 9 for PWL for gamma correction</p> <p>The default is 179/256</p>  |
|  | 15:12 | <p><b>Reserved</b></p> <p>Format: MBZ</p>                                  |
|  | 11:0  | <p><b>PWL_Gamma_Slope_8</b></p> <p>Format: U4.8</p>                        |
|  |       | <p>Slope 8 for PWL for gamma correction</p> <p>The default is 215/256</p>  |
| 19   | 31:28 | <p><b>Reserved</b></p> <p>Format: MBZ</p>                                  |
|  | 27:16 | <p><b>PWL_Gamma_Slope_11</b></p> <p>Format: U4.8</p>                       |
|  |       | <p>Slope 11 for PWL for gamma correction</p> <p>The default is 124/256</p> |
|  | 15:12 | <p><b>Reserved</b></p> <p>Format: MBZ</p>                                  |
|  | 11:0  | <p><b>PWL_Gamma_Slope_10</b></p> <p>Format: U4.8</p>                       |
| <p>Slope 10 for PWL for gamma correction</p> <p>The default is 151/256</p> |       |  |
| 20   | 31:24 | <p><b>PWL_INV_GAMMA_Point 4</b></p> <p>Default Value: 101</p>              |
|  |       | <p>Format: U8</p>  |
|  |       | <p>Point 4 for PWL for inverse gamma correction</p>                        |
|  | 23:16 | <p><b>PWL_INV_GAMMA_Point 3</b></p> <p>Default Value: 79</p>               |
|  |       | <p>Format: U8</p>  |
|  | 15:8  | <p><b>PWL_INV_GAMMA_Point 2</b></p> <p>Default Value: 55</p>               |
| <p>Format: U8</p>  |       |  |
| <p>Point 2 for PWL for inverse gamma correction</p>                        |       |  |

| <b>VEBOX_GAMUT_STATE</b> |       |   |   |       |      |     |
|--------------------------|-------|---|---|-------|------|-----|
|                          | 7:0   | <b>PWL_INV_GAMMA_Point 1</b><br>Default Value: 30<br>Format: U8<br>Point 1 for PWL for inverse gamma correction   |   |       |      |     |
|                          |       |   |   |       |      |     |
| 21                       | 31:24 | <b>PWL_INV_GAMMA_Point 8</b><br>Format: U8<br>Point 8 for PWL for inverse gamma correction<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Value</th> <th style="width: 50%; text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">181</td> <td></td> </tr> </tbody> </table> | Value   | Name  | 181  |     |
|                          |       | Value   | Name  |       |      |     |
|                          |       | 181   |   |       |      |     |
|                          |       | 23:16   | <b>PWL_INV_GAMMA_Point 7</b><br>Format: U8<br>Point 7 for PWL for inverse gamma correction<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Value</th> <th style="width: 50%; text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">162</td> <td></td> </tr> </tbody> </table> | Value | Name | 162 |
|                          | Value |   | Name  |       |      |     |
|                          | 162   |   |   |       |      |     |
|                          | 15:8  | <b>PWL_INV_GAMMA_Point 6</b><br>Format: U8<br>Point 6 for PWL for inverse gamma correction<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Value</th> <th style="width: 50%; text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">141</td> <td></td> </tr> </tbody> </table> | Value   | Name  | 141  |     |
|                          |       | Value   | Name  |       |      |     |
|                          | 141   |   |   |       |      |     |
|                          | 7:0   | <b>PWL_INV_GAMMA_Point 5</b><br>Format: U8<br>Point 5 for PWL for inverse gamma correction<br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Value</th> <th style="width: 50%; text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">122</td> <td></td> </tr> </tbody> </table> | Value   | Name  | 122  |     |
|                          | Value | Name  |   |       |      |     |
|                          | 122   |   |   |       |      |     |
| 22                       | 31:24 | <b>Reserved</b><br>Format: MBZ  |   |       |      |     |
|                          | 23:16 | <b>PWL_INV_GAMMA_Point 11</b><br>Default Value: 237<br>Format: U8<br>Point 11 for PWL for inverse gamma correction  |   |       |      |     |
|                          |       | 15:8  | <b>PWL_INV_GAMMA_Point 10</b><br>Default Value: 219<br>Format: U8<br>Point 10 for PWL for inverse gamma correction  |       |      |     |
|                          | 7:0   |   | <b>PWL_INV_GAMMA_Point 9</b>  |       |      |     |

| <b>VEBOX_GAMUT_STATE</b>                     |   |   |                |         |         |   |  |  |
|--|---|---|----------------|---------|---------|---|--|--|
|  |   | <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">200</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> <tr> <td colspan="2">Point 9 for PWL for inverse gamma correction</td> </tr> </table>                            | Default Value: | 200     | Format: | U8  | Point 9 for PWL for inverse gamma correction |  |
| Default Value:                               | 200   |   |                |         |         |   |  |  |
| Format:                                      | U8  |   |                |         |         |   |  |  |
| Point 9 for PWL for inverse gamma correction |   |   |                |         |         |   |  |  |
| 23   | 31:24   | <b>PWL_INV_GAMMA_Bias_4</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">33</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> <tr> <td colspan="2">Bias 4 for PWL for inverse gamma correction</td> </tr> </table>  | Default Value: | 33      | Format: | U8  | Bias 4 for PWL for inverse gamma correction  |  |
|  |   | Default Value:  | 33             |         |         |   |  |  |
|  |   | Format:   | U8             |         |         |   |  |  |
|  | Bias 4 for PWL for inverse gamma correction   |   |                |         |         |   |  |  |
|  | 23:16   | <b>PWL_INV_GAMMA_Bias_3</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">20</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> <tr> <td colspan="2">Bias 3 for PWL for inverse gamma correction</td> </tr> </table>  | Default Value: | 20      | Format: | U8  | Bias 3 for PWL for inverse gamma correction  |  |
|  |   | Default Value:  | 20             |         |         |   |  |  |
|  |   | Format:   | U8             |         |         |   |  |  |
|  | Bias 3 for PWL for inverse gamma correction   |   |                |         |         |   |  |  |
|  | 15:8  | <b>PWL_INV_GAMMA_Bias_2</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">10</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> <tr> <td colspan="2">Bias 2 for PWL for inverse gamma correction</td> </tr> </table>  | Default Value: | 10      | Format: | U8  | Bias 2 for PWL for inverse gamma correction  |  |
|  |   | Default Value:  | 10             |         |         |   |  |  |
|  |   | Format:   | U8             |         |         |   |  |  |
|  | Bias 2 for PWL for inverse gamma correction   |   |                |         |         |   |  |  |
| 7:0  | <b>PWL_INV_GAMMA_Bias_1</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> <tr> <td colspan="2">Bias 1 for PWL for inverse gamma correction</td> </tr> </table> | Default Value:  | 3              | Format: | U8      | Bias 1 for PWL for inverse gamma correction |  |  |
|  | Default Value:  | 3   |                |         |         |   |  |  |
|  | Format:   | U8  |                |         |         |   |  |  |
| Bias 1 for PWL for inverse gamma correction  |   |   |                |         |         |   |  |  |
| 24   | 31:24   | <b>PWL_INV_GAMMA_Bias_8</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">117</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> <tr> <td colspan="2">Bias 8 for PWL for inverse gamma correction</td> </tr> </table> | Default Value: | 117     | Format: | U8  | Bias 8 for PWL for inverse gamma correction  |  |
|  |   | Default Value:  | 117            |         |         |   |  |  |
|  |   | Format:   | U8             |         |         |   |  |  |
|  | Bias 8 for PWL for inverse gamma correction   |   |                |         |         |   |  |  |
|  | 23:16   | <b>PWL_INV_GAMMA_Bias_7</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">92</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> <tr> <td colspan="2">Bias 7 for PWL for inverse gamma correction</td> </tr> </table>  | Default Value: | 92      | Format: | U8  | Bias 7 for PWL for inverse gamma correction  |  |
|  |   | Default Value:  | 92             |         |         |   |  |  |
|  |   | Format:   | U8             |         |         |   |  |  |
|  | Bias 7 for PWL for inverse gamma correction   |   |                |         |         |   |  |  |
|  | 15:8  | <b>PWL_INV_GAMMA_Bias_6</b> <table border="1"> <tr> <td>Default Value:</td> <td style="text-align: center;">67</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> <tr> <td colspan="2">Bias 6 for PWL for inverse gamma correction</td> </tr> </table>  | Default Value: | 67      | Format: | U8  | Bias 6 for PWL for inverse gamma correction  |  |
| Default Value:                               |   | 67  |                |         |         |   |  |  |
| Format:                                      |   | U8  |                |         |         |   |  |  |
| Bias 6 for PWL for inverse gamma correction  |   |   |                |         |         |   |  |  |

| <b>VEBOX_GAMUT_STATE</b> |  |  |                |         |         |    |
|--------------------------|--|--|----------------|---------|---------|----|
|                          | 7:0  | <p><b>PWL_INV_GAMMA_Bias_5</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: center;">49</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>Bias 5 for PWL for inverse gamma correction</p>    | Default Value: | 49      | Format: | U8 |
| Default Value:           | 49   |  |                |         |         |    |
| Format:                  | U8   |  |                |         |         |    |
| 25                       | 31:24  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">MBZ</td> </tr> </table>   | Format:        | MBZ     |         |    |
|                          | Format:  | MBZ  |                |         |         |    |
|                          | 23:16  | <p><b>PWL_INV_GAMMA_Bias_11</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: center;">215</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>Bias 11 for PWL for inverse gamma correction</p> | Default Value: | 215     | Format: | U8 |
|                          | Default Value:   | 215  |                |         |         |    |
| Format:                  | U8   |  |                |         |         |    |
| 15:8                     | <p><b>PWL_INV_GAMMA_Bias_10</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: center;">180</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>Bias 10 for PWL for inverse gamma correction</p> | Default Value:   | 180            | Format: | U8      |    |
| Default Value:           | 180  |  |                |         |         |    |
| Format:                  | U8   |  |                |         |         |    |
| 7:0                      | <p><b>PWL_INV_GAMMA_Bias_9</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: center;">147</td> </tr> <tr> <td>Format:</td> <td style="text-align: center;">U8</td> </tr> </table> <p>Bias 9 for PWL for inverse gamma correction</p>   | Default Value:   | 147            | Format: | U8      |    |
| Default Value:           | 147  |  |                |         |         |    |
| Format:                  | U8   |  |                |         |         |    |
| 26                       | 31:28  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">MBZ</td> </tr> </table>   | Format:        | MBZ     |         |    |
|                          | Format:  | MBZ  |                |         |         |    |
|                          | 27:16  | <p><b>PWL_INV_GAMMA_Slope_1</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">U4.8</td> </tr> </table> <p>Slope 1 for PWL for gamma correction<br/>The default is 72/256</p>   | Format:        | U4.8    |         |    |
|                          | Format:  | U4.8   |                |         |         |    |
| 15:12                    | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">MBZ</td> </tr> </table>   | Format:  | MBZ            |         |         |    |
| Format:                  | MBZ  |  |                |         |         |    |
| 11:0                     | <p><b>PWL_INV_GAMMA_Slope_0</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">U4.8</td> </tr> </table> <p>Slope 0 for PWL for gamma correction<br/>The default is 26/256</p>   | Format:  | U4.8           |         |         |    |
| Format:                  | U4.8   |  |                |         |         |    |
| 27                       | 31:28  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: center;">MBZ</td> </tr> </table>   | Format:        | MBZ     |         |    |
| Format:                  | MBZ  |  |                |         |         |    |

