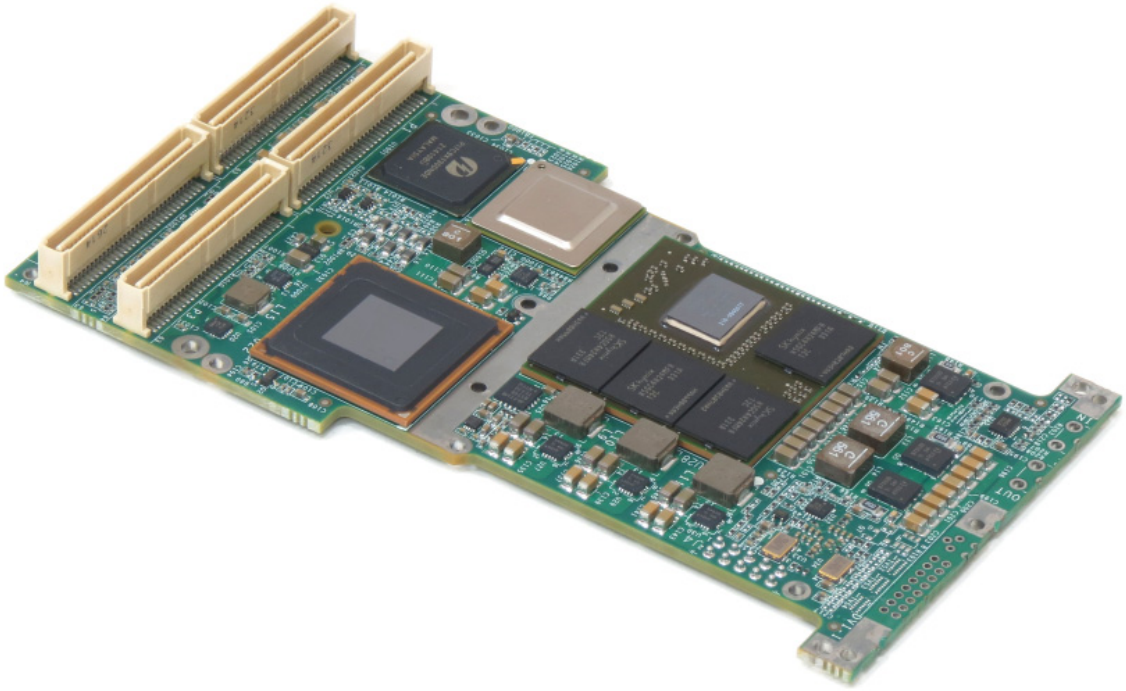
M598

Radeon™ E8860 (Adelaar) Video & Graphics PMC

Aitech
Embedded Computