FUJITSU

Graphics Display Controllers

Fujitsu is the global leader in graphics display controllers (GDCs) with a complete family of products designed specifically for embedded applications. Graphics processors combine display controller functionality with grpahics-rendering capability to produce single-chip solutions for displaying content on small form-factor, high resolution LCDs. Fujitsu GDCs are ideal for automotive applications such as instrument clusters, in-dash navigation, heads-up displays and rear-seat entertainment. They are also well suited for medical, avionics and industrial applications such as mobile information terminals, factory automation systems, patient monitors and ultrasound systems.

For more information please visit: http://us.fujitsu.com/micro/gdc

<table>
<tr><th>Part Number</th><th>SoC</th><th>Geometry Processor</th><th>Rendering Engine (Max)</th><th>Overlay</th><th>Digital Video Input</th><th>Digital RGB Output</th><th>Analog RGB Output</th><th>Power Supply Voltage (V)</th><th>Package QFP</th><th>Other</th></tr>
<tr><td>MB86290A "Cremson"</td><td>Standalone GDC</td><td>Unavailable</td><td rowspan="3">100 MHz</td><td rowspan="3">4 layers</td><td>Unavailable</td><td>Unavailable</td><td rowspan="2">Yes</td><td rowspan="3">2.5V (Internal)
3.3V (External)</td><td>QFP240</td><td>—</td></tr>
<tr><td>MB86291A "Scarlet"</td><td>Standalone GDC</td><td rowspan="2">100 MHz (Max.)</td><td rowspan="2">ITU-RBT656</td><td rowspan="6">Yes, up to 1024x768</td><td>QFP208</td><td>—</td></tr>
<tr><td>MB86292 "Orchid"</td><td>Standalone GDC</td><td rowspan="2">No</td><td>QFP256</td><td>—</td></tr>
<tr><td>MB86293 "Coral-Q"</td><td>Standalone GDC</td><td rowspan="5">166 MHz (Max.)</td><td rowspan="5">133 MHz</td><td rowspan="5">6 layers</td><td>No</td><td rowspan="4">1.8V (Internal)
3.3V (External)</td><td>QFP256</td><td>—</td></tr>
<tr><td>MB86294 "Coral-B"</td><td>Standalone GDC</td><td>ITU-RBT656</td><td rowspan="3">Yes</td><td>QFP256, BGA256</td><td>—</td></tr>
<tr><td>MB86295 "Coral-P"</td><td>Standalone GDC</td><td rowspan="3">ITU-RBT656
Digital RGB</td><td>BGA256</td><td>—</td></tr>
<tr><td>MB86296 "Coral-PA"</td><td>Standalone GDC</td><td>BGA256</td><td>—</td></tr>
<tr><td>MB86276 "Lime"</td><td>Standalone GDC</td><td>Unavailable</td><td>No</td><td>BGA256</td><td>—</td></tr>
<tr><td>MB86277 "Mint"</td><td>Standalone GDC</td><td>Unavailable</td><td>100MHz</td><td>6 layers</td><td>YUV</td><td>Yes, up to 1024x768</td><td>Yes</td><td>1.8 V (Internal)
3.3 V (External)</td><td>QFP256</td><td>—</td></tr>
<tr><td>MB86297 "Carmine"</td><td>Standalone GDC</td><td>266MHz</td><td>266MHz</td><td>8 layers</td><td>Dual Independent: YUV, YUV/RGB</td><td>Dual Independent, up to 1280x1024 each</td><td>No</td><td>1.2V (Internal)
1.8V (Memory)
3.3V (External)</td><td>BGA543</td><td>OpenGL-ES 1.1 Compliant GDC</td></tr>
<tr><td>MB86298 "Ruby"</td><td>Standalone GDC</td><td>266MHz</td><td>266MHz</td><td>8 layers</td><td>Four Independent: YUV, YUV, YUV, YUV/RGB</td><td>Dual Independent, up to 1280x1024 each</td><td>No</td><td>1.2V (Internal)
1.8V (Memory)
3.3V (External)</td><td>BGA543</td><td>OpenGL-ES 2.0 Compliant GDC</td></tr>
<tr><td>MB88F332 "Indigo"</td><td>Standalone GDC</td><td>N/A</td><td>N/A</td><td>4 layers</td><td>Via APIX</td><td>Yes, up to 1280x480</td><td>No</td><td>1.8V (Internal)
3.3V & 5V (External)</td><td>QFP208</td><td>—</td></tr>
<tr><td>MB86R01 "Jade"</td><td>ARM926EJ-S based SOC</td><td>166MHz</td><td>166MHz</td><td>6 layers</td><td>Dual Independent: YUV, YUV/RGB</td><td>Dual Independent, up to 1280x768</td><td>No</td><td>1.2V (Internal)
1.8V (Memory)
3.3V (External)</td><td>BGA484</td><td>—</td></tr>
<tr><td>MB86R02 "Jade-D"</td><td>ARM926EJ-S based SOC</td><td>166MHz</td><td>166MHz</td><td>6 layers</td><td>Dual Independent: YUV, YUV/RGB</td><td>Dual Independent, up to 1280x768</td><td>No</td><td>1.2V (Internal)
1.8V (Memory)
3.3V (External)</td><td>BGA484</td><td>APIX, TCON, Dithering</td></tr>
</table>