| <b>VEBOX_GAMUT_STATE</b> |       |  |  |
|--------------------------|-------|--|--|
|                          | 27:16 | <b>PWL_INV_GAMMA_Slope_3</b><br>Format: U4.8<br>Slope 3 for PWL for gamma correction<br>The default is 151/256 |  |
|                          | 15:12 | <b>Reserved</b><br>Format: MBZ   |  |
|                          | 11:0  | <b>PWL_INV_GAMMA_Slope_2</b><br>Format: U4.8<br>Slope 2 for PWL for gamma correction<br>The default is 107/256 |  |
|                          | 28    | 31:28  | <b>Reserved</b><br>Format: MBZ   |
|                          |       | 27:16  | <b>PWL_INV_GAMMA_Slope_5</b><br>Format: U4.8<br>Slope 5 for PWL for gamma correction<br>The default is 243/256 |
|                          |       | 15:12  | <b>Reserved</b><br>Format: MBZ   |
| 11:0                     |       | <b>PWL_INV_GAMMA_Slope_4</b><br>Format: U4.8<br>Slope 4 for PWL for gamma correction<br>The default is 195/256 |  |
| 29                       | 31:28 | <b>Reserved</b><br>Format: MBZ   |  |
|                          | 27:16 | <b>PWL_INV_GAMMA_Slope_7</b><br>Format: U4.8<br>Slope 7 for PWL for gamma correction<br>The default is 337/256 |  |
|                          | 15:12 | <b>Reserved</b><br>Format: MBZ   |  |
|                          | 11:0  | <b>PWL_INV_GAMMA_Slope_6</b><br>Format: U4.8   |  |



| <b>VEBOX_GAMUT_STATE</b> |       |   |
|--------------------------|-------|---|
|                          |       | <p>Slope 6 for PWL for gamma correction</p> <p>The default is 305/256</p>   |
| 30                       | 31:28 | <p><b>Reserved</b></p> <p>Format: MBZ</p>   |
|                          | 27:16 | <p><b>PWL_INV_GAMMA_Slope_9</b></p> <p>Format: U4.8</p> <p>Slope 9 for PWL for gamma correction</p> <p>The default is 445/256</p>   |
|                          | 15:12 | <p><b>Reserved</b></p> <p>Format: MBZ</p>   |
|                          | 11:0  | <p><b>PWL_INV_GAMMA_Slope_8</b></p> <p>Format: U4.8</p> <p>Slope 8 for PWL for gamma correction</p> <p>The default is 404/256</p>   |
| 31                       | 31:28 | <p><b>Reserved</b></p> <p>Format: MBZ</p>   |
|                          | 27:16 | <p><b>PWL_INV_GAMMA_Slope_11</b></p> <p>Format: U4.8</p> <p>Slope 11 for PWL for gamma correction</p> <p>The default is 555/256</p> |
|                          | 15:12 | <p><b>Reserved</b></p> <p>Format: MBZ</p>   |
|                          | 11:0  | <p><b>PWL_INV_GAMMA_Slope_10</b></p> <p>Format: U4.8</p> <p>Slope 10 for PWL for gamma correction</p> <p>The default is 498/256</p> |
| 32                       | 31    | <p><b>Reserved</b></p> <p>Format: MBZ</p>   |
|                          | 30:16 | <p><b>Offset_in_G</b></p> <p>Default Value: 0</p> <p>Format: S14</p> <p>The input offset for green component</p>                    |

| <b>VEBOX_GAMUT_STATE</b> |       |   |
|--------------------------|-------|---|
|                          | 15    | <b>Reserved</b><br>Format: MBZ  |
|                          | 14:0  | <b>Offset_in_R</b><br>Default Value: 0<br>Format: S14<br>The input offset for red component               |
|                          | 33    | 31 <b>Reserved</b><br>Format: MBZ   |
|                          | 30:16 | <b>Offset_out_B</b><br>Format: S2.12<br>The input offset for green component<br>The default is -1246/4096 |
|                          | 15    | <b>Reserved</b><br>Format: MBZ  |
|                          | 14:0  | <b>Offset_in_B</b><br>Default Value: 0<br>Format: S14<br>The input offset for red component               |
|                          | 34    | 31 <b>Reserved</b><br>Format: MBZ   |
|                          | 30:16 | <b>Offset_out_G</b><br>Format: S2.12<br>The input offset for green component<br>The default is -983/4096  |
|                          | 15    | <b>Reserved</b><br>Format: MBZ  |
|                          | 14:0  | <b>Offset_out_R</b><br>Format: S2.12<br>The input offset for red component<br>The default is -974/4096    |
|                          | 35    | 31 <b>Reserved</b>  |

| <b>VEBOX_GAMUT_STATE</b> |   |  |       |      |   |   |       |   |
|--------------------------|---|--|-------|------|---|---|-------|---|
|                          |   | Format: MBZ  |       |      |   |   |       |   |
|                          | 30  | <b>FullRangeMappingEnable</b><br><table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Basic Mode <b>[Default]</b></td> </tr> <tr> <td style="text-align: center;">1</td> <td>Advance Mode</td> </tr> </tbody> </table>  | Value | Name | 0 | Basic Mode <b>[Default]</b>                                     | 1     | Advance Mode                                  |
| Value                    | Name  |  |       |      |   |   |       |   |
| 0                        | Basic Mode <b>[Default]</b>                                     |  |       |      |   |   |       |   |
| 1                        | Advance Mode  |  |       |      |   |   |       |   |
|                          | 29:20   | <b>d(in,default)</b><br>Default Value: 205<br>Format: U10<br>InnerTriangleMappingLength  |       |      |   |   |       |   |
|                          | 19:10   | <b>d(out, default)</b><br>Default Value: 164<br>Format: U10<br>OuterTriangleMappingLength  |       |      |   |   |       |   |
|                          | 9:0   | <b>d1(out)</b><br>Default Value: 287<br>Format: U10<br>OuterTriangleMappingLengthBelow   |       |      |   |   |       |   |
| 36                       | 31  | <b>xvYccDecEncEnable</b><br>This bit is valid only when ColorGamutCompressionnEnable is on.<br><table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Both xvYcc decode and xvYcc encode are enabled <b>[Default]</b></td> </tr> <tr> <td style="text-align: center;">0</td> <td>To disable both xvYcc decode and xvYcc encode</td> </tr> </tbody> </table> | Value | Name | 1 | Both xvYcc decode and xvYcc encode are enabled <b>[Default]</b> | 0     | To disable both xvYcc decode and xvYcc encode |
| Value                    | Name  |  |       |      |   |   |       |   |
| 1                        | Both xvYcc decode and xvYcc encode are enabled <b>[Default]</b> |  |       |      |   |   |       |   |
| 0                        | To disable both xvYcc decode and xvYcc encode                   |  |       |      |   |   |       |   |
|                          | 30:28   | <b>CompressionLineShift</b><br><table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">3</td> <td><b>[Default]</b></td> </tr> <tr> <td>[0,4]</td> <td></td> </tr> </tbody> </table>   | Value | Name | 3 | <b>[Default]</b>  | [0,4] |   |
| Value                    | Name  |  |       |      |   |   |       |   |
| 3                        | <b>[Default]</b>  |  |       |      |   |   |       |   |
| [0,4]                    |   |  |       |      |   |   |       |   |
|                          | 27:10   | <b>Reserved</b><br>Format: MBZ   |       |      |   |   |       |   |
|                          | 9:0   | <b>d1(in)</b><br>Default Value: 820<br>Format: U10<br>InnerTriangleMappingLengthBelow  |       |      |   |   |       |   |
| 37                       | 31:30   | <b>GCC BasicModeSelection</b>  |       |      |   |   |       |   |

| <b>VEBOX_GAMUT_STATE</b> |   |                                       |                                    |
|--------------------------|---|---------------------------------------|------------------------------------|
|                          | <b>Value</b>  | <b>Name</b>                           | <b>Description</b>                 |
|                          | 00b   | Default                               |                                    |
|                          | 01b   | Scaling Factor                        | Used along with Dword66 Bits 28:11 |
|                          | 10b   | Single Axis Gamma Correction          | Used along with Dword67 Bit 29     |
|                          | 11b   | Scaling factor with fixed luma        | Used along with Dword37 Bits 28:11 |
| 29                       | <b>LumaChormaOnlyCorrection</b>   |                                       |                                    |
|                          | <b>Value</b>  | <b>Name</b>                           |                                    |
|                          | 0   | Luma Only Correction <b>[Default]</b> |                                    |
|                          | 1   | Chorma Only Correction                |                                    |
| 28:25                    | <b>Reserved</b>   |                                       |                                    |
|                          | Project:  | CHV, BSW                              |                                    |
|                          | Format:   | MBZ                                   |                                    |
| 24:11                    | <b>BasicModeScalingFactor</b>   |                                       |                                    |
|                          | Project:  | CHV, BSW                              |                                    |
|                          | Format:   | U2.12                                 |                                    |
|                          | Used when FullRangeMappingEnable is in basic mode and base mode selection bit is set to scaling factor. |                                       |                                    |
| 10:1                     | <b>Reserved</b>   |                                       |                                    |
|                          | Format:   | MBZ                                   |                                    |
| 0                        | <b>Cpi Override</b>   |                                       |                                    |
|                          | <b>Value</b>  | <b>Name</b>                           |                                    |
|                          | 0   | <b>[Default]</b>                      |                                    |
|                          | 1   | Override Cpi calculation              |                                    |

## VEBOX\_RGB\_TO\_GAMMA\_CORRECTION

| VEBOX_RGB_TO_GAMMA_CORRECTION |                        |                             |     |
|-------------------------------|------------------------|-----------------------------|-----|
| Source:                       | VideoEnhancementCS     |                             |     |
| Size (in bits):               | 64                     |                             |     |
| Default Value:                | 0x00000000, 0x00000000 |                             |     |
| Color depth is 16 bits.       |                        |                             |     |
| DWord                         | Bit                    | Description                 |     |
| 0..1                          | 63:48                  | <b>B-ch Corrected Value</b> |     |
|                               |                        | Default Value:              | 0h  |
|                               |                        | Format:                     | U16 |
|                               | 47:32                  | <b>G-ch Corrected Value</b> |     |
|                               |                        | Default Value:              | 0h  |
|                               |                        | Format:                     | U16 |
|                               | 31:16                  | <b>R-ch Corrected Value</b> |     |
|                               |                        | Default Value:              | 0h  |
|                               |                        | Format:                     | U16 |
|                               | 15:0                   | <b>Pixel Value</b>          |     |
|                               |                        | Default Value:              | 0h  |
|                               |                        | Format:                     | U16 |

