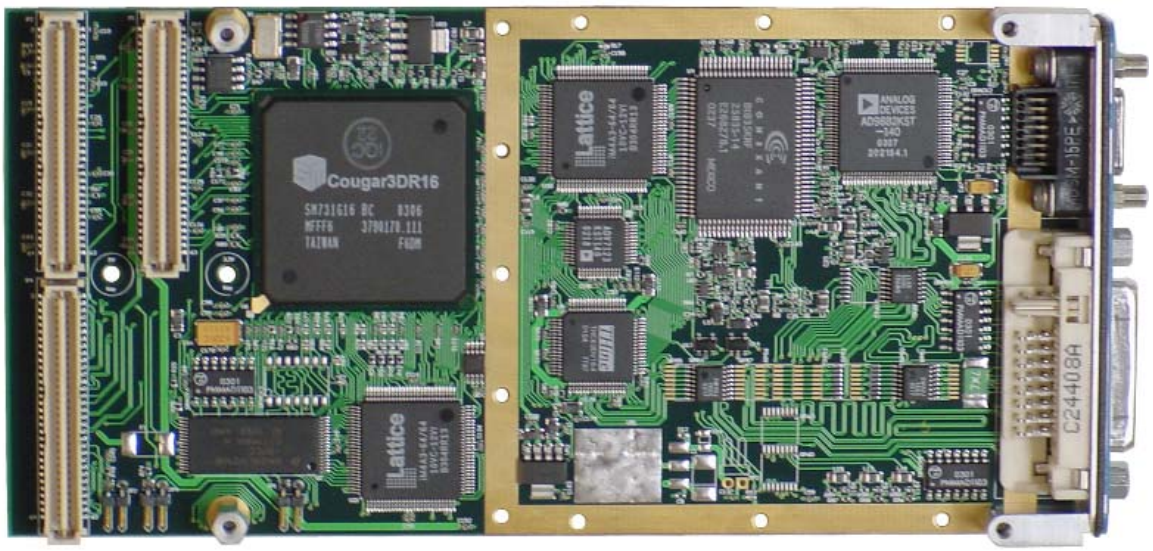
Rastergraf

StratusPMC

High Resolution
Single or Dual Channel Graphics
with Video / Hi-Res Input



Features

- 128-bit graphics accelerator
- 16 MB display memory
- Supports one display at up to 1600 x 1200 or two displays at up to 1280 x 1024
- Dual channel VGA or LVDS and single channel NTSC/PAL and DVI display modes
- NTSC/PAL, RGB, and DVI capture up to 1024 x 768
- VxWorks, Linux, LynxOS, and Windows 2K/XP

StratusPMC

Rastergraf's StratusPMC is a display controller and video capture PMC (PCI Mezzanine Card) board. The card is designed for use under VxWorks (using Wind River's WindML or Rastergraf's SDL) and Linux (using SDL or XFree86) operating environments. It also supports DirectX environments running Windows.

StratusPMC features a Silicon Motion SM731 System On a Chip (SOC) graphics accelerator with 16 Mbytes of on-chip SDRAM. This 128-bit 2D/3D graphics engine supports compatible displays at 1600x1200x16 bpp or 1280x1024x24 bpp. It supports multiple display options that are detailed in the Output Configurations table on the following page.

The StratusPMC features the Conexant Bt835 NTSC/PAL/S-Video and Analog Devices AD9882 High Speed RGB/DVI digitizers. A loopback can connect Video Output to Input for self-testing.

The standard StratusPMC configuration includes:

- **Front-panel DVI-I connector:** Supplies DVI Output and primary and secondary analog RGB outputs. The RGB outputs support VGA (RGBHV), Sync-On-Green (SOG), and Composite Sync.
- **Front panel 15-pin MDSM connector:** Provides S-Video and Composite Video inputs and outputs or high speed (1024 x 768) RGBHV input with optional Sync-on-Green.
- **Rear panel (J4/Pn4):** Supplies dual LVDS outputs. Note: a related product,TopazPMC supports front panel LVDS.

Rastergraf's factory configured I/O Resource Matrix maximizes I/O flexibility, enabling most functions on either the front or rear panel. Please contact the Rastergraf for more information.

Embedded Life-Cycle Support

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

The Embedded Graphics Source.

Rastergraf's SM731-based product line includes the Tropos/PMC board, an entry-level display controller with a single front panel VGA connector. The Duros/PMC and Garnet/PMC are ruggedized versions of the Tropos and Stratus, respectively.

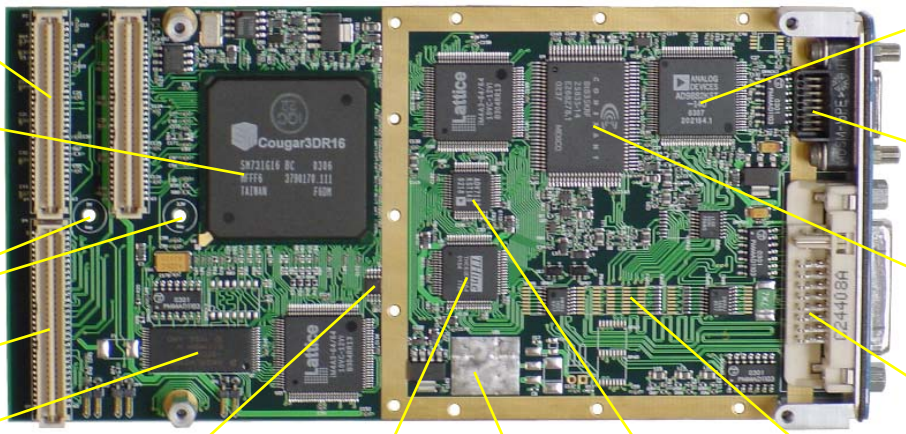
Additional Rastergraf products include:

• Single, dual, and quad display-only PMC modules.

• Dual display/dual capture head PMC module.

• 3U and 6U VME graphics boards.

StratusPMC can also be used in standard CompactPCI and PCI slots with an appropriate adapter board. Please contact Rastergraf for more information or consult our web page at *www.rastergraf.com*.



StratusPMC Features

- Silicon Motion 128-bit 2D/3D graphics controller
- 32-bit, 33/66 MHz PCI interface
- Pixel size is programmable for 8, 16, or 24 bits/pixel
- 16 MB SDRAM Graphics Memory
- Single VGA/RGB output up to 1600 x 1200 @ 16 bpp or 1280 x 1024 @ 24 bpp. Dual outputs up to 1280 x 1024 x 16 bpp
- DVI output at 1600 x 1200 @ 16 bpp or 1280 x 1024 x 24 bpp
- Dual LVDS output up to 1024 x 768 x 24 bpp (rear panel only)
- Hardware scroll, pan, and cursor
- VGA BIOS support
- NTSC/PAL Video Input Digitizer
- High Speed RGB or DVI input up to 1024 x 768
- Flexible assignment of front and rear panel connections
- Optional local 3.3V regulator for hosts that lack 3.3V
- Use on PCI and CompactPCI with a PMC host adapter

StratusPMC Technical Overview

Introduction

The StratusPMC contains four major functional blocks: the Silicon Motion SM731 graphics controller, the multimode video digitizers, the BIOS programmer, and the I/O Resource Matrix (IORM).

System On a Chip Graphics Accelerator

The StratusPMC is powered by a Silicon Motion SM731 SOC graphics accelerator. It includes a 32-bit, 33/66 MHz PCI bus, LVDS encoders, parallel-data flat panel outputs, NTSC/PAL encoder, 235 MHz RAMDAC, and a DMA controller. It supports all ACPI power states. The SM731 includes 16 MB of on-chip SDRAM operating at up to 150 MHz. It provides sufficient bandwidth to concurrently support large displays and other graphics and video processing functions.

The SM731's 128-bit Drawing Engine supports 3 ROPs, BitBLT, color expansion, and line draw. It includes an IEEE Floating Point Setup engine as well as a complete 3D rendering engine. The 3D pipeline can setup 6M triangles/second and rasterize at 125 Mpix/second. The dual pipe texture engine can output 250 Mtex/second. It provides mip mapping, alpha blend, specular highlights, stencil planes, fog, anisotropic filter, bump mapping and Z buffer support.

The SM731's Motion Compensation, Video Processor, and Video Capture Units provide superior video quality for real-time video playback and capture. When combined with a fast host CPU, the Motion Compensation block enables full frame playback of DVD video content without the need for additional hardware. The Video Processor supports multiple independent full screen, full motion video windows with overlay. Each video window uses hardware YUV-to-RGB conversion, scaling, and color interpolation.

The programmable video timing ranges from 30 to 150 Hz vertical and 15.7 kHz to 100 kHz horizontal refresh rates, with a pixel clock up to 235 MHz, delivering display formats up to 1600 x 1200 @ 16 bpp or 1280 x 1024 @ 24 bpp.

The graphics display output uses an internal RAMDAC which integrates the graphics and 64 x 64 x 2 bit cursor pixels into 24-bit RGB color values. The analog signals from the RAMDAC are connected to a standard RGBHV (VGA) or SOG monitor. I2C/DDC lines enable the host computer to control the monitor and local peripheral devices.

The SM731 provides a 24-bit output for parallel-data flat panels, which is used on Stratus to drive the external THine THC63DV164 DVI encoder and secondary DAC Analog Devices ADV7123. The DAC can supply a second VGA port. When both channels (either with LVDS or analog) are used, the display resolution should be limited to 1024 x 768 because of the additional overhead imposed on the internal data buses.

Video, RGB, and DVI Inputs

The SM731 has a single wide-band 16-bit video input port. It can accept input in YUV or 5:6:5 RGB formats. The StratusPMC uses a PLD-based multiplexer to support Video and RGB/DVI digitizers. One of these sources is selected as the active digitizer. RGB, 8-bit monochrome (G or YUV), or color YUV is then provided to the SM731.

A Conexant Bt835 Video Digitizer selects and decodes one-of-four NTSC/PAL composite video or one-of-three composite plus S-Video. The Bt835 provides on-the-fly scaled and clipped digitized video images to the SM731 input port. Image data can be captured by the host CPU using the SM731 DMA to transfer captured data in graphics memory into host memory. A self-test feature can connect the Composite Video Output to a video input.

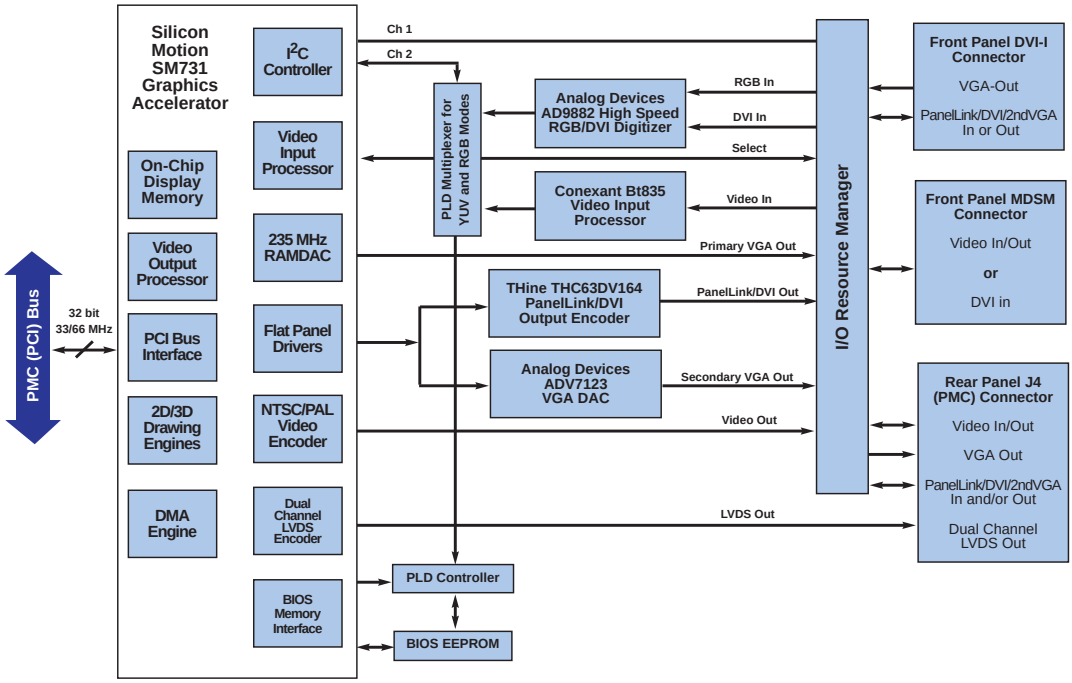
An Analog Devices AD9882 dual mode digitizer supports high speed RGB and DVI up to 1600 x 1200. RGB input can be accepted with separate syncs or Sync-On-Green. Although the AD9882 can supply 24-bit RGB, the SM731's 16-bit input port limits RGB to 5:6:5.

