Rastergraf

GeminiPMC

Dual Channel High Resolution Graphics Controllers for PMC

Solaris ■ Windows ■ Real-Time Operating Systems ■ Linux

Features

- Dual independent 128-bit graphics controllers provide no-compromise drawing engine performance at up to 1920 x 1200 (VGA) or 1600 x 1200 (optional DVI)
- 16 MB display memory per channel
- 33/66 MHz, 32/64 bit PCI host bus, 32-bit, 66 MHz local busl
- VxWorks, Linux, LynxOS, Solaris and Windows

GeminiPMC

Rastergraf's GeminiPMC fulfills high performance requirements for dual channel graphics common to embedded computing processing environments, including Solaris, Linux, Windows, and real-time operating systems such as VxWorks and LynxOS.

Using two 128-bit Borealis graphics accelerators, the GeminiPMC supports independent 2D/3D/OpenGL/DirectX compatible displays with screen resolutions up to 1920 x 1200 with up to 16.7 million colors (32 bpp). Monitor support includes analog VGA and Sync On Green (SOG) plus optional digital (DVI).

A quad-image VGA/FCode BIOS enables the GeminiPMC to operate in virtually any x86 or SPARC system using VGA, Sync-On-Green, or DVI displays.

An asynchronous PCI bridge supports all PMC interfaces from 32-bit, 33 MHz to 64-bit, 66 MHz, while enabling the Borealis graphics accelerators to always operate at 32-bit, 66 MHz.

The GeminiPMC has two standard VGA connectors. When the optional DVI is ordered, they are replaced by a 68-pin HD ribbon connector plus an available breakout cable.

Embedded Life-Cycle Support

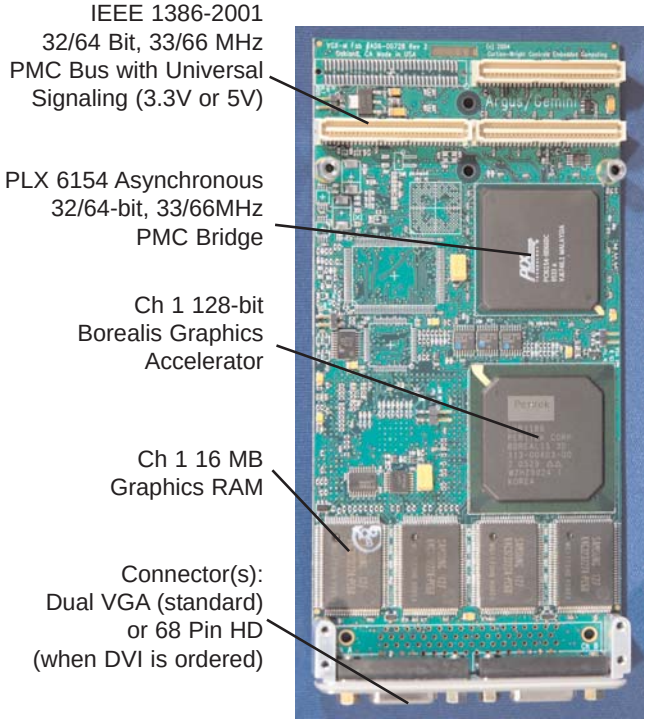
Rastergraf's comprehensive selection of PMC, CompactPCI and PCI solutions are designed to satisfy the product life-cycle requirements demanded by the embedded computing market.

The Embedded Graphics Source.

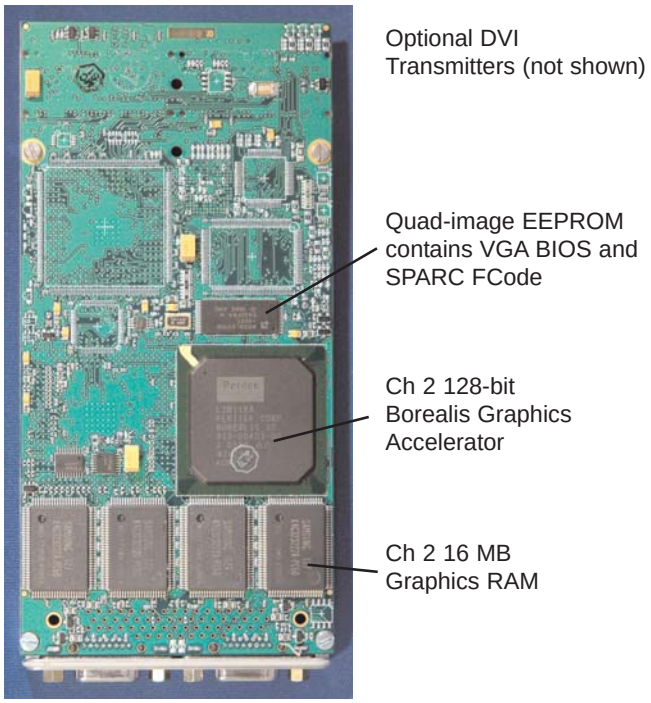
Rastergraf products include:

- Single and dual-head display-only PMC
- Single head display/capture
- Single display-only CPCI
- CompactPCI and PCI carriers

Please contact Rastergraf for more information or consult our web page at *www.rastergraf.com*..



Top View



Bottom View

Features

- Dual Borealis 128-bit 2D/3D graphics controllers
- 33/66 MHz, 32/64-bit PCI interface
- Each display programmable for 8, 16, or 32 bits/pixel
- Each controller has 16 MB SGRAM
- Analog (RGB) resolution up to 1920 x 1200
- Optional DVI up to 1600 x 1200
- OpenGL 1.1 in Hardware
- Hardware scroll, pan, and cursor
- VGA and FCode BIOS support on Channel A
- Bridge supports Vital Product Data EEPROM
- Can be used with Rastergraf PCI and CompactPCI carriers

GeminiPMC Technical Overview

Introduction

The Rastergraf GeminiPMC is a PMC (PCI Mezzanine Card) multi-function display controller for VMEbus, CompactPCI, and PCI computers. When used with a Rastergraf PMC adapter board, the GeminiPMC can be used in standard CompactPCI and PCI slots.

Gemini System Overview

Referring to the block diagram, the GeminiPMC is composed of two functional blocks: PMC interface bridge and Borealis graphics controllers.

Asynchronous PCI Bridge Architecture

The PLX 6154 Asynchronous PCI Bridge supports all PMC interfaces, from 32-bit, 33 MHz to 64-bit, 66 MHz, while enabling the local side to always operate at 32 bit, 66 MHz, which is the native interface for the graphics controllers. This capability is due to the 6154's use of large internal FIFOs to unlock the timing of the primary and secondary PCI buses from each other.

128-Bit Graphics Accelerator

Each GeminiPMC display channel is powered by a ***Borealis*** graphics accelerator. With its 128-bit wide memory bus, the Borealis can draw up to sixteen 256-color pixels each memory cycle for a raw drawing speed of 2 GB/s. It can generate many hundreds of thousands of shaded triangles per second. The drawing engine's blazing performance is further enhanced by its display list capability, which enables it to execute lists of instructions from the CPU, rather than just one at a time. The Borealis and the host CPU can process data independently, thus breaking the lockstep which often reduces system throughput.

The display memory has 16 MB of high speed SGRAM, which provides ample local storage for the graphics image and off-screen data such as texture maps, Z-buffer, and backing store.

The Borealis does not use the RAMDAC to provide YUV to RGB color space conversion. Instead, it uses a programmable Look Up Table (LUT) as part of its Drawing Engine. When video data is copied from off-screen memory as part of the video image double-buffering operation, pixels can be converted on the fly to the current display pixel format. This allows for efficient use of offscreen memory and the ability to dynamically accommodate a variety of image formats.

The Borealis can smoothly X/Y scale small RGB or YUV video clips up to full screen at any resolution and any color depth, and maintain a rate greater than 30 frames per second.

For basic startup support on any system expecting a VGA device on power up, the GeminiPMC graphics Channel A includes a quad image BIOS that supports VGA and FCode, with or without Sync On Green. Once the operating system is running, full function drivers can be loaded, allowing the Borealis's extended instruction set to be utilized.

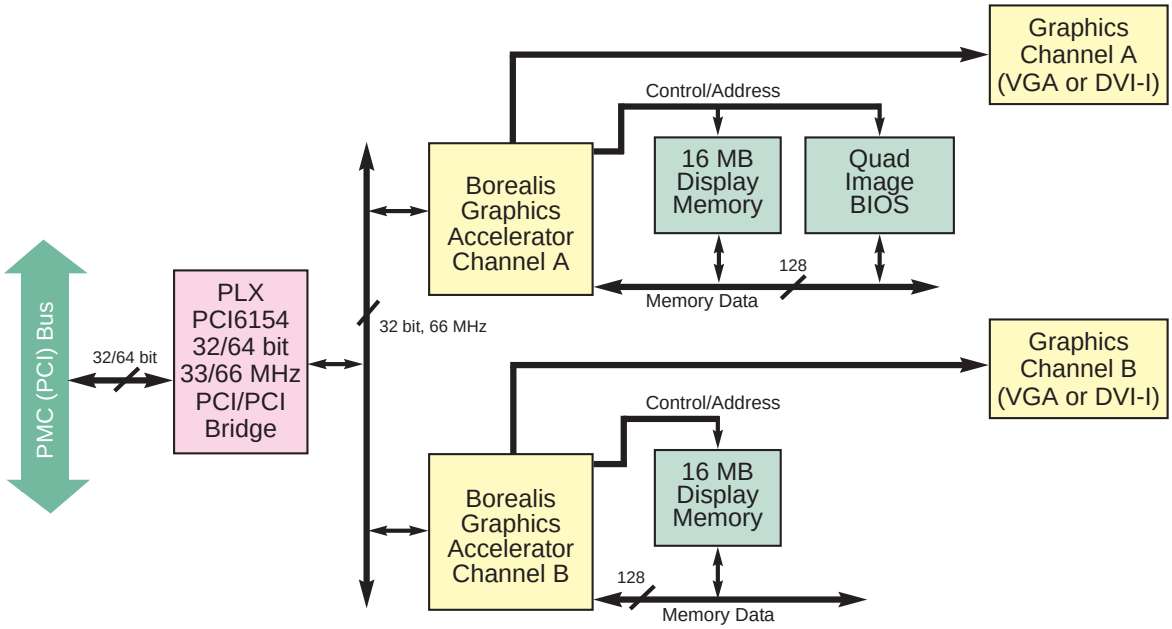
The Borealis programmable video timing ranges from 30 to 150 Hz vertical and 15.7 to 100 KHz horizontal refresh rates, with a pixel clock up to 250 MHz, giving display formats up to 1920 x 1200 x 32 bpp. Note that GeminiPMC does not support interlaced timing.

The display output is directed through an internal RAMDAC which includes a graphics cursor with a 64 x 64 x 2 bit map. It integrates the graphics and cursor pixels into 24-bit color values (8 bits each of RGB). The analog signals from the RAMDAC are connected to a standard RGBHV (VGA) or Sync On Green monitor. Display Data Channel lines enable the host computer to control the monitor.

A separate data path from the Borealis supports the optional digital output using a PanelLink (DVI) converter. It provides clock and encoded 24-bit graphics data on four matched-length differential pairs.

I/O Connections

All connections are made through the front panel twin VGA connectors, or when DVI is included, a 68-pin high density connector. A breakout cable splits the functions into dual DVI-I (for both DVI and VGA).



GeminiPMC Functional Diagram

Display Formats and Output Usage

Graphics Output Flexibility

Because there are two separate graphics controllers, each output channel is completely independent of the other.

Please contact the factory if you have a special configuration requirement. Also, refer to the User's Manual, which provides comprehensive information about connectors and cabling.

Analog Non-Interlaced Video Output

The standard version of the GeminiPMC supports dual VGA (analog) outputs up to 1920x1200x32 bpp with a programmable composite sync on green.(SOG) mode. It has 2 standard VGA connectors on the front panel.

Digital DVI Output

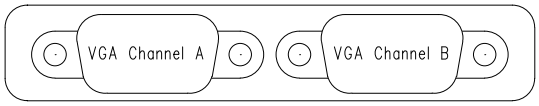
The GeminiPMC/DVI adds DVI capability with a resolution up to 1600x1200 and operates in single-link mode only. It has a 68-pin front-panel connector. It requires a breakout cable that splits out into two standard DVI-I (DVI+VGA) connectors.