GDC Product Comparsion

Graphics Display Controllers

MB86290A "Cremson"

Features
- Various kinds of 2D/3D graphics acceleration functions (@100MHz)
- Display resolution up to 1024 x 768
- 4 layers of overlay display
- Supply voltage 2.5V (internal), 3.3V (external)

MB86291A "Scarlet"

Features
- Embedded 16Bit SDRAM
- Geometry processor (@100MHz)
- Digital video input function
- Various kinds of 2D/3D graphics acceleration functions @100MHz)
- 4 layers of overlay display
- Supply voltage 2.5V (internal), 3.3V (external)

MB86292 "Orchid"

Features
- External memory version of MB86291A
- Geometry processor (@100MHz)
- Digital video input function
- Various kinds of 2D/3D graphics acceleration functions (@100MHz)
- 4 layers of overlay display
- Supply voltage 2.5V (internal), 3.3V (external)

MB86293 "Coral-Q"

Features
- Geometry processor (@166MHz)
- Various kinds of 2D/3D graphics acceleration functions (@133MHz)
- 4 layers of overlay display
- Supply voltage 1.8V (internal), 3.3V (external)

MB86294 "Coral-B"

Features
- Geometry processor (@166MHz)
- Various kinds of 2D/3D graphics acceleration functions (@133MHz)
- YUV video input with downscale
- 6 layers of overlay display
- Supply voltage 1.8V (internal), 3.3V (external)

MB86295 "Coral-P"

Features
- Geometry processor (@166MHz)
- Various kinds of 2D/3D graphics acceleration functions (@133MHz)
- 6 layers of overlay display
- Digital video input function
- PCI bus interface
- Supply voltage 1.8V (internal), 3.3V (external)

MB86296 "Coral-PA"

Features
- Geometry processor (@166MHz)
- Various kinds of 2D/3D graphics acceleration functions (@133MHz)
- 6 layers of overlay display
- Digital video input function
- PCI bus interface
- Supply voltage 1.8V (internal), 3.3V (external)
- Dual-display support
- Double-buffer PCI interface (almost 2x performance increase compared to previous generation
- Flexible video upscale and downscale
- Native RGB mode for video input
- Allows PCI bus clock to be used as input clock
- Programmable pixel clock

Graphics Display Controllers

MB86276 "Lime"

Features

- Various kinds of 2D graphics acceleration functions (@133MHz)
- 6 layers of overlay display
- Digital video input function
- Flexible video upscale and downscale
- Native RGB mode for video input
- Dual-display support
- Programmable pixel clock
- SRAM type host interface
- SDRAM interface for graphics memory
- Supply voltage 1.8V (internal), 3.3V (external)

MB86277 "Mint"

Features

- Various kinds of 2D graphics acceleration functions (@100MHz)
- 6 layers of overlay display
- Digital YUV video input function
- Flexible video downscale
- Digital and analog RGB output
- Programmable pixel clock
- SRAM-type host interface
- SDRAM interface for graphics memory
- Supply voltage 1.8V (internal), 3.3V (external)

MB86297 "Carmine"

Features

- Various kinds of 2D/3D graphics acceleration functions compliant with the OpenGL ES 1.1 standard (@266MHz)
- 8 layers of overlay display
- Dual independent video input (YUV and YUV/RGB) function
- Flexible video upscale and downscale
- Native RGB mode for video input
- Dual independent display support (up to four displays can be driven simultaneously) up to 1280x1024 resolution
- Programmable pixel clock
- PCI-type host interface
- DDR interface for graphics memory
- Supply voltage 1.2V (internal), 1.8V (memory interface), 3.3V (external)

MB86298 "Ruby"

Features

- Various kinds of 2D/3D graphics acceleration functions compliant with the OpenGL ES 2.0 standard (@266MHz) and a programmable shader engine
- 8 layers of overlay display
- Four independent video input channels (YUV, YUV, YUV, YUV/RGB), supporting up to 720p video
- Flexible video upscale and downscale
- Native RB mode for video input
- Dual independent display support (up to four display can be driven simultaneously) up to 1280x1024 resolution
- Programmable pixel clock
- PCI Express type host interface
- DDR2 interface for graphics memory
- Supply voltage 1.2V (internal), 1.8V (memory interface), 3.3V (external)
- Built-in spread spectrum or dithered clock generation