Field Programmable BIOS

The SM731's auxiliary I^2C port and a PLD are used to drive the BIOS EEPROM's data and address lines to enable field programming.

I/O Resource Matrix

The I/O Resource Matrix (IORM) uses factory installed 0-ohm packs to direct the StratusPMC input and output streams to the MDSM and DVI front panel connectors and/or the rear panel I/O (Pn4) connector.



StratusPMC Functional Diagram

StratusPMC I/O Standard Configuration

Graphics Output

StratusPMC supports a wide range of graphics and video I/O configurations. Its two graphics display channels can be configured as single DVI, dual VGA, or dual LVDS outputs. It can, for example, simultaneously deliver dual VGA or LVDS outputs (LVDS is rear-panel only: See Rastergraf's **Topaz/PMC** card for front panel LVDS support). Maximum display resolution in dual display mode is 1024 x 768 x 8 bpp.

Video Input

StratusPMC provides a single video input channel that supports Composite, S-Video, NTSC, and PAL inputs. Encoded NTSC/PAL is also provided in composite or S-Video format.

Video Output

StratusPMC also provides video (Composite/S-Video/NTSC/PAL) output.

Display/Capture Throughput

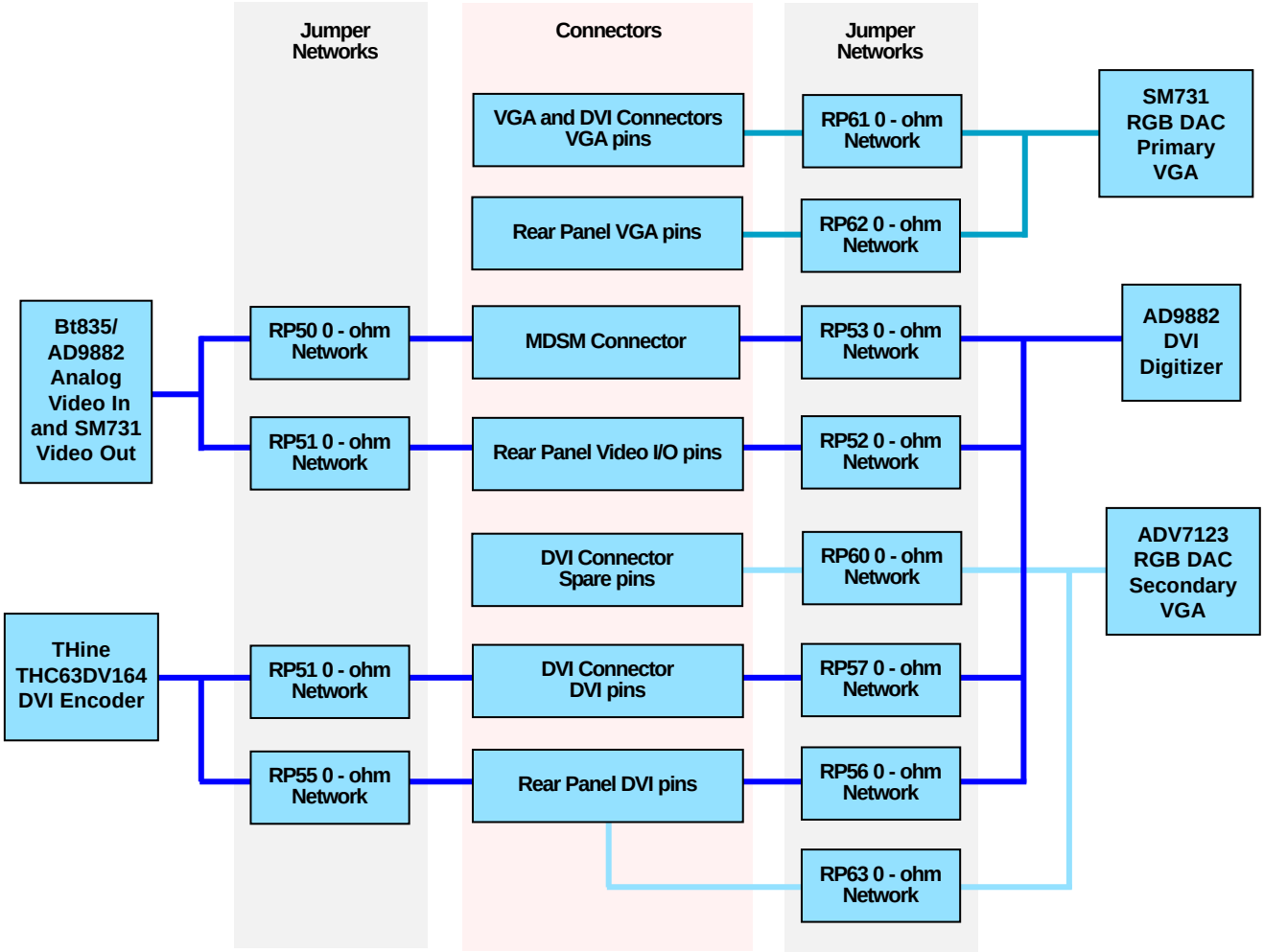
The SM731 Graphics Controller is a flexible chip. It supports a single input capture channel as well as up to two independent outputs. It has widowing capabilities and a 128-bit high-performance drawing engine. But, the overall throughput is handicapped somewhat by a 64-bit memory bus. This section provides some tabulated information about the practical capabilities of the SM731. These sorts of limitations are common in graphics chips, but it's just unusual for a vendor to provide quantified data to the customers.