Note that the same data is supplied on both the VGA and the DVI ports for a given display channel.

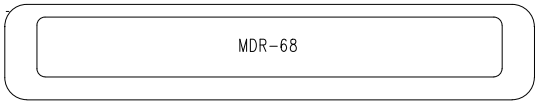
Video Mode	Resolution	Pixel Size (bits)	Windows Format	Refresh Freq. (Hz)	Output Channels	Notes
Analog Non-Interlaced	up to 1920x1200	8,16,32	WUXGA max	150 Hz at VGA, 77 Hz at WUXGA	Ch1, Ch 2	Also supports Sync On Green
Digital DVI (single link only)	up to 1600x1200	8,16,32	UXGA max	60 Hz	Ch1, Ch 2	GeminiPMC/DVI ONLY

GeminiPMC Front Panels

Front Panel for GeminiPMC

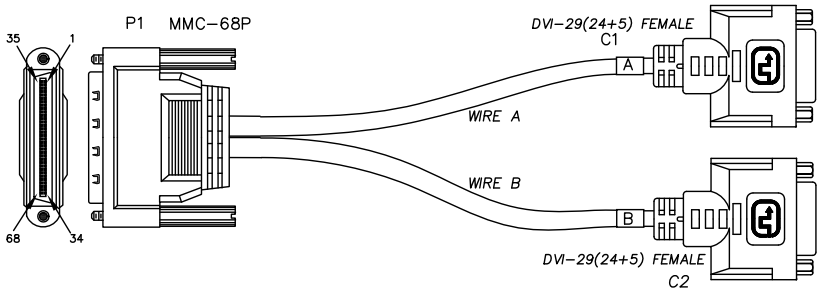


Front Panel for GeminiPMC/DVI



GeminiPMC Cables

Gemini Version	Breakout Cable?	VGA out Ch 1	VGA out Ch2	DVI Out Ch 1	DVI Out Ch 2
GeminiPMC	standard VGA	VGA 1	VGA 2		
GeminiPMC/DVI	A31-00736-0012	DVI-I #1	DVI-I #2	DVI-I #1	DVI-I #2



GeminiPMC/DVI A31-00736-0012 (VGX-2/1) cable assembly

Display Resolutions

Resolution	Vertical Scan Rate			
	Windows and RTOS		Solaris	
	Format	Maximum	Index	Frequency
640 x 480	VGA	150+ Hz	8 9	60 Hz 75 Hz
800 x 600	SVGA	150+ Hz	6 7	60 Hz 75 Hz
1024 x 768	UVGA	142 Hz	0 1	60 Hz 75 Hz
1152 x 864	Sun	126 Hz	2 [default] 3	60 Hz 75 Hz
1280 x 1024	SXGA	107 Hz	4 5	60 Hz 75 Hz
1600 x 1200	UXGA	91 Hz	C	60 Hz
1920 x 1080	HDTV	83 Hz	n/a	n/a
1920 x 1200	WUXGA	77 Hz	D	60 Hz

Ruggedization

Rastergraf is not in the militarized business. The intent of the following table is to illustrate how the Rastergraf graphic boards fit into the standard ruggedized classes.

Rastergraf boards use standard distribution grade derated commercial temperature range or industrial temperature range components. No formal component tracking is maintained.

Spec	Air-Cooled Level 0	Air-Cooled Level 50	Air-Cooled Level 100	Air-Cooled Level 200
Graphics Board(s)	Gemini Eclipse3 Topaz	Gemini Eclipse3 Topaz	Gemini Eclipse3 Topaz	Eclipse3 Topaz
Operating Temperature (4, 6)	0°C to 50°C	-20°C to 65°C	-40°C to 71°C	-40°C to 85°C
Storage Temperature	-40°C to 85°C	-40°C to 85°C	-55°C to 125°C	-55°C to 125°C
Humidity Operating	0 to 95% non-condensing	0 to 100% non-condensing	0 to 100% non-condensing	0 to 100% non-condensing
Humidity Storage	0 to 95% condensing	0 to 100% condensing	0 to 100% condensing	0 to 100% condensing
Vibration Sine (1)	2 g peak 15-2 kHz	2 g peak 15-2 kHz	10 g peak 15-2 kHz	10 g peak 15-2 kHz
Vibration Random (2)	0.01 g2/Hz 15-2 kHz	0.02 g2/Hz 15-2 kHz	0.04 g2/Hz 15-2 kHz	0.04 g2/Hz 15-2 kHz
Shock (3)	20 g peak	20 g peak	30 g peak	30 g peak
Conformal Coat (5)	optional	optional	optional	optional
Ordering Option (7)	/CA or /CS	/A5A or /A5S	/A1A or /A1S	/A2A or /A2S