## VEBOX\_STD\_STE\_STATE

| VEBOX_STD_STE_STATE   |  |                                      |     |
|---|--|--------------------------------------|-----|
| Project:  | CHV, BSW   |                                      |     |
| Source:   | VideoEnhancementCS   |                                      |     |
| Size (in bits):   | 928  |                                      |     |
| Default Value:  | 0x9A6E39F0, 0x400D3C65, 0x000C9180, 0xFE2F2E00, 0x0003FFFF, 0x00140000, 0xD82E0640, 0x8285ECEC, 0x07FB8282, 0x00000000, 0x02117000, 0xA38FEC96, 0x0100C8C8, 0x003A6871, 0x01478000, 0x0107C306, 0x1291F008, 0x00094855, 0x1C1BD100, 0x03802008, 0x0002A980, 0x00080180, 0x0007CFF5, 0x18D1F07C, 0x000800BD, 0x1C080100, 0x03800000, 0x0008012B, 0x0008012B |                                      |     |
| This state structure contains the state used by the STD/STE function. |  |                                      |     |
| DWord   | Bit  | Description                          |     |
| 0   | 31:24  | <b>V_Mid</b>                         |     |
|   |  | Default Value:                       | 154 |
|   |  | Format:                              | U8  |
|   |  | Rectangle middle-point V coordinate. |     |
|   | 23:16  | <b>U_Mid</b>                         |     |
|   |  | Default Value:                       | 110 |
|   |  | Format:                              | U8  |
|   |  | Rectangle middle-point U coordinate. |     |
|   | 15:10  | <b>Hue_Max</b>                       |     |
|   |  | Default Value:                       | 14  |
|   |  | Format:                              | U6  |
|   |  | Rectangle half width.                |     |
|   | 9:4  | <b>Sat_Max</b>                       |     |
|   |  | Default Value:                       | 31  |
|   |  | Format:                              | U6  |
| Rectangle half length.  |  |                                      |     |
| 3   | <b>Reserved</b>  |                                      |     |
|   | Format:  | MBZ                                  |     |
| 2   | <b>Output Control</b>  |                                      |     |
|   | <b>Value</b>   | <b>Name</b>                          |     |
|   | 0  | Output Pixels                        |     |
|   | 1  | Output STD Decisions                 |     |

| <b>VEBOX_STD_STE_STATE</b> |       |  |
|----------------------------|-------|--|
|                            | 1     | <b>STE Enable</b><br>Format: Enable  |
|                            | 0     | <b>STD Enable</b><br>Format: Enable<br><br><div style="text-align: center; background-color: #e1eef6; padding: 2px;"><b>Programming Notes</b></div> This needs to be enabled if 'STD Score Output' is enabled. |
| 1                          | 31    | <b>Reserved</b><br>Project: CHV, BSW<br>Format: MBZ  |
|                            | 30:28 | <b>Diamond Margin</b><br>Default Value: 4<br>Format: U3  |
|                            | 27:21 | <b>Diamond<sub>du</sub></b><br>Default Value: 0<br>Format: S6 2's complement<br>Rhombus center shift in the sat-direction, relative to the rectangle center.   |
|                            | 20:18 | <b>HS<sub>margin</sub></b><br>Default Value: 3<br>Format: U3<br>Defines rectangle margin.  |
|                            | 17:10 | <b>Cos(<math>\alpha</math>)</b><br>Default Value: 79<br>Format: S0.7 2's complement<br>The default is 79/128   |
|                            | 9:8   | <b>Reserved</b><br>Format: MBZ   |
|                            | 7:0   | <b>Sin(<math>\alpha</math>)</b><br>Default Value: 101<br>Format: S0.7 2's complement<br>The default is 101/128   |
| 2                          | 31:21 | <b>Reserved</b><br>Format: MBZ   |
|                            | 20:13 | <b>Diamond<sub>alpha</sub></b>   |

| VEBOX_STD_STE_STATE  |   |  |  |
|--|---|--|--|
|  |   | Default Value: 100                     |  |
|  |   | Format: U2.6                           |  |
|  |   | 1/tan( $\beta$ ) The default is 100/64 |  |
|  | 12:7  | <b>Diamond_Th</b>                      |  |
|  |   | Default Value: 35                      |  |
|  |   | Format: U6                             |  |
|  | Half length of the rhombus axis in the sat-direction.       |  |  |
|  | 6:0   | <b>Diamond_dv</b>                      |  |
|  |   | Default Value: 0                       |  |
| Format: S6 2's complement  |   |  |  |
| Rhombus center shift in the hue-direction, relative to the rectangle center. |   |  |  |
| 3  | 31:24   | <b>Y_point_3</b>                       |  |
|  |   | Default Value: 254                     |  |
|  |   | Format: U8                             |  |
|  | Third point of the Y piecewise linear membership function.  |  |  |
|  | 23:16   | <b>Y_point_2</b>                       |  |
|  |   | Default Value: 47                      |  |
|  |   | Format: U8                             |  |
|  | Second point of the Y piecewise linear membership function. |  |  |
|  | 15:8  | <b>Y_point_1</b>                       |  |
|  |   | Default Value: 46                      |  |
|  |   | Format: U8                             |  |
|  | First point of the Y piecewise linear membership function.  |  |  |
|  | 7   | <b>VY_STD_Enable</b>                   |  |
|  |   | Format: Enable                         |  |
|  |   | Enables STD in the VY subspace.        |  |
| 6:0  | <b>Reserved</b>   |  |  |
|  | Format: MBZ   |  |  |
|  |   |  |  |
| 4  | 31:18   | <b>Reserved</b>                        |  |
|  |   | Format: MBZ                            |  |
|  | 17:13   | <b>Y_Slope_2</b>                       |  |
| Default Value: 31  |   |  |  |



| <b>VEBOX_STD_STE_STATE</b>      |   |  |                |                     |                                 |       |                                 |  |                     |  |
|---------------------------------|---|--|----------------|---------------------|---------------------------------|-------|---------------------------------|--|---------------------|--|
|                                 |   | <table border="1"> <tr> <td>Format:</td> <td>U2.3</td> </tr> <tr> <td colspan="2">Slope between points Y3 and Y4.</td> </tr> <tr> <td colspan="2">The default is 31/8</td> </tr> </table>  | Format:        | U2.3                | Slope between points Y3 and Y4. |       | The default is 31/8             |  |                     |  |
| Format:                         | U2.3  |  |                |                     |                                 |       |                                 |  |                     |  |
| Slope between points Y3 and Y4. |   |  |                |                     |                                 |       |                                 |  |                     |  |
| The default is 31/8             |   |  |                |                     |                                 |       |                                 |  |                     |  |
|                                 | 12:8  | <p><b>Y_Slope_1</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>31</td> </tr> <tr> <td>Format:</td> <td>U2.3</td> </tr> <tr> <td colspan="2">Slope between points Y1 and Y2.</td> </tr> <tr> <td colspan="2">The default is 31/8</td> </tr> </table> | Default Value: | 31                  | Format:                         | U2.3  | Slope between points Y1 and Y2. |  | The default is 31/8 |  |
| Default Value:                  | 31  |  |                |                     |                                 |       |                                 |  |                     |  |
| Format:                         | U2.3  |  |                |                     |                                 |       |                                 |  |                     |  |
| Slope between points Y1 and Y2. |   |  |                |                     |                                 |       |                                 |  |                     |  |
| The default is 31/8             |   |  |                |                     |                                 |       |                                 |  |                     |  |
|                                 | 7:0   | <p><b>Y_point_4</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>255</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Fourth point of the Y piecewise linear membership function.</p>   | Default Value: | 255                 | Format:                         | U8    |                                 |  |                     |  |
| Default Value:                  | 255   |  |                |                     |                                 |       |                                 |  |                     |  |
| Format:                         | U8  |  |                |                     |                                 |       |                                 |  |                     |  |
| 5                               | 31:16   | <p><b>INV_Skin_types_margin</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>20 Skin_Type_margin</td> </tr> <tr> <td>Format:</td> <td>U0.16</td> </tr> </table> <p><math>1/(2 * Skin\_types\_margin)</math></p>                                       | Default Value: | 20 Skin_Type_margin | Format:                         | U0.16 |                                 |  |                     |  |
|                                 | Default Value:  | 20 Skin_Type_margin  |                |                     |                                 |       |                                 |  |                     |  |
| Format:                         | U0.16   |  |                |                     |                                 |       |                                 |  |                     |  |
| 15:0                            | <p><b>INV_Margin_VYL</b></p> <table border="1"> <tr> <td>Format:</td> <td>U0.16</td> </tr> </table> <p><math>1 / Margin\_VYL</math> <math>1 / Margin\_VYL = 3300/65536</math></p>                     | Format:  | U0.16          |                     |                                 |       |                                 |  |                     |  |
| Format:                         | U0.16   |  |                |                     |                                 |       |                                 |  |                     |  |
| 6                               | 31:24   | <p><b>P1L</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>216</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Y Point 1 of the lower part of the detection PWLF.</p>  | Default Value: | 216                 | Format:                         | U8    |                                 |  |                     |  |
|                                 | Default Value:  | 216  |                |                     |                                 |       |                                 |  |                     |  |
|                                 | Format:   | U8   |                |                     |                                 |       |                                 |  |                     |  |
| 23:16                           | <p><b>P0L</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>46</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Y Point 0 of the lower part of the detection PWLF.</p>        | Default Value:   | 46             | Format:             | U8                              |       |                                 |  |                     |  |
| Default Value:                  | 46  |  |                |                     |                                 |       |                                 |  |                     |  |
| Format:                         | U8  |  |                |                     |                                 |       |                                 |  |                     |  |
| 15:0                            | <p><b>INV_Margin_VYU</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>1600</td> </tr> <tr> <td>Format:</td> <td>U0.16</td> </tr> </table> <p><math>1 / Margin\_VYU = 1600/65536</math></p> | Default Value:   | 1600           | Format:             | U0.16                           |       |                                 |  |                     |  |
| Default Value:                  | 1600  |  |                |                     |                                 |       |                                 |  |                     |  |
| Format:                         | U0.16   |  |                |                     |                                 |       |                                 |  |                     |  |

| <b>VEBOX_STD_STE_STATE</b> |  |   |
|----------------------------|--|---|
| 7                          | 31:24  | <b>B1L</b>  |
|                            |  | Default Value: 130<br>Format: U8<br>V Bias 1 of the lower part of the detection PWLF.   |
|                            | 23:16  | <b>B0L</b>  |
|                            |  | Default Value: 133<br>Format: U8<br>V Bias 0 of the lower part of the detection PWLF.   |
| 15:8                       | <b>P3L</b>   |   |
|                            | Default Value: 236<br>Format: U8<br>Y Point 3 of the lower part of the detection PWLF. |   |
| 7:0                        | <b>P2L</b>   |   |
|                            | Default Value: 236<br>Format: U8<br>Y Point 2 of the lower part of the detection PWLF. |   |
| 8                          | 31:27  | <b>Reserved</b>   |
|                            |  | Format: MBZ   |
|                            | 26:16  | <b>S0L</b>  |
|                            |  | Default Value: FFBh<br>Format: S2.8 2's complement<br>Slope 0 of the lower part of the detection PWLF.<br>The default is -5/256 |
| 15:8                       | <b>B3L</b>   |   |
|                            | Default Value: 130<br>Format: U8<br>V Bias 3 of the lower part of the detection PWLF.  |   |
| 7:0                        | <b>B2L</b>   |   |
|                            | Default Value: 130<br>Format: U8<br>V Bias 2 of the lower part of the detection PWLF.  |   |
| 9                          | 31:22  | <b>Reserved</b>   |