Note that this data is empirically obtained. There may be cases where a format that was observed to be clean might not be with high drawing engine activity. Special test software was used, not SDL or X Windows, in order to avoid application software dependencies.

The following chart shows the results of empirical tests designed to test the limits of the display/capture capabilities. The entries are coded: for example, 1600-8-63 means 1600x1200, 8 bpp, 63 Hz vertical refresh. Other combinations are possible, and some modes (e.g. 1280x1024 capture) are possible when conditions are right. Please refer to the User's Manual, Section 2.5, for more information.

Ch 2 (DVI/VGA)	Ch 1 (VGA only)	Ch 2 Capture Window	Ch 1 Capture Window
1600-8-63	inactive	1024-75	inactive
1600-8-73	inactive	640-60	inactive
1600-8-77+	inactive	inactive	inactive
1600-16-48	inactive	1024-75	inactive
1600-16-62	inactive	640-60	inactive
1600-16-77+	inactive	inactive	inactive
1280-8-85+	inactive	1024-75	inactive
1280-8-85+	inactive	640-60	inactive
1280-8-85+	inactive	inactive	inactive
1280-32-52	inactive	1024-75	inactive
1280-32-63	inactive	640-60	inactive
1280-32-75	inactive	inactive	inactive
1600-16-58	1280-32-60	inactive	inactive
1280-8-73	1280-8-74	1024-75	inactive
1280-8-73	1280-8-74	inactive	1024-75
1280-8-45	1280-8-46	1024-75	1024-75
1280-8-85+	1280-8-85+	inactive	inactive
1280-32-59	1280-32-60	inactive	inactive
1024-32-62	1024-32-63	640-75	640-75
1024-32-85+	1024-32-86+	inactive	inactive