Notes:

1. Sine vibration based on a sine sweep duration of 10 minutes per axis in each of three mutually perpendicular axes. May be displacement limited from 15 to 44 Hz, depending on specific test equipment. **Shock and Vibration values are by design and not tested in production.**
2. Random vibration 60 minutes per axis, in each of three mutually perpendicular axes.
3. Three hits in each axis, both directions, 1/2 sine and saw tooth. Total 36 hits.
4. Standard air-flow is 8 cfm at sea level. Some higher-powered products may require additional airflow. Consult the factory for details.
5. Conformal coating type to be specified by customer. Consult the factory for details..
6. Temperature is measured at the card interior (not at edge) using on-board LM75 temperature monitor.
7. Last letter in ordering option: A for Acrylic Conformal Coating, S for Silicone Conformal Coating

Graphics Software Support

SDL Subroutine Library includes Built-In Self Test module
WindML support (requires SDL)
Accelerated X Server with OpenGL
Windows 2K/XP drivers including accelerated DirectX and OpenGL

Software Support Matrix

	SDL	X	DirectX 7	Self-Test using SDL	Multi-Head	OpenGL	x86 BIOS	xSun and OpenGL DDX	Test S/W using SunVTS	SPARC FCode
Solaris SPARC 32/64-bit					✓			✓	✓	✓
Solaris x86	✓	✓			✓	✓	✓			
VxWorks x86/PowerPC	✓			✓	✓		✓			
Windows XP/7			✓		✓	✓	✓			
Linux x86/PowerPC	✓	✓		✓		✓	✓			
LynxOS PowerPC	✓	✓				✓				

SDL Graphics Library

SDL is a graphics library designed to be a device-independent programming interface. SDL is ideally suited to demanding board level and embedded systems applications. Drivers are available for selected host CPU boards and operating systems. SDL is supplied in object library format, which means that its target code size can be controlled by limiting the number of functions used in a given application. SDL has been designed to run on any CPU and operating system that uses linear addressing and is supported by the GNU C compiler and linker.

SDL is easy to use. It includes a complete set of graphics primitives that interface to the Borealis graphics controller's accelerated functions. All graphics primitives are drawn as single pixel lines. Rectangles, polygons, circles, ellipses, and chords can be filled with a solid color or stipple patterns.

Complete information about SDL is contained in the Standard Drawing Library C Reference Manual that is available for download from our web site at http://www.rastergraf.com.

SDL Feature Summary

- Solid (thin and wide) and dashed lines, polylines, and rectangles
- Pixblits to/from the display and host memory
- Filled and hollow polygons, ellipses, circles, sectors, and chords
- Solid and Pattern Fills - Pixel Processing
- Proportional and Fixed Width Fonts
- Clipping Rectangle and Logical Origin
- VGA output 640x480 to 1920x1200
- DVI output 640x480 to 1600x1200
- 8/16/24 bpp
- Sync On Green