| <b>VEBOX_STD_STE_STATE</b>   |  |                             |
|--|--|-----------------------------|
|  |  | Format: MBZ                 |
|  | 21:11  | <b>S2L</b>                  |
|  |  | Default Value: 0            |
|  |  | Format: S2.8 2's complement |
|  | The default is 0/256   |                             |
|  | 10:0   | <b>S1L</b>                  |
|  |  | Default Value: 0            |
| Format: S2.8 2's complement  |  |                             |
| Slope 1 of the lower part of the detection PWLF.<br>The default is 0/256 |  |                             |
| 10   | 31:27  | <b>Reserved</b>             |
|  |  | Format: MBZ                 |
|  | 26:19  | <b>P1U</b>                  |
|  |  | Default Value: 66           |
|  |  | Format: U8                  |
|  | Y Point 1 of the upper part of the detection PWLF.                       |                             |
|  | 18:11  | <b>P0U</b>                  |
|  |  | Default Value: 46           |
|  |  | Format: U8                  |
|  | Y Point 0 of the upper part of the detection PWLF.                       |                             |
| 10:0   | <b>S3L</b>   |                             |
|  | Default Value: 0   |                             |
|  | Format: S2.8 2's complement  |                             |
|  | Slope 3 of the lower part of the detection PWLF.<br>The default is 0/256 |                             |
| 11   | 31:24  | <b>B1U</b>                  |
|  |  | Default Value: 163          |
|  |  | Format: U8                  |
|  | V Bias 1 of the upper part of the detection PWLF.                        |                             |
|  | 23:16  | <b>B0U</b>                  |
| Default Value: 143   |  |                             |
| Format: U8   |  |                             |

| <b>VEBOX_STD_STE_STATE</b>  |   |                     |         |                     |                     |
|---|---|---------------------|---------|---------------------|---------------------|
|   | <p>V Bias 0 of the upper part of the detection PWLF.</p>  |                     |         |                     |                     |
| 15:8  | <p><b>P3U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>236</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Y Point 3 of the upper part of the detection PWLF.</p>   | Default Value:      | 236     | Format:             | U8                  |
| Default Value:  | 236   |                     |         |                     |                     |
| Format:   | U8  |                     |         |                     |                     |
| 7:0   | <p><b>P2U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>150</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>Y Point 2 of the upper part of the detection PWLF.</p>   | Default Value:      | 150     | Format:             | U8                  |
| Default Value:  | 150   |                     |         |                     |                     |
| Format:   | U8  |                     |         |                     |                     |
| 12  | <p>31:27 <b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:             | MBZ     |                     |                     |
|   | Format:   | MBZ                 |         |                     |                     |
|   | <p>26:16 <b>S0U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>256</td> </tr> <tr> <td>Format:</td> <td>S2.8 2's complement</td> </tr> </table> <p>Slope 0 of the upper part of the detection PWLF.<br/>The default is 256/256</p> | Default Value:      | 256     | Format:             | S2.8 2's complement |
|   | Default Value:  | 256                 |         |                     |                     |
|   | Format:   | S2.8 2's complement |         |                     |                     |
|   | <p>15:8 <b>B3U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>200</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>V Bias 3 of the upper part of the detection PWLF.</p>   | Default Value:      | 200     | Format:             | U8                  |
| Default Value:  | 200   |                     |         |                     |                     |
| Format:   | U8  |                     |         |                     |                     |
| <p>7:0 <b>B2U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>200</td> </tr> <tr> <td>Format:</td> <td>U8</td> </tr> </table> <p>V Bias 2 of the upper part of the detection PWLF.</p>  | Default Value:  | 200                 | Format: | U8                  |                     |
| Default Value:  | 200   |                     |         |                     |                     |
| Format:   | U8  |                     |         |                     |                     |
| <p>31:22 <b>Reserved</b></p> <table border="1"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:   | MBZ                 |         |                     |                     |
| Format:   | MBZ   |                     |         |                     |                     |
| <p>21:11 <b>S2U</b></p> <table border="1"> <tr> <td>Default Value:</td> <td>F4Dh</td> </tr> <tr> <td>Format:</td> <td>S2.8 2's complement</td> </tr> </table> <p>Slope 2 of the upper part of the detection PWLF.<br/>The default is -179/256</p> | Default Value:  | F4Dh                | Format: | S2.8 2's complement |                     |
| Default Value:  | F4Dh  |                     |         |                     |                     |
| Format:   | S2.8 2's complement   |                     |         |                     |                     |

| <b>VEBOX_STD_STE_STATE</b> |       |   |
|----------------------------|-------|---|
|                            | 10:0  | <b>S1U</b><br>Default Value: 113<br>Format: S2.8<br>Slope 1 of the upper part of the detection PWLF.<br>The default is 113/256  |
|                            |       | <b>Reserved</b><br>Format: MBZ  |
|                            |       | 27:20 <b>Skin_types_margin</b><br>Default Value: 20<br>Format: U8<br>Skin types Y margin Restrict Skin_types_thresh >= Skin_types_margin > 0 Restrict (Skin_types_thresh + Skin_types_margin) <= 255  |
|                            |       | 19:12 <b>Skin_types_thresh</b><br>Default Value: 120<br>Format: U8<br>Skin types Y margin Restrict Skin_types_thresh >= Skin_types_margin > 0 Restrict (Skin_types_thresh + Skin_types_margin) <= 255 |
| 14                         | 11    | <b>Skin_Types_Enable</b><br>Default Value: 0 Disable<br>Format: Enable<br>Treat differently bright and dark skin types  |
|                            |       | 10:0 <b>S3U</b><br>Default Value: 0<br>Format: S2.8 2's complement<br>Slope 3 of the upper part of the detection PWLF.<br>The default is 0/256  |
|                            |       | <b>Reserved</b><br>Format: MBZ  |
|                            |       | 30:21 <b>SATB1</b><br>Default Value: 8<br>Format: S7.2 2's complement<br>First bias for the saturation PWLF (bright skin).  |
| 15                         | 31    | <b>Reserved</b><br>Format: MBZ  |
|                            | 30:21 | <b>SATB1</b><br>Default Value: 8<br>Format: S7.2 2's complement<br>First bias for the saturation PWLF (bright skin).  |

| <b>VEBOX_STD_STE_STATE</b> |   |   |
|----------------------------|---|---|
|                            |   | The default is 8/4                                  |
| 16                         | 20:14   | <b>SATP3</b>  |
|                            |   | Default Value: 31                                   |
|                            |   | Format: S6 2's complement                           |
|                            |   | Third point for the saturation PWLF (bright skin).  |
|                            | 13:7  | <b>SATP2</b>  |
|                            |   | Default Value: 6                                    |
|                            |   | Format: S6 2's complement                           |
|                            |   | Second point for the saturation PWLF (bright skin). |
|                            | 6:0   | <b>SATP1</b>  |
|                            |   | Default Value: 6                                    |
|                            |   | Format: S6 2's complement                           |
|                            |   | First point for the saturation PWLF (bright skin).  |
| 16                         | 31  | <b>Reserved</b>                                     |
|                            |   | Format: MBZ   |
|                            | 30:20   | <b>SATS0</b>  |
|                            |   | Default Value: 297                                  |
|                            |   | Format: U3.8  |
|                            |   | Zeroth slope for the saturation PWLF (bright skin)  |
|                            |   | The default is 297/256                              |
|                            | 19:10   | <b>SATB3</b>  |
|                            |   | Default Value: 124                                  |
|                            |   | Format: S7.2 2's complement                         |
|                            |   | Third bias for the saturation PWLF (bright skin)    |
|                            |   | The default is 124/4                                |
| 9:0                        | <b>SATB2</b>                                      |   |
|                            | Default Value: 8                                  |   |
|                            | Format: S7.2 2's complement                       |   |
|                            | Second bias for the saturation PWLF (bright skin) |   |
|                            | The default is 8/4                                |   |
| 17                         | 31:22   | <b>Reserved</b>                                     |
|                            |   | Format: MBZ   |

| <b>VEBOX_STD_STE_STATE</b> |       |  |
|----------------------------|-------|--|
|                            | 21:11 | <b>SATS2</b><br>Default Value: 297<br>Format: U3.8<br>Second slope for the saturation PWLF (bright skin)<br>The default is 297/256 |
|                            | 10:0  | <b>SATS1</b><br>Default Value: 85<br>Format: U3.8<br>First slope for the saturation PWLF (bright skin)<br>The default is 85/256    |
| 18                         | 31:25 | <b>HUEP3</b><br>Default Value: 14<br>Format: S6 2's complement<br>Third point for the hue PWLF (bright skin)                       |
|                            | 24:18 | <b>HUEP2</b><br>Default Value: 6<br>Format: S6 2's complement<br>Second point for the hue PWLF (bright skin)                       |
|                            | 17:11 | <b>HUEP1</b><br>Default Value: 7Ah -6<br>Format: S6 2's complement<br>First point for the hue PWLF (bright skin)                   |
|                            | 10:0  | <b>SATS3</b><br>Default Value: 256<br>Format: U3.8<br>Third slope for the saturation PWLF (bright skin)<br>The default is 256/256  |
| 19                         | 31:30 | <b>Reserved</b><br>Format: MBZ   |
|                            | 29:20 | <b>HUEB3</b><br>Default Value: 56<br>Format: S7.2 2's complement   |