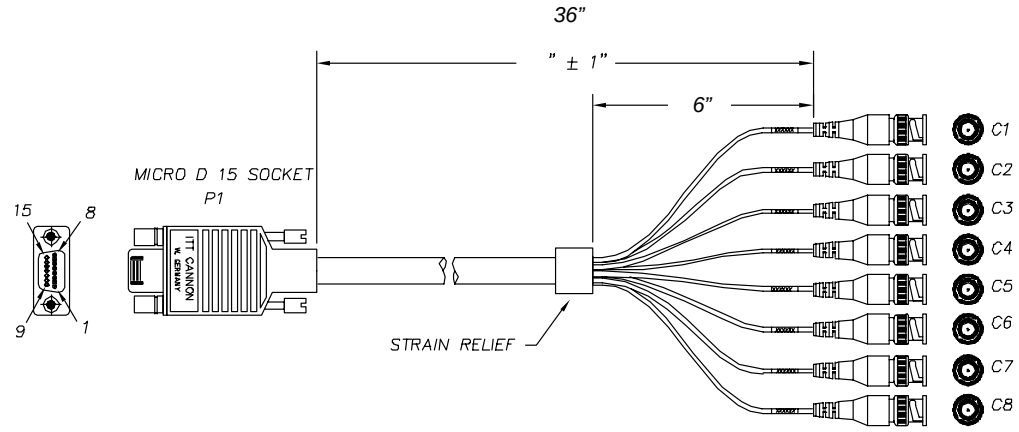
StratusPMC I/O Configuration Options



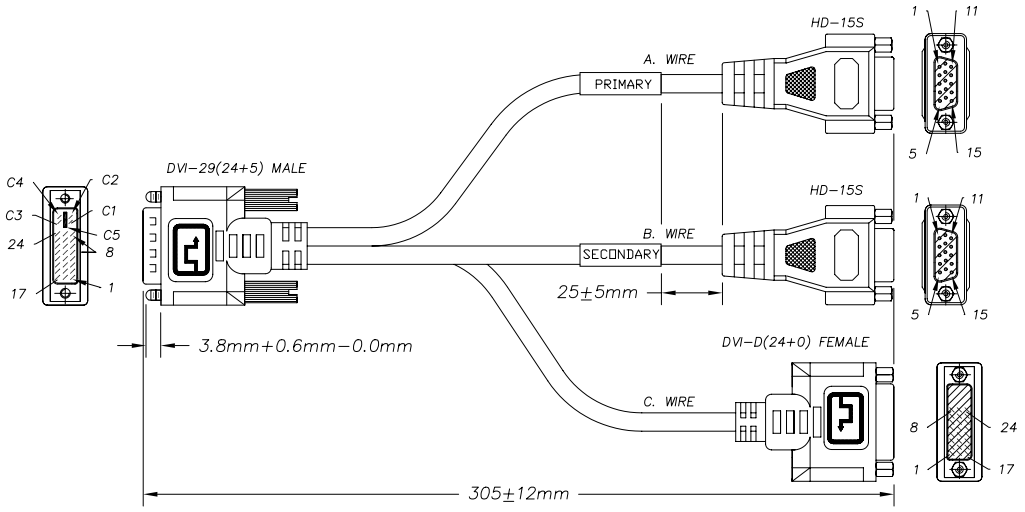
			VGA Out	Second VGA Out**	Dual LVDS Out	DVI Out	Composite/ S-Video/ NTSC/PAL Out	Analog RGB In	DVI In	Composite/ S-Video/ NTSC/PAL/ In	Order Options
Standard	Stratus/PMC		DVI-I (Front)	DVI-I (Uses "spare" pins; Front)	Rear	DVI-I (Front)	MDSM (Front)	MDSM (Front)		MDSM (Front)	
Specials	Stratus/PMC (Maximum)		DVI-I (Front)	DVI-I (Uses "spare" pins; Front)	Rear	DVI-I (Front)	MDSM (Front)	MDSM (Front)	Rear	MDSM (Front)	/MAX
	Stratus/PMC (Rear DVI Out)		Rear		Rear	Rear	Rear	Rear		Rear	/RIO3
	Stratus/PMC (Rear DVI In)		Rear		Rear		Rear	Rear (uses rear DVI out)	Rear	Rear	/RIO4
	Stratus/PMC (Rear Dual VGA)		Rear	Rear (uses rear DVI out)	Rear		Rear	Rear	Rear	Rear	/RIO5
	Stratus/PMC (DVI In)	(Standard)*	DVI-I (Front)	DVI-I (Uses "spare" pins; Front)			MDSM (Front)	MDSM (Front)	DVI-I (Front)	MDSM (Front)	/FDI1
		(Alternate)	DVI-I (Front)	DVI-I (Uses "spare" pins; Front)		DVI-I (Front)			MDSM (Front)		/FDI2