MB88F332 "Indigo"

Features

- Line-buffer-based sprite engine for graphics implementation
- Support for up to 512 different sprites
- Support for RLE compressed sprites
- 4 layers of overlay display (front and back color, sprite, and APIX layers)
- Video input and control over APIX interface
- Alternate SPI interface for control
- Built-in SRAM (128K+8K) and Flash (160K)
- SPI interface for optional external flash
- RGB/RSDS video output supporting up 1280x480 display resolution
- Built-in TCON and dithering unit
- Rich MCU peripheral set (SMCs, CAN, sound generators, ADCs, PWMs, UARTs, etc.) to support system partitioning
- Supply voltage 1.8V (internal), 5V and 3.3V (external)
- Built-in Spread Spectrum or dithered clock generation

Graphics Display Controllers

MB86R01 "Jade"

Features

- An SOC with ARM926EJ-S at 333MHz and Coral-class GDC engine
- External bus interface for NOR Flash and other slave peripherals
- DDR2 interface for ARM9 and graphics RAM
- A rich peripheral set (USB, IDE, Media-LB, UARTs, PWMs, CAN, I²S, I²C, etc.)
- Full 2D/3D GDC engine with geometry processor, running at 166MHz
- Independent dual video inputs (YUV, YUV/RGB)
- Independent dual video outputs capable of driving displays up to 1280x768 resolution
- Up to four displays, which can be driven simultaneously
- Supply voltage 1.2V (internal), 1.8V (memory), 3.3V (external)

MB86R02 "Jade-D"

Features

- An SOC with ARM926EJ-S at 333MHz and Coral-class GDC engine
- External bus interface for NOR Flash and other slave peripherals
- DDR2 interface for ARM9 and graphics RAM
- A rich peripheral set (USB, IDE, Media-LB, UARTs, PWMs, CAN, I²S, I²C, etc.)
- Full 2D/3D GDC engine with geometry processor, running at 166MHz
- Independent dual video inputs (YUV, YUV/RGB)
- Independent dual video outputs capable of driving displays up to 1280x768 resolution
- Up to four displays, which can be driven simultaneously
- Supply voltage 1.2V (internal), 1.8V (memory), 3.3V (external)
- Additional APIX interfaces
- Built-in TCON and dithering units
- Built-in spread spectrum or dithered clock generation

Device	Ordering Part Number(s)	Description
Evaluation Boards		
MB86295 "Coral-P"	MB86295EB01	PCI board for PCs
MB86296 "Coral-PA"	MB86296EB01	PCI board for PCs
MB86296 "Coral-PA"	MB86296-ADA01	Dual-display adapter board for Coral-PA
MB86297 "Carmine"	MB86297EB01	PCI board for PCs
MB86277 "Mint"	EVB-Mint	Mint adapter board
MB86R01 "Jade"	MB86R01-CORE	Jade standalone core board
MB86R01 "Jade"	MB86R01-OPT	Jade standalone optional board
MB86298 "Ruby"	MB86298EB01	Ruby PCI board
MB86298 "Ruby"	MB86298EB01-VIDEO01	Analog RGB input peripheral board for use with MB86298EB01
MB86298 "Ruby"	MB86298EB01-APIX01	APIX extension board for use with MB86298EB01
Starter Kits		
MB86276 "Lime"	CREMSON-STARTERKIT-CPU369	CPU module using MB91F369 + debugging RAM
MB86276 "Lime"	STARTERKITMB91302	CPU module using MB91302 + debugging RAM
MB86276 "Lime"	CREMSON-STARTERKIT-Lime	Lime sub-board for module starterkit
MB86276 "Lime"	SK-91F467D-208PFV	CPU module for Cremson modular starterkit
MB86276 "Lime"	SK-86276-91476D	Lime standalone starterkit with host MCU
MB86277 "Mint"	SK-MB86277-91467D	Mint standalone starterkit with host MCU
MB88F332 "Indigo"	SK-88F332	Main for peripherals for use with EVB-INDIGO
MB88F332 "Indigo"	EVB-INDIGO	Daughter board having the Indigo device
MB88F332 Indigo"	GLYN_TFT_5.7	320x240, 5.7" TFT LCD panel for use with SK-88F332
MB86R01 "Jade"	SK-86R01	Jade standalone starterkit (4 modules) mainly for use with Linux and QNX Toolchain
MB86R01 "Jade"	SK-86R0X-GHS-TRACE-ADA	Adapter board for SK-86R01 for tracing with GHS toolchain
MB86R02 "Jade-D"	SK-86R02-01	Fully featured Jade-D starterkit consisting of three boards
MB86R02 "Jade-D"	EVB-JADE-D	Upgrade board for using with SK-86R01

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