| <b>VEBOX_STD_STE_STATE</b> |  |  |                |         |         |                     |
|----------------------------|--|--|----------------|---------|---------|---------------------|
|                            |  | <p>Third bias for the hue PWLF (bright skin)</p> <p>The default is 56/4</p>  |                |         |         |                     |
|                            | 19:10  | <p><b>HUEB2</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">8</td> </tr> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>Second bias for the hue PWLF (bright skin)</p> <p>The default is 8/4</p> | Default Value: | 8       | Format: | S7.2 2's complement |
| Default Value:             | 8  |  |                |         |         |                     |
| Format:                    | S7.2 2's complement  |  |                |         |         |                     |
|                            | 9:0  | <p><b>HUEB1</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">8</td> </tr> <tr> <td>Format:</td> <td>S7.2 2's complement</td> </tr> </table> <p>First bias for the hue PWLF (bright skin)</p> <p>The default is 8/4</p>  | Default Value: | 8       | Format: | S7.2 2's complement |
| Default Value:             | 8  |  |                |         |         |                     |
| Format:                    | S7.2 2's complement  |  |                |         |         |                     |
| 20                         | 31:22  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:        | MBZ     |         |                     |
|                            | Format:  | MBZ  |                |         |         |                     |
|                            | 21:11  | <p><b>HUES1</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">85</td> </tr> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>First slope for the hue PWLF (bright skin)</p> <p>The default is 85/256</p>            | Default Value: | 85      | Format: | U3.8                |
| Default Value:             | 85   |  |                |         |         |                     |
| Format:                    | U3.8   |  |                |         |         |                     |
| 10:0                       | <p><b>HUES0</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">384</td> </tr> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>Zereth slope for the hue PWLF (bright skin)</p> <p>The default is 384/256</p> | Default Value:   | 384            | Format: | U3.8    |                     |
| Default Value:             | 384  |  |                |         |         |                     |
| Format:                    | U3.8   |  |                |         |         |                     |
| 21                         | 31:22  | <p><b>Reserved</b></p> <table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Format:        | MBZ     |         |                     |
|                            | Format:  | MBZ  |                |         |         |                     |
| 21:11                      | <p><b>HUES3</b></p> <table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">256</td> </tr> <tr> <td>Format:</td> <td>U3.8</td> </tr> </table> <p>Third slope for the hue PWLF (bright skin)</p> <p>The default is 256/256</p>  | Default Value:   | 256            | Format: | U3.8    |                     |
| Default Value:             | 256  |  |                |         |         |                     |
| Format:                    | U3.8   |  |                |         |         |                     |



| <b>VEBOX_STD_STE_STATE</b> |       |  |
|----------------------------|-------|--|
| 22                         | 10:0  | <b>HUES2</b><br>Default Value: 384<br>Format: U3.8<br>Second slope for the hue PWLF (bright skin)<br>The default is 384/256                  |
|                            | 31    | <b>Reserved</b><br>Format: MBZ   |
|                            | 30:21 | <b>SATB1_DARK</b><br>Default Value: 0<br>Format: S7.2 2's complement<br>First bias for the saturation PWLF (dark skin)<br>The default is 0/4 |
|                            | 20:14 | <b>SATP3_DARK</b><br>Default Value: 31<br>Format: S6 2's complement<br>Third point for the saturation PWLF (dark skin)                       |
|                            | 13:7  | <b>SATP2_DARK</b><br>Default Value: 31<br>Format: S6 2's complement<br>Second point for the saturation PWLF (dark skin)                      |
|                            | 6:0   | <b>SATP1_DARK</b><br>Default Value: FF5h<br>Format: S6 2's complement<br>First point for the saturation PWLF (dark skin) Default Value: -11  |
|                            | 31    | <b>Reserved</b><br>Format: MBZ   |
|                            | 30:20 | <b>SATS0_DARK</b><br>Default Value: 397<br>Format: U3.8<br>Zeroth slope for the saturation PWLF (dark skin)<br>The default is 397/256        |
|                            | 19:10 | <b>SATB3_DARK</b>  |

| <b>VEBOX_STD_STE_STATE</b> |   |  |
|----------------------------|---|--|
|                            |   | Default Value: 124                               |
|                            |   | Format: S7.2 2's complement                      |
|                            |   | Third bias for the saturation PWLF (dark skin)   |
|                            |   | The default is 124/4                             |
|                            |   |  |
|                            | 9:0   | <b>SATB2_DARK</b>                                |
|                            |   | Default Value: 124                               |
|                            |   | Format: S7.2 2's complement                      |
|                            |   | Second bias for the saturation PWLF (dark skin)  |
|                            |   | The default is 124/4                             |
| 24                         | 31:22   | <b>Reserved</b>                                  |
|                            |   | Format: MBZ                                      |
|                            | 21:11   | <b>SATS2_DARK</b>                                |
|                            |   | Default Value: 256                               |
|                            |   | Format: U3.8                                     |
|                            |   | Second slope for the saturation PWLF (dark skin) |
|                            |   | The default is 256/256                           |
|                            | 10:0  | <b>SATS1_DARK</b>                                |
|                            |   | Default Value: 189                               |
|                            |   | Format: U3.8                                     |
|                            | First slope for the saturation PWLF (dark skin) |  |
|                            | The default is 189/256                          |  |
| 25                         | 31:25   | <b>HUEP3_DARK</b>                                |
|                            |   | Default Value: 14                                |
|                            |   | Format: S6 2's complement                        |
|                            |   | Third point for the hue PWLF (dark skin).        |
|                            | 24:18   | <b>HUEP2_DARK</b>                                |
|                            |   | Default Value: 2                                 |
|                            |   | Format: S6 2's complement                        |
|                            |   | Second point for the hue PWLF (dark skin).       |
|                            | 17:11   | <b>HUEP1_DARK</b>                                |
|                            |   | Default Value: 0                                 |
| Format: S6 2's complement  |   |  |

| <b>VEBOX_STD_STE_STATE</b> |  |  |                |         |         |                     |
|----------------------------|--|--|----------------|---------|---------|---------------------|
|                            |  | First point for the hue PWLF (dark skin).  |                |         |         |                     |
|                            | 10:0   | <b>SATS3_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">256</td> </tr> <tr> <td>Format:</td> <td style="text-align: right;">U3.8</td> </tr> </table><br>Third slope for the saturation PWLF (dark skin)<br>The default is 256/256     | Default Value: | 256     | Format: | U3.8                |
| Default Value:             | 256  |  |                |         |         |                     |
| Format:                    | U3.8   |  |                |         |         |                     |
| 26                         | 31:30  | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: right;">MBZ</td> </tr> </table>  | Format:        | MBZ     |         |                     |
|                            | Format:  | MBZ  |                |         |         |                     |
|                            | 29:20  | <b>HUEB3_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">56</td> </tr> <tr> <td>Format:</td> <td style="text-align: right;">S7.2 2's complement</td> </tr> </table><br>Third bias for the hue PWLF (dark skin).<br>The default is 56/4 | Default Value: | 56      | Format: | S7.2 2's complement |
|                            | Default Value:   | 56   |                |         |         |                     |
|                            | Format:  | S7.2 2's complement  |                |         |         |                     |
|                            | 19:10  | <b>HUEB2_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Format:</td> <td style="text-align: right;">S7.2 2's complement</td> </tr> </table><br>Second bias for the hue PWLF (dark skin).<br>The default is 0/4  | Default Value: | 0       | Format: | S7.2 2's complement |
|                            | Default Value:   | 0  |                |         |         |                     |
|                            | Format:  | S7.2 2's complement  |                |         |         |                     |
|                            | 9:0  | <b>HUEB1_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Format:</td> <td style="text-align: right;">S7.2 2's complement</td> </tr> </table><br>First bias for the hue PWLF (dark skin).<br>The default is 0/4   | Default Value: | 0       | Format: | S7.2 2's complement |
|                            | Default Value:   | 0  |                |         |         |                     |
| Format:                    | S7.2 2's complement  |  |                |         |         |                     |
| 31:22                      | <b>Reserved</b><br><table border="1" style="width: 100%;"> <tr> <td>Format:</td> <td style="text-align: right;">MBZ</td> </tr> </table>  | Format:  | MBZ            |         |         |                     |
| Format:                    | MBZ  |  |                |         |         |                     |
| 21:11                      | <b>HUES1_DARK</b><br><table border="1" style="width: 100%;"> <tr> <td>Default Value:</td> <td style="text-align: right;">256</td> </tr> <tr> <td>Format:</td> <td style="text-align: right;">U3.8</td> </tr> </table><br>First slope for the hue PWLF (dark skin).<br>The default is 256/256 | Default Value:   | 256            | Format: | U3.8    |                     |
| Default Value:             | 256  |  |                |         |         |                     |
| Format:                    | U3.8   |  |                |         |         |                     |
| 10:0                       | <b>HUES0_DARK</b>  |  |                |         |         |                     |

| <b>VEBOX_STD_STE_STATE</b> |  |  |
|----------------------------|--|--|
| 28                         |  | Default Value: 299   |
|                            |  | Format: U3.8   |
|                            |  | Zeroth slope for the hue PWLF (dark skin).<br>The default is 299/256 |
|                            |  |  |
|                            | 31:22  | <b>Reserved</b>  |
|                            |  | Format: MBZ  |
|                            | 21:11  | <b>HUES3_DARK</b>  |
|                            |  | Default Value: 256   |
|                            |  | Format: U3.8   |
|                            |  | Third slope for the hue PWLF (dark skin).<br>The default is 256/256  |
|                            |  |  |
|                            | 10:0   | <b>HUES2_DARK</b>  |
|                            | Default Value: 299   |  |
|                            | Format: U3.8   |  |
|                            | Second slope for the hue PWLF (dark skin).<br>The default is 299/256 |  |
|                            |  |  |

## VEBOX TLB Control Register

| <b>VTCR - VEBOX TLB Control Register</b> |  |  |                                   |                                   |         |    |
|--|--|--|-----------------------------------|-----------------------------------|---------|----|
| Register Space:                          | MMIO: 0/2/0  |  |                                   |                                   |         |    |
| Project:                                 | CHV, BSW   |  |                                   |                                   |         |    |
| Source:                                  | PRM  |  |                                   |                                   |         |    |
| Default Value:                           | 0x00000000   |  |                                   |                                   |         |    |
| Size (in bits):                          | 32   |  |                                   |                                   |         |    |
| Address:                                 | 04270h   |  |                                   |                                   |         |    |
| DWord                                    | Bit  | Description  |                                   |                                   |         |    |
| 0  | 31:1   | <b>Reserved</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Default Value:</td> <td>00000000000000000000000000000000b</td> </tr> <tr> <td>Access:</td> <td>RO</td> </tr> </table> | Default Value:                    | 00000000000000000000000000000000b | Access: | RO |
|  |  | Default Value:   | 00000000000000000000000000000000b |                                   |         |    |
| Access:                                  | RO   |  |                                   |                                   |         |    |
| 0  | <b>Invalidate TLBs on the corresponding Engine</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Default Value:</td> <td>0b</td> </tr> <tr> <td>Access:</td> <td>R/W</td> </tr> </table> <p>SW writes 1 to invalidate the TLBs for the associated engine and HW clears the bit when invalidation is complete. To ensure proper invalidation of the TLBs, SW has to ensure the corresponding engine's HW pipeline is flushed and cleared from all its memory accesses. Otherwise HW cannot guarantee the proper invalidation for TLBs.<br/>This bit is self clear.</p> | Default Value:   | 0b                                | Access:                           | R/W     |    |
| Default Value:                           | 0b   |  |                                   |                                   |         |    |
| Access:                                  | R/W  |  |                                   |                                   |         |    |





| <b>VEBOX_VERTEX_TABLE</b>                      |  |  |                                    |             |             |           |                                    |                                    |
|--|--|--|------------------------------------|-------------|-------------|-----------|------------------------------------|------------------------------------|
| 0x00000000, 0x00000000                         |  |  |                                    |             |             |           |                                    |                                    |
| DWord  | Bit  | Description  |                                    |             |             |           |                                    |                                    |
| 0..511   | 31:28  | <b>Reserved</b>  |                                    |             |             |           |                                    |                                    |
|  |  | Format: <span style="float: right;">MBZ</span>   |                                    |             |             |           |                                    |                                    |
|  | 27:16  | <b>Vertex table entry 0 - Lv (12 bits)</b>   |                                    |             |             |           |                                    |                                    |
|  |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">100h-ED6h</td> <td></td> <td>Range for Vertices BT601 and BT709</td> </tr> </tbody> </table> | Value                              | Name        | Description | 100h-ED6h |                                    | Range for Vertices BT601 and BT709 |
|  |  | Value  | Name                               | Description |             |           |                                    |                                    |
|  | 100h-ED6h  |  | Range for Vertices BT601 and BT709 |             |             |           |                                    |                                    |
|  |  |  |                                    |             |             |           |                                    |                                    |
|  | 15:12  | <b>Reserved</b>  |                                    |             |             |           |                                    |                                    |
| Format: <span style="float: right;">MBZ</span> |  |  |                                    |             |             |           |                                    |                                    |
| 11:0   | <b>Vertex table entry 0 - Cv (12 bits)</b>   |  |                                    |             |             |           |                                    |                                    |
|  | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">400h-A00h</td> <td></td> <td>Range for Vertices BT601 and BT709</td> </tr> </tbody> </table> | Value  | Name                               | Description | 400h-A00h   |           | Range for Vertices BT601 and BT709 |                                    |
|  | Value  | Name   | Description                        |             |             |           |                                    |                                    |
| 400h-A00h                                      |  | Range for Vertices BT601 and BT709   |                                    |             |             |           |                                    |                                    |
|  |  |  |                                    |             |             |           |                                    |                                    |