* Preferred configuration for maximum performance.
** May be possible to obtain rear video I/O via jumpers.

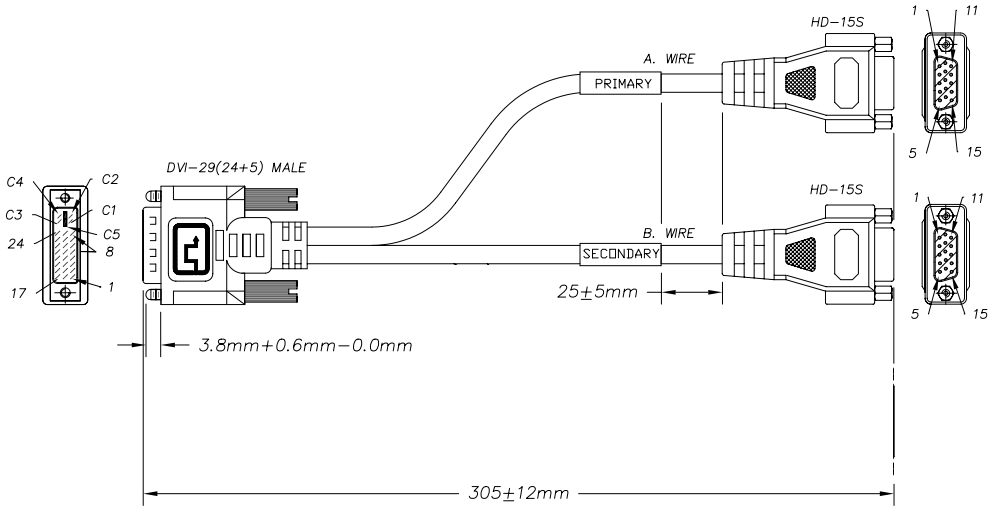
StratusPMC Cable Options



E-A31007350036 (VSG-8/3) Cable assembly



E-A31007351012 (VSG-3/1) Cable assembly



E-A310011-0A (VSG-2/1) Cable assembly

Product Specifications

Graphics Controllers	Silicon Motion SM731, 32-bit/66 MHz PCI
Maximum Dot Clock	235 MHz
Horizontal Scan Rates	31.5 to 115 kHz
Display Memory	16 MB SDRAM
Display Colors	16.7 Million @ 24-bits, 256 @ 8-bits
Digitizers	Conexant Bt835 with 4 input mux and S-Video supports NTSC/PAL cameras Analog Devices AD9882 RGB/DVI supports RGBHV, RGB with Sync-On-Green or Composite Sync, or DVI inputs up to 1024x768. Output to SM731 is either 5:6:5 RGB or YUV.
Environment	
Temperature	0°C to +70°C, operating, -55°C to +85°C, storage
Humidity	10% - 90% non-condensing
Power Requirements	+3.3V ±5%, 1 A (est), +5V ±5%, .3 A (est) Local 3.3V regulator option if no host 3.3V.
Compatibility	IEEE 1386-2001, 32-bit, 66 MHz Universal PCI Bus signaling (5V and 3.3V)
PCI Device IDs and Interrupts	SM731 IDSEL = PMC IDSEL, INTA LM75 INTB
PCI Subsystem Vendor ID	0x10F0 (Vendor Code)
PCI Subsystem Device ID	0x00C7 (StratusPMC Identifier)
Dimensions	149 mm x 74 mm
Board Connections	Controlled by the IO Resource Director
Front Panel	DVI-I and MDSM-15
Rear (PMC Pn4)	64 pin PMC connector
Cautionary Note	**Pn4 off-board connections must be inner-layer matched length for DVI and LVDS signals. Other I/Os require inner-layer signal+ground pairs.**
I/O Resource Matrix (IORM)	**Connections either to front or rear but not both. Not all choices are available simultaneously. Contact factory for details. Must be set up at factory.** **DVI connector:** 2 x VGA and DVI In 2 x VGA and DVI Out **MDSM Connector:** NTSC/PAL Video I/O, High Speed RGB In, DVI In **Rear (PMC Pn4):** Dual LVDS (always) 2 x VGA, DVI In/Out, High Speed RGB In NTSC/PAL Video I/O
Analog Monitor Support	VGA with optional Sync-On-Green or Composite Sync, Non-interlaced up to 1600x1200 @ 16 bpp or 1280 x 1024 @ 24 bpp.
