

Display Restriction

MB87P2020-A

© Fujitsu Microelectronics Europe GmbH

History

| Date | Author | Version | Comment |
|-------------|---------------|----------------|----------------|
| 12/09/03 | MMu | V1.0 | First version |
| | | | |
| | | | |

Warranty and Disclaimer

To the maximum extent permitted by applicable law, Fujitsu Mikroelektronik GmbH restricts its warranties and its liability for **all products delivered free of charge** (eg. software include or header files, application examples, application Notes, target boards, evaluation boards, engineering samples of IC's etc.), its performance and any consequential damages, on the use of the Product in accordance with (i) the terms of the License Agreement and the Sale and Purchase Agreement under which agreements the Product has been delivered, (ii) the technical descriptions and (iii) all accompanying written materials. In addition, to the maximum extent permitted by applicable law, Fujitsu Mikroelektronik GmbH disclaims all warranties and liabilities for the performance of the Product and any consequential damages in cases of unauthorised decompiling and/or reverse engineering and/or disassembling. **Note, all these products are intended and must only be used in an evaluation laboratory environment.**

1. Fujitsu Mikroelektronik GmbH warrants that the Product will perform substantially in accordance with the accompanying written materials for a period of 90 days from the date of receipt by the customer. Concerning the hardware components of the Product, Fujitsu Mikroelektronik GmbH warrants that the Product will be free from defects in material and workmanship under use and service as specified in the accompanying written materials for a duration of 1 year from the date of receipt by the customer.
2. Should a Product turn out to be defect, Fujitsu Mikroelektronik GmbH's entire liability and the customer's exclusive remedy shall be, at Fujitsu Mikroelektronik GmbH's sole discretion, either return of the purchase price and the license fee, or replacement of the Product or parts thereof, if the Product is returned to Fujitsu Mikroelektronik GmbH in original packing and without further defects resulting from the customer's use or the transport. However, this warranty is excluded if the defect has resulted from an accident not attributable to Fujitsu Mikroelektronik GmbH, or abuse or misapplication attributable to the customer or any other third party not relating to Fujitsu Mikroelektronik GmbH.
3. To the maximum extent permitted by applicable law Fujitsu Mikroelektronik GmbH disclaims all other warranties, whether expressed or implied, in particular, but not limited to, warranties of merchantability and fitness for a particular purpose for which the Product is not designated.
4. To the maximum extent permitted by applicable law, Fujitsu Mikroelektronik GmbH's and its suppliers' liability is restricted to intention and gross negligence.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES

To the maximum extent permitted by applicable law, in no event shall Fujitsu Mikroelektronik GmbH and its suppliers be liable for any damages whatsoever (including but without limitation, consequential and/or indirect damages for personal injury, assets of substantial value, loss of profits, interruption of business operation, loss of information, or any other monetary or pecuniary loss) arising from the use of the Product.

Should one of the above stipulations be or become invalid and/or unenforceable, the remaining stipulations shall stay in full effect.

Display limitation for physical color depths at Jasmine MB87P2020-A

There is a limitation in X-dimension for displays with physical color formats 1bpp, 4bpp, RGB111. For these formats the displayable size in X-dimension is limited to 256 pixels.

The image on display is produced in a more-step approach. The GPU reads the graphic data from up to four layers from VRAM and converts it to the physical output stream. The LSA (Line Segment Accumulator) is used to realize the vertical layer order in planes.

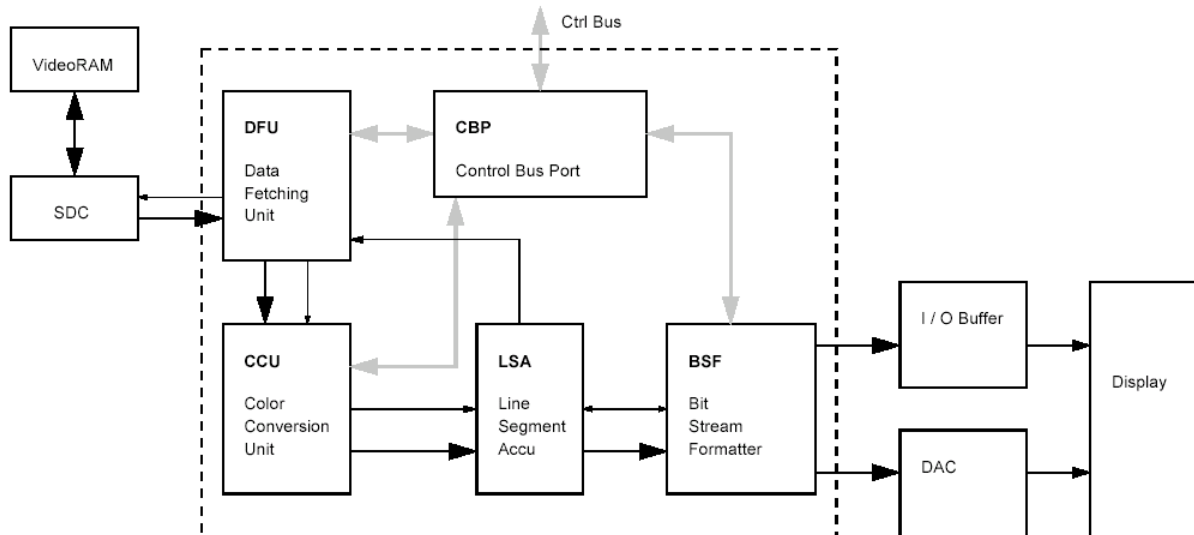


Figure 1: GPU top level structure

The function to calculate the start address of the effective offset for layer overlay equalizes differences in the display offset and aligns the line segments fetched from the VideoRAM to the full segment size into LSA. Only the first segment from a line of pixels in the accumulator can cause an offset, further segments are processed aligned. Processed were only visible pixels from the offset to the next grid of the segment boundaries.