## VECS Hardware-Detected Error Bit Definitions

| VECS Hardware-Detected Error Bit Definitions |   |  |      |             |   |  |                            |
|--|---|--|------|-------------|---|--|----------------------------|
| Project:                                     | CHV, BSW  |  |      |             |   |  |                            |
| Source:                                      | VideoEnhancementCS  |  |      |             |   |  |                            |
| Size (in bits):                              | 16  |  |      |             |   |  |                            |
| Default Value:                               | 0x00000000  |  |      |             |   |  |                            |
| DWord  | Bit   | Description  |      |             |   |  |                            |
| 0  | 15:3  | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>  |      | MBZ         |   |  |                            |
|  |   | MBZ  |      |             |   |  |                            |
|  | 2   | <b>Command Privilege Violation Error</b><br>Project: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>CHV, BSW</td></tr></table><br>This bit is set if a command classified as privileged is parsed in a non-privileged batch buffer. The command will be converted to a NOOP and parsing will continue. |      | CHV, BSW    |   |  |                            |
|  |   | CHV, BSW   |      |             |   |  |                            |
| 1  | <b>Reserved</b><br>Format: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td>MBZ</td></tr></table>   |  | MBZ  |             |   |  |                            |
|  | MBZ   |  |      |             |   |  |                            |
| 0  | <b>Instruction Error</b><br>This bit is set when the Renderer Instruction Parser detects an error while parsing an instruction. Instruction errors include: <ul style="list-style-type: none"> <li>Client ID value (Bits 31:29 of the Header) is not supported (only MI, 2D and 3D are supported).</li> <li>Defeatured MI Instruction Opcodes:</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Value</th> <th style="width: 15%;">Name</th> <th style="width: 70%;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td> </td> <td>Instruction Error detected</td> </tr> </tbody> </table> <p style="text-align: center;"><b>Programming Notes</b></p> This error indications cannot be cleared except by reset (i.e., it is a fatal error). | Value  | Name | Description | 1 |  | Instruction Error detected |
| Value  | Name  | Description  |      |             |   |  |                            |
| 1  |   | Instruction Error detected   |      |             |   |  |                            |

## VERTEX\_BUFFER\_STATE

| DWord  |                             | Bit  | Description |          |     |         |                             |                          |                |        |  |
|--|-----------------------------|--|-------------|----------|-----|---------|-----------------------------|--------------------------|----------------|--------|--|
| Project:   |                             | CHV, BSW   |             |          |     |         |                             |                          |                |        |  |
| Source:  |                             | RenderCS   |             |          |     |         |                             |                          |                |        |  |
| Size (in bits):  |                             | 128  |             |          |     |         |                             |                          |                |        |  |
| Default Value:   |                             | 0x00000000, 0x00000000, 0x00000000, 0x00000000   |             |          |     |         |                             |                          |                |        |  |
| <p>This structure is used in 3DSTATE_VERTEX_BUFFERS to set the state associated with a VB. The VF function will use this state to determine how/where to extract vertex element data for all vertex elements associated with the VB.</p> |                             |  |             |          |     |         |                             |                          |                |        |  |
| 0  | 31:26                       | <b>Vertex Buffer Index</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U6 index</td> </tr> </table> <p>This field contains an index value which selects the VB state being defined.</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>[0,32]</td> <td></td> </tr> </tbody> </table> |             | Project: | All | Format: | U6 index                    | Value                    | Name           | [0,32] |  |
| Project:   | All                         |  |             |          |     |         |                             |                          |                |        |  |
| Format:  | U6 index                    |  |             |          |     |         |                             |                          |                |        |  |
| Value  | Name                        |  |             |          |     |         |                             |                          |                |        |  |
| [0,32]   |                             |  |             |          |     |         |                             |                          |                |        |  |
|  | 25:23                       | <b>Reserved</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  |             | Project: | All | Format: | MBZ                         |                          |                |        |  |
| Project:   | All                         |  |             |          |     |         |                             |                          |                |        |  |
| Format:  | MBZ                         |  |             |          |     |         |                             |                          |                |        |  |
|  | 22:16                       | <b>Memory Object Control State</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MEMORY_OBJECT_CONTROL_STATE</td> </tr> </table> <p>Specifies the memory object control state for this vertex buffer.</p>  |             | Project: | All | Format: | MEMORY_OBJECT_CONTROL_STATE |                          |                |        |  |
| Project:   | All                         |  |             |          |     |         |                             |                          |                |        |  |
| Format:  | MEMORY_OBJECT_CONTROL_STATE |  |             |          |     |         |                             |                          |                |        |  |
|  | 15                          | <b>Reserved</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  |             | Project: | All | Format: | MBZ                         |                          |                |        |  |
| Project:   | All                         |  |             |          |     |         |                             |                          |                |        |  |
| Format:  | MBZ                         |  |             |          |     |         |                             |                          |                |        |  |
|  | 14                          | <b>Address Modify Enable</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> </table> <p>If set, the Buffer Starting Address field is used to update the state of this buffer. If clear, that field is ignored and the previously-programmed value is maintained.</p>  |             | Project: | All |         |                             |                          |                |        |  |
| Project:   | All                         |  |             |          |     |         |                             |                          |                |        |  |
|  | 13                          | <b>Null Vertex Buffer</b><br><table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>This field enabled causes any fetch for vertex data to return 0.</p> <table border="1"> <tr> <td><b>Programming Notes</b></td> <td><b>Project</b></td> </tr> </table>  |             | Project: | All | Format: | Enable                      | <b>Programming Notes</b> | <b>Project</b> |        |  |
| Project:   | All                         |  |             |          |     |         |                             |                          |                |        |  |
| Format:  | Enable                      |  |             |          |     |         |                             |                          |                |        |  |
| <b>Programming Notes</b>   | <b>Project</b>              |  |             |          |     |         |                             |                          |                |        |  |

| <b>VERTEX_BUFFER_STATE</b> |      |   |             |      |             |         |          |  |       |          |  |
|----------------------------|------|---|-------------|------|-------------|---------|----------|--|-------|----------|--|
|                            |      | VERTEX_BUFFER_STATE.Null Vertex Buffer must be set when the VERTEX_BUFFER_STATE.Buffer Size is 0x0.   | CHV, BSW    |      |             |         |          |  |       |          |  |
|                            | 12   | <b>Reserved</b><br>Project: All<br>Format: MBZ  |             |      |             |         |          |  |       |          |  |
|                            | 11:0 | <b>Buffer Pitch</b><br>Format: U12 Count of bytes<br>This field specifies the pitch in bytes of the structures accessed within the VB. This information is required in order to access elements in the VB via a structure index.  |             |      |             |         |          |  |       |          |  |
|                            |      | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Description</th> <th>Project</th> </tr> </thead> <tbody> <tr> <td>[0,2048]</td> <td></td> <td>Bytes</td> <td>CHV, BSW</td> </tr> </tbody> </table>   | Value       | Name | Description | Project | [0,2048] |  | Bytes | CHV, BSW |  |
| Value                      | Name | Description   | Project     |      |             |         |          |  |       |          |  |
| [0,2048]                   |      | Bytes   | CHV, BSW    |      |             |         |          |  |       |          |  |
|                            |      | <b>Programming Notes</b>  |             |      |             |         |          |  |       |          |  |
|                            |      | <ul style="list-style-type: none"> <li>Different VERTEX_BUFFER_STATE structures can refer to the same memory region using different Buffer Pitch values.</li> <li>See note on 64-bit float alignment in Buffer Starting Address.</li> </ul>   |             |      |             |         |          |  |       |          |  |
| 1..2                       | 63:0 | <b>Buffer Starting Address</b><br>Format: GraphicsAddress[63:0]Vertex_Buffer<br>This field contains the byte-aligned Graphics Address LSBs of the first element of interest within the VB. Software must program this value with the combination (sum) of the base address of the memory resource and the byte offset from the base address to the starting structure within the buffer. If the Address ModifyEnable bit is clear, this field is ignored and the previous value of Buffer Starting Address for this buffer is maintained.   |             |      |             |         |          |  |       |          |  |
|                            |      | <b>Programming Notes</b>  |             |      |             |         |          |  |       |          |  |
|                            |      | <ul style="list-style-type: none"> <li>64-bit floating point values must be 64-bit aligned in memory, or UNPREDICTABLE data will be fetched. When accessing an element containing 64-bit floating point values, the Buffer Starting Address and Source Element Offset values must add to a 64-bit aligned address, and BufferPitch must be a multiple of 64-bits.</li> <li>VBs can only be allocated in linear (not tiled) graphics memory.</li> <li>As computed index values are, by definition, interpreted as unsigned values, there is no issue with accesses to locations before (lower address value) the start of the buffer. However, these wrapped indices are subject to Max Index checking (see below).</li> </ul> |             |      |             |         |          |  |       |          |  |
| 3                          | 31:0 | <b>Buffer Size</b><br>Format: U32 Count of bytes<br>This field specifies the size of the buffer in bytes. Vertex element accesses which straddle or go past the end of the buffer will return 0's for all elements. Note that BufferSize=0 indicates that there is no valid data in the buffer.   |             |      |             |         |          |  |       |          |  |
|                            |      | <b>Value</b>  | <b>Name</b> |      |             |         |          |  |       |          |  |

| VERTEX_BUFFER_STATE |                |
|---------------------|----------------|
|                     | [0, FFFFFFFFh] |

## VERTEX\_ELEMENT\_STATE

| <b>VERTEX_ELEMENT_STATE</b>  |                        |                            |
|--|------------------------|----------------------------|
| Project:   | All                    |                            |
| Source:  | RenderCS               |                            |
| Size (in bits):  | 64                     |                            |
| Default Value:   | 0x00000000, 0x00000000 |                            |
| Description  |                        | Project                    |
| <p>This structure is used in 3DSTATE_VERTEX_ELEMENTS to set the state associated with a vertex element. A vertex element is defined as an entity supplying from 1 to 4 DWord vertex components to be stored in the vertex URB entry. The number of supported vertex elements is:</p>   |                        |                            |
| [CHV, BSW]: 34   |                        | CHV, BSW                   |
| <p>The VF function will use this state, and possibly the state of the associated vertex buffer, to fetch/generate the source vertex element data, perform any required format conversions, padding with zeros, and store the resulting destination vertex element data into the vertex URB entry.</p>  |                        |                            |
| Programming Notes  |                        | Project                    |
| <ul style="list-style-type: none"> <li>The (new) 3DSTATE_VF_SGVS command is used to specify optional insertion of VertexID and/or InstanceID into the input vertex data, logically following the processing of the VERTEX_ELEMENT_STATE structures. The VFCOMP_STORE_VID/IID encodings are no longer available in VERTEX_ELEMENT_STATE.</li> <li>When SourceElementFormat is set to one of the *64*_PASSTHRU formats, 64-bit components are stored in the URB without any conversion. In this case, vertex elements must be written as 128 or 256 bits, with VFCOMP_STORE_0 being used to pad the output as required. E.g., if R64_PASSTHRU is used to copy a 64-bit Red component into the URB, Component 1 must be specified as VFCOMP_STORE_0 (with Components 2,3 set to VFCOMP_NOSTORE) in order to output a 128-bit vertex element, or Components 1-3 must be specified as VFCOMP_STORE_0 in order to output a 256-bit vertex element. Likewise, use of R64G64B64_PASSTHRU requires Component 3 to be specified as VFCOMP_STORE_0 in order to output a 256-bit vertex element.</li> <li>When SourceElementFormat is set to one of the *64*_PASSTHRU formats then VFCOMP_STORE_SRC must be used for every valid component.</li> <li>Any SourceElementFormat of *64*_PASSTHRU cannot be used with an element which has edge flag enabled.</li> </ul> |                        | CHV, BSW                   |
| The SourceElementFormat needs to be a single-component format with an element which has edge flag enabled.   |                        |                            |
| DWord  | Bit                    | Description                |
| 0  | 31:26                  | <b>Vertex Buffer Index</b> |
|  |                        | Project: CHV, BSW          |

| <b>VERTEX_ELEMENT_STATE</b> |   |                            |  |                |
|-----------------------------|---|----------------------------|--|----------------|
|                             | Format:   | U6                         |  |                |
|                             | This field specifies which vertex buffer the element is sourced from.   |                            |  |                |
|                             | <b>Value</b>  | <b>Name</b>                |  |                |
|                             | [0,32]  | Up to 33 VBs are supported |  |                |
|                             | <b>Programming Notes</b>  |                            |  |                |
|                             | It is possible for a vertex element to include only internally-generated data (VertexID, etc.), in which case the associated vertex buffer state is ignored.  |                            |  |                |
| 25                          | <b>Valid</b>  |                            |  |                |
|                             | Project:  | CHV, BSW                   |  |                |
|                             | Format:   | Boolean                    |  |                |
|                             | <b>Value</b>  | <b>Name</b>                | <b>Description</b>                             | <b>Project</b> |
|                             | 1h  | TRUE                       | this vertex element is used in vertex assembly | All            |
|                             | 0h  | FALSE                      | this vertex element is not used.               | All            |
| 24:16                       | <b>Source Element Format</b>  |                            |  |                |
|                             | Project:  | All                        |  |                |
|                             | Format:   | SURFACE_FORMAT [CHV, BSW]  |  |                |
|                             | Range: Valid formats are found in the 3D Primitive Processing FormatConversion portion of the vertex fetch chapter.   |                            |  |                |
|                             | Format: The encoding of this field is identical the Surface Format field of the SURFACE_STATE structure, as described in the Sampler chapter.   |                            |  |                |
|                             | This field specifies the format in which the memory-resident source data for this particular vertex element is stored in the memory buffer. This only applies to elements stored with VFCOMP_STORE_SRC component control. (All other component types have an explicit format).  |                            |  |                |
| 15                          | <b>Edge Flag Enable</b>   |                            |  |                |
|                             | Project:  | CHV, BSW                   |  |                |
|                             | Format:   | Enable                     |  |                |
|                             | <b>Description</b>  |                            |  | <b>Project</b> |
|                             | When ENABLED, the source element is interpreted as an EdgeFlag for the vertex. If the source element is zero, the EdgeFlag will be set to FALSE. If the source element is non-zero, the EdgeFlag will be set to TRUE. The EdgeFlag bit will travel down the fixed function pipeline along with the vertex handle, etc. and not be stored in the vertex data like the other vertex elements. Refer to the fixed function descriptions for how this EdgeFlag affects rendering. |                            |  |                |
|                             | Edge flags are supported for the following primitive topology types only, otherwise EdgeFlagEnable must not be ENABLED.   |                            |  |                |
|                             | <ul style="list-style-type: none"> <li>3DPRIM_TRILIST*</li> </ul>   |                            |  |                |

| <b>VERTEX_ELEMENT_STATE</b>                                    |  |          |  |         |  |       |      |          |  |
|--|--|----------|--|---------|--|-------|------|----------|--|
|  | <ul style="list-style-type: none"> <li>• 3DPRIM_TRISTRIP*</li> <li>• 3DPRIM_TRIFAN*</li> <li>• 3DPRIM_POLYGON</li> </ul> <p>If this bit is DISABLED for all valid VERTEX_ELEMENTS, the vertex will be assigned a default EdgeFlag of TRUE.</p> <p>Edge flags are supported for all primitive topology types.</p>   |          |  |         |  |       |      |          |  |
|  | CHV, BSW   |          |  |         |  |       |      |          |  |
| <b>Programming Notes</b>                                       |  |          |  |         |  |       |      |          |  |
|  | <ul style="list-style-type: none"> <li>• This bit must only be ENABLED on the last valid VERTEX_ELEMENT structure.</li> <li>• When set, Component 0 Control must be set to VFCOMP_STORE_SRC, and Component 1-3 Control must be set to VFCOMP_NOSTORE.</li> </ul>   |          |  |         |  |       |      |          |  |
| 14:12  | <b>Reserved</b>  |          |  |         |  |       |      |          |  |
|  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project: | All                                    | Format: | MBZ                                    |       |      |          |  |
| Project:   | All  |          |  |         |  |       |      |          |  |
| Format:  | MBZ  |          |  |         |  |       |      |          |  |
| 11:0   | <b>Source Element Offset</b>   |          |  |         |  |       |      |          |  |
|  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U12 byte offset</td> </tr> </table> <p>Byte offset of the source vertex element data in the structures comprising the vertex buffer.</p> <table border="1"> <thead> <tr> <th style="text-align: center;">Value</th> <th style="text-align: center;">Name</th> </tr> </thead> <tbody> <tr> <td>[0,2047]</td> <td></td> </tr> </tbody> </table> | Project: | All                                    | Format: | U12 byte offset                        | Value | Name | [0,2047] |  |
| Project:   | All  |          |  |         |  |       |      |          |  |
| Format:  | U12 byte offset  |          |  |         |  |       |      |          |  |
| Value  | Name   |          |  |         |  |       |      |          |  |
| [0,2047]   |  |          |  |         |  |       |      |          |  |
| <b>Programming Notes</b>                                       |  |          |  |         |  |       |      |          |  |
| See note on 64-bit float alignment in Buffer Starting Address. |  |          |  |         |  |       |      |          |  |
| 1  | 31   |          |  |         |  |       |      |          |  |
|  | <b>Reserved</b>  |          |  |         |  |       |      |          |  |
|  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project: | All                                    | Format: | MBZ                                    |       |      |          |  |
| Project:   | All  |          |  |         |  |       |      |          |  |
| Format:  | MBZ  |          |  |         |  |       |      |          |  |
|  | 30:28  |          |  |         |  |       |      |          |  |
|  | <b>Component 0 Control</b>   |          |  |         |  |       |      |          |  |
|  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>3D_Vertex_Component_Control [CHV, BSW]</td> </tr> </table> <p>Refer to the 3D_Vertex_Component_Control table below</p>  | Project: | All                                    | Format: | 3D_Vertex_Component_Control [CHV, BSW] |       |      |          |  |
| Project:   | All  |          |  |         |  |       |      |          |  |
| Format:  | 3D_Vertex_Component_Control [CHV, BSW]   |          |  |         |  |       |      |          |  |
|  | 27   |          |  |         |  |       |      |          |  |
|  | <b>Reserved</b>  |          |  |         |  |       |      |          |  |
|  | <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project: | All                                    | Format: | MBZ                                    |       |      |          |  |
| Project:   | All  |          |  |         |  |       |      |          |  |
| Format:  | MBZ  |          |  |         |  |       |      |          |  |
|  | 26:24  |          |  |         |  |       |      |          |  |
|  | <b>Component 1 Control</b>   |          |  |         |  |       |      |          |  |
|  | <table border="1"> <tr> <td>Format:</td> <td>3D_Vertex_Component_Control [CHV, BSW]</td> </tr> </table>  | Format:  | 3D_Vertex_Component_Control [CHV, BSW] |         |  |       |      |          |  |
| Format:  | 3D_Vertex_Component_Control [CHV, BSW]   |          |  |         |  |       |      |          |  |

| <b>VERTEX_ELEMENT_STATE</b> |   |          |  |         |     |
|-----------------------------|---|----------|--|---------|-----|
|                             | Refer to the 3D_Vertex_Component_Control table below  |          |  |         |     |
| 23                          | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project: | All                                    | Format: | MBZ |
| Project:                    | All   |          |  |         |     |
| Format:                     | MBZ   |          |  |         |     |
| 22:20                       | <p><b>Component 2 Control</b></p> <table border="1"> <tr> <td>Format:</td> <td>3D_Vertex_Component_Control [CHV, BSW]</td> </tr> </table> <p>Refer to the 3D_Vertex_Component_Control table below</p> | Format:  | 3D_Vertex_Component_Control [CHV, BSW] |         |     |
| Format:                     | 3D_Vertex_Component_Control [CHV, BSW]  |          |  |         |     |
| 19                          | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project: | All                                    | Format: | MBZ |
| Project:                    | All   |          |  |         |     |
| Format:                     | MBZ   |          |  |         |     |
| 18:16                       | <p><b>Component 3 Control</b></p> <table border="1"> <tr> <td>Format:</td> <td>3D_Vertex_Component_Control [CHV, BSW]</td> </tr> </table> <p>Refer to the 3D_Vertex_Component_Control table below</p> | Format:  | 3D_Vertex_Component_Control [CHV, BSW] |         |     |
| Format:                     | 3D_Vertex_Component_Control [CHV, BSW]  |          |  |         |     |
| 15:8                        | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>   | Project: | All                                    | Format: | MBZ |
| Project:                    | All   |          |  |         |     |
| Format:                     | MBZ   |          |  |         |     |
| 7:0                         | <p><b>Reserved</b></p> <table border="1"> <tr> <td>Project:</td> <td>CHV, BSW</td> </tr> <tr> <td>Format:</td> <td>MBZ</td> </tr> </table>  | Project: | CHV, BSW                               | Format: | MBZ |
| Project:                    | CHV, BSW  |          |  |         |     |
| Format:                     | MBZ   |          |  |         |     |



## Vertical Line Stride Override Message Descriptor Control Field

| <b>MDC_VLSO - Vertical Line Stride Override Message Descriptor Control Field</b>   |            |  |          |     |         |        |
|--|------------|--|----------|-----|---------|--------|
| Project:   | CHV, BSW   |  |          |     |         |        |
| Source:  | PRM        |  |          |     |         |        |
| Size (in bits):  | 3          |  |          |     |         |        |
| Default Value:   | 0x00000000 |  |          |     |         |        |
| DWord  | Bit        | Description  |          |     |         |        |
| 0  | 2          | <b>Vertical Line Stride Override</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>Enable</td> </tr> </table> <p>If set, override the Vertical Line Stride and Vertical Line Stride Offset fields in the surface state with the fields below.</p> | Project: | All | Format: | Enable |
|  |            | Project:   | All      |     |         |        |
|  |            | Format:  | Enable   |     |         |        |
| <b>Vertical Line Stride</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U1</td> </tr> </table> <p>Specifies number of lines (0 or 1) to skip between logically adjacent lines - provides support of interleaved (field) surfaces as textures.</p> | Project:   | All  | Format:  | U1  |         |        |
| Project:   | All        |  |          |     |         |        |
| Format:  | U1         |  |          |     |         |        |
| <b>Vertical Line Stride Offset</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Project:</td> <td>All</td> </tr> <tr> <td>Format:</td> <td>U1</td> </tr> </table> <p>Specifies the offset of the initial line from the beginning of the buffer. Ignored when Override VerticalLine Stride is 0.</p>           | Project:   | All  | Format:  | U1  |         |        |
| Project:   | All        |  |          |     |         |        |
| Format:  | U1         |  |          |     |         |        |

## VFE\_STATE\_EX

| <b>VFE_STATE_EX</b> |                     |   |       |      |   |                     |
|---------------------|---------------------|---|-------|------|---|---------------------|
| Project:            |                     | CHV, BSW  |       |      |   |                     |
| Source:             |                     | RenderCS  |       |      |   |                     |
| Size (in bits):     |                     | 256   |       |      |   |                     |
| Default Value:      |                     | 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000, 0x00000000,<br>0x00000000, 0x00000000   |       |      |   |                     |
| DWord               | Bit                 | Description   |       |      |   |                     |
| 0                   | 31:8                | <b>Reserved</b>   |       |      |   |                     |
|                     | 7:0                 | <b>Reserved</b><br>Format: MBZ  |       |      |   |                     |
| 1                   | 31:0                | <b>VFE Control</b><br>This field is used by VFE depending on the mode of operation. See the following tables for details. If VFE Mode = AVC-IT or AVC-MC, this field is valid as defined in Table 1 13. If VFE Mode = VC1-IT, this field is valid as defined in Table 1 14. Otherwise, this field is reserved.  |       |      |   |                     |
| 2                   | 31:0                | <b>Interface Descriptor Remap Table</b><br>This field contains the interface descriptor remap table entries for the first 8 kernel indices. Each table entry has 4 bits, providing a remapping range of [0, 15]. The input of this table is the Interface Descriptor Offset within the MEDIA_OBJECT or MEDIA_OBJECT_EX command. As the table is limited to map the first 16 values, any Interface Descriptor Offset greater than 15 is not remapped. Bits 31:28: Remap for index = 7 Bits 27:24: Remap for index = 6 Bits 23:20: Remap for index = 5 Bits 19:16: Remap for index = 4 Bits 15:12: Remap for index = 3 Bits 11:8: Remap for index = 2 Bits 7:4: Remap for index = 1 Bits 3:0: Remap for index = 0 |       |      |   |                     |
| 3                   | 31:0                | <b>Interface Descriptor Remap Table (cont)</b><br>This field contains the interface descriptor remap table entries for the next 8 kernel indices (index = 8...15). Each table entry has 4 bits, providing a remapping range of [0, 15]. Bits 31:28: Remap for index = 15 Bits 27:24: Remap for index = 14 Bits 23:20: Remap for index = 13 Bits 19:16: Remap for index = 12 Bits 15:12: Remap for index = 11 Bits 11:8: Remap for index = 10 Bits 7:4: Remap for index = 9 Bits 3:0: Remap for index = 8  |       |      |   |                     |
| 4                   | 31                  | <b>Scoreboard Enable</b>  |       |      |   |                     |
|                     |                     | Project: CHV, BSW   |       |      |   |                     |
|                     |                     | This field enables and disables the hardware scoreboard in the Media Pipeline. If this field is cleared, hardware ignores the following scoreboard state fields.  |       |      |   |                     |
|                     |                     | This should be enabled at all times in the state and the scoreboard enable field in the MEDIA_OBJECT command should be use instead. If this field is disabled, the scratch space pointer calculation will be incorrect and any attempt to use the scoreboard later will result in a hardware hang.  |       |      |   |                     |
|                     |                     | <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Scoreboard disabled</td> </tr> </tbody> </table>  | Value | Name | 0 | Scoreboard disabled |
| Value               | Name                |   |       |      |   |                     |
| 0                   | Scoreboard disabled |   |       |      |   |                     |

| <b>VFE_STATE_EX</b> |   |                                  |
|---------------------|---|----------------------------------|
|                     | 1   | Scoreboard enabled               |
| 30                  | <b>Scoreboard Type</b>  |                                  |
|                     | Project:  | CHV, BSW                         |
|                     | This field selects the type of scoreboard in use.   |                                  |
|                     | This field must be zero (stalling scoreboard)   |                                  |
|                     | <b>Value</b>  | <b>Name</b>                      |
|                     | 0   | Stalling Scoreboard              |
| 1                   | Reserved (for Non-stalling scoreboard)  |                                  |
| 29:8                | <b>Reserved</b>   |                                  |
|                     | Format:   | MBZ                              |
| 7:0                 | <b>Scoreboard Mask</b>  |                                  |
|                     | Project:  | CHV, BSW                         |
|                     | Format:   | Boolean                          |
|                     | Each bit indicates the corresponding dependency scoreboard is enabled. The scoreboard is based on the relative (X, Y) distance from the current threads' (X, Y) position. |                                  |
|                     | <b>Value</b>  | <b>Name</b>                      |
| [0,7]               | Bit n   | Score n is enabled               |
| 5                   | 31:28   | <b>Scoreboard 3 Delta Y</b>      |
|                     | Project:  | CHV, BSW                         |
|                     | Format:   | S3                               |
|                     | Relative vertical distance of the dependent instance assigned to scoreboard 3, in the form of 2's compliment.   |                                  |
|                     | 27:24   | <b>Scoreboard 3 Delta X</b>      |
|                     | Project:  | CHV, BSW                         |
|                     | Format:   | S3                               |
|                     | Relative horizontal distance of the dependent instance assigned to scoreboard 3, in the form of 2's compliment.   |                                  |
|                     | 23:16   | <b>Scoreboard 2 Delta (X, Y)</b> |
|                     | Project:  | CHV, BSW                         |
| 15:8                | <b>Scoreboard 1 Delta (X, Y)</b>  |                                  |
| Project:            | CHV, BSW  |                                  |
| 7:0                 | <b>Scoreboard 0 Delta (X, Y)</b>  |                                  |
| Project:            | CHV, BSW  |                                  |
| 6                   | 31:24   | <b>Scoreboard 7 Delta (X, Y)</b> |

| <b>VFE_STATE_EX</b> |       |                                  |
|---------------------|-------|----------------------------------|
|                     |       | Project: CHV, BSW                |
|                     | 23:16 | <b>Scoreboard 6 Delta (X, Y)</b> |
|                     |       | Project: CHV, BSW                |
|                     | 15:8  | <b>Scoreboard 5 Delta (X, Y)</b> |
|                     |       | Project: CHV, BSW                |
|                     | 7:0   | <b>Scoreboard 4 Delta (X, Y)</b> |
|                     |       | Project: CHV, BSW                |
| 7                   | 31:0  | <b>Reserved</b>                  |
|                     |       | Format: MBZ                      |

## VP8 Encoder StreamOut Format

| VP8 Encoder StreamOut Format |  |                             |
|------------------------------|--|-----------------------------|
| Project:                     | CHV, BSW                                       |                             |
| Source:                      | VideoCS  |                             |
| Size (in bits):              | 128  |                             |
| Default Value:               | 0x00000000, 0x00000000, 0x00000000, 0x00000000 |                             |
| DWord                        | Bit  | Description                 |
| 0                            | 31:24  | <b>MbY</b>                  |
|                              |  | Format: U8                  |
|                              | 23:16  | <b>MbX</b>                  |
|                              |  | Format: U8                  |
|                              | 15:8   | <b>MbClock16</b>            |
|                              | Format: U8                                     |                             |
|                              | 7:3  | <b>Reserved</b>             |
| Format: MBZ                  |  |                             |
| 2                            | <b>MbRcFlag</b>                                |                             |
| Format: U1                   |  |                             |
| 1                            | <b>MBLevelInterMBConformanceFlag</b>           |                             |
| Format: U1                   |  |                             |
| 0                            | <b>MBLevelIntraMBConformanceFlag</b>           |                             |
| Format: U1                   |  |                             |
| 1                            | 31:29  | <b>Reserved</b>             |
|                              | Format: MBZ                                    |                             |
|                              | 28:16  | <b>MB_Residual_BitCount</b> |
|                              | Format: U13                                    |                             |
| 15:13                        | <b>Reserved</b>                                |                             |
| Format: MBZ                  |  |                             |
| 12:0                         | <b>MB_Total_BitCount</b>                       |                             |
| Format: U13                  |  |                             |
| 2                            | 31:25  | <b>Reserved</b>             |
|                              | Format: MBZ                                    |                             |
| 24:0                         | <b>Cbp</b>                                     |                             |
| Format: U25                  |  |                             |
| 3                            | 31   | <b>Reserved</b>             |
| Format: MBZ                  |  |                             |

| VP8 Encoder StreamOut Format |       |   |
|------------------------------|-------|---|
|                              | 30    | <b>LastMbFlag</b><br>Format:   U1       |
|                              | 29    | <b>IntraMBFlag</b><br>Format:   U1      |
|                              | 28:24 | <b>MbType5Bits</b><br>Format:   U5      |
|                              | 23:19 | <b>Reserved</b><br>Format:   MBZ        |
|                              | 18    | <b>QindexClampHigh</b><br>Format:   U1  |
|                              | 17    | <b>QindexClampLow</b><br>Format:   U1   |
|                              | 16    | <b>CoeffClampStatus</b><br>Format:   U1 |
|                              | 15:0  | <b>Reserved</b><br>Format:   MBZ        |