Composite Video Signal	1 Volt peak to peak, consisting of: 660 mV Reference White 54 mV Reference Black 286 mV Sync
DVI Digital Monitor Support	1600x1200 @ 16 bpp or 1280 x 1024 @ 24 bpp
LVDS Digital Monitor Support	Dual channel, 1024x768x24 bpp each
Software Support	Standard Drawing Library (SDL) for Linux and VxWorks; WindML for VxWorks; Windows 2K/XP drivers; XFree86 for Linux.
VGA BIOS	Allows board to function as system console.
Maintenance Features	DDC-2B control enables system software to interrogate monitor for type and capabilities; RAMDAC sense function can detect monitor connections; LM75 thermal sensor can report board temp; composite video In/Out loopback
Power-management capabilities	Depending on operating system support, most devices can be at least partially powered down

Display Resolutions

Windows, Linux and RTOS			
Resolution	**Pixel Size (bpp)**	**Format**	**Vertical Scan, (max)**
640 x 480	8, 16, 24, 32	VGA	150+ Hz
800 x 600	8, 16, 24, 32	SVGA	150+ Hz
1024 x 768	8, 16, 24, 32	UVGA	142 Hz
1280 x 1024	8, 16, 24, 32	SXGA	107 Hz
1600 x 1200	8, 16	UXGA	91 Hz

Ordering Information

StratusPMC

Silicon Motion SM731 Graphics Accelerator, 16 MB SDRAM, Conexant Bt835 video digitizer, Analog Devices AD9882 High Speed RGB/DVI Digitizer, I/O Resource Director, NTSC/PAL video out, dual analog (VGA plus Sync-On-Green or Composite Sync), digital (DVI and dual LVDS), and VGA BIOS.

Options

/V

Add local 3.3V regulator for systems without 3.3V on PMC bus.

E-A31007350036 (VSG-8/3)

MDSM15 to 8 BNC cable, 3 ft.

E-A31007351012 (VSG-3/1)

DVI-I to dual VGA plus DVI-D breakout cable, 1 ft.

E-A310011-0A (VSG-2/1)

DVI-I to dual VGA breakout cable, 1 ft.

Software:

SDL

Standard Drawing Library (SDL) Package with C-callable graphics library for VxWorks and Linux.

WindML

VxWorks high level graphics interface. Requires SDL License.

XFree86

X Windows port with video-in support for Linux x86

DRV/WIN

Driver for Windows 2000 and Windows XP systems

Note: Specifications and version number may change as enhancements and improvements occur.

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