Product Specifications

Graphics Controllers	Borealis, 32-bit, 33/66 MHz PCI 2.1
Maximum Dot Clock	250 MHz
Horizontal Scan Rates	31.5 to 115 kHz
Display Memory	16MB or 32MB SGRAM
Display Colors	16.7 Million @ 24 bits (uses a full 32-bit word) 65,536 @ 16-bits, 256 @ 8-bits
PCI-PCI Bridge	PLX PCI6154: 32/64-bit, 33/66 MHz (PMC side) 32-bit, 66 MHz (local side)
VPD Serial EEPROM	2 Kb (for 6154 bridge)
Environment	Temperature: 0°C to +70°C, operating, -55°C to +85°C, storage Humidity: 5% - 95% non-condensing
Power Requirements	+5V ±5%, 0.2 A (Max.) +3.3V ±5%, 2.2 A (Max.). Measurements do not include 5V power sourced to Ch 1 & Ch 2 VGA/DVI (limited to 1A total).
PCI Compatibility	32/64-bit, 33/66 MHz, PCI 2.2 compliant Universal PCI Bus signaling (5V and 3.3V)
Standards Compatibility	IEEE 1386-2001 (PMC)
Dimensions	149 mm x 74 mm
PCI Device IDs and Interrupts	6154 Bridge: IDSEL = PMC IDSEL Borealis Channel A: IDSEL = 6154_AD17, INTA Borealis Channel B: IDSEL = 6154_AD18, INTB
Video Connector (standard)	**Dual DB15-HD** VESA (Standard VGA)
Video Connector (/DVI option)	Uses 68-pin 3M N10268-52E2VC Mini-D ribbon, which supplies both DVI-D (for digital panels) and VGA (for analog applications). DVI-I to DVI-D+VGA splitter cables are readily available.
Analog Monitor Support	Standard multi-frequency VGA compatible mon itors supports resolutions up to 1920x1200. Sync-On-Green (SOG) is jumper selectable.
Composite Video Signal	1 Volt peak to peak, consisting of: 660 mV Reference White 54 mV Reference Black 286 mV Sync
Analog Flatpanel Support	VGA compatible, up to 1920x1200.
Digital Flatpanel Support	Optional - DVI, up to 1600x1200.
MTBF	361K hours using Bellcore model (ground benign).
Quad-Image BIOS	Allows board to function as system console on x86 (VGA/DVI), SPARC (FCode), and Sync-On-Green monitor-based systems.
Maintenance Features	DDC-2B control enables system software to inter-rogate monitor for type and capabilities; RAMDAC 1-bit ADC sense function can detect monitor con-nections; RAMDAC's integral CRC capability allows any 24 video data lines to be tested; LM75 thermal sensor can report board temp..
Power-management capabilities	Depending on operating system support, most devices can be at least partially powered down.

Ordering Information

GeminiPMC General Description:
High performance graphics controller provides two Borealis Graphics Accelerators, 16MB SGRAM per channel, VGA graphics outputs, Quad-image BIOS supports VGA, DVI, RGB+Sync-On-Green, and FCode.

GeminiPMC/VGA
Basic board includes dual front panel VGA connectors

GeminiPMC/DVI
Add digital output (DVI) and replace VGA connectors with 68-pin connector (breakout cable is required to access all functions)

/GL
OpenGL license per board

Breakout Cable:

A31-00736-0012
VGX-2/1 Gemini to a set of 2x DVI-I (DVI + VGA). 1 ft.(30 cm)

Software:

SDL/R3.6.7
SDL graphics library for x86/PPC VxWorks, x86/PPC Linux, and PPC LynxOS.

WML/R1.2
WindML for for WindML 3.0 for x86/PPC VxWorks. Requires SDL.

Windows Drivers
Drivers for Windows XP and Windows 7 (32-bit only). Downloadable from www.rastergraf.com

DRV/LN/B/R3.0
2D accelerated X-Windows DDX drivers for x86 and PPC Linux and x86 Solaris. Supports XFree86 4.x and X.org X11R6.8.2.

LYX/B/R1.3
2D accelerated X-Windows DDX drivers for LynxOS 4.0

DDX/SO/R5.0
2D X-Windows DDX drivers for SPARC Solaris 2.6-10.

GL/SO/R1.2
One license per board - serial number controlled.
High Performance Direct Rendering Infrastructure (DRI) based hardware accelerated 3D/OpenGL DDX driver for SPARC Solaris 2.6-10. Requires DDX/SO/R5.0

SunVTS R3.0
Support SunVTS 6.1 for x86 and SPARC Solaris 2.6-10. For SPARC Solaris, also requires DDX/SO/R5.0.

NOTES: **/RX.X** is software revision number, subject to change.
Solaris x86 support requires Solaris 9 or newer.

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