To calculate the effective offsets the lower bits from the segment counter are subtracted from the start position in the segment descriptor. The bit size used of the lower bits of the segment counter does not fit to the bit size of the upper part of the start address in the segment descriptor.

Wrong:
 $\text{eff_offs} = \{(\text{sd_start}[8:5] - \text{seg_cnt}[2:0]), \text{sd_start}[4:0]\};$
 $(\text{eff_offs} = \text{sd_start}[8:0] - 64 * \text{seg_cnt}[2:0];)$
 Correct:
 $\text{eff_offs} = \{(\text{sd_start}[8:5] - \text{seg_cnt}[3:0]), \text{sd_start}[4:0]\};$
 $(\text{eff_offs} = \text{sd_start}[8:0] - 64 * \text{seg_cnt}[3:0];)$

If the segment counter reaches the value 8, this causes a wrong offset calculation of +0x100.

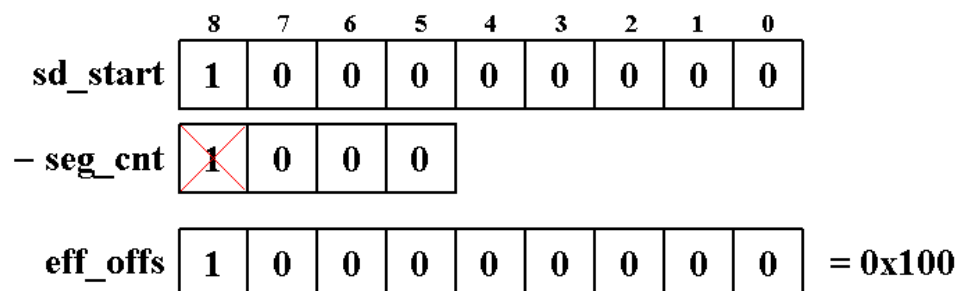


Figure 2: Wrong calculation

The bit `eff_offs[8]`, where the error occurs, is not used for calculating the LSA start address in modes of 1 and 2 ppw (pixel per 24-bit word), this is equivalent to a color depth of 24 or 16 bpp (bits per pixel). The other modes 24 ppw (1 bpp), 8 ppw (RGB111) and 6 ppw (4 bpp) are using the bit [8] and have the limitation.
The other physical color formats have no limitation: RGB333, RGB444, RGB666 and RGB888.

| Physical Color Space Code | 1 bpp | RGB111 | 4 bpp | RGB333 | RGB444 | RGB666 | RGB888 |
|---------------------------|-------|--------|-------|--------|--------|--------|--------|
| ppw _{phys} | 24 | 8 | 6 | 2 | 2 | 1 | 1 |

Figure 3: Number of pixels per LSA word. Red area show the limitation formats

The workaround for the affected output formats is to emulate another display size. Display formats greater than 256 Pixels with the limited color depths could be converted, e.g. 160x480 pixels for physical 320x240 pixels display. The Sync signals were configured in such a way, that two logical lines were output as one physical line for the display. Each second line of 160 pixels generates a line pulse (H-Sync). If the drawing layer should have 320x240 pixel dimension, a temporary display layer can be used. Data transfers from the drawing layer to the temporary display layer are recommended to use the internal layer-to-layer memcopy function. The two 160 pixels lines of the drawing layer were reordered (interlaced) during the copy function to the display layer.

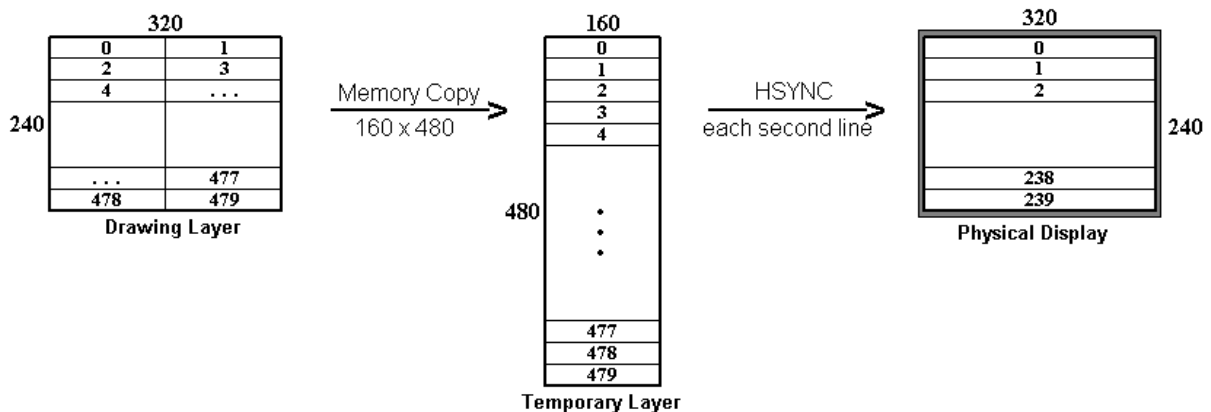


Figure 4: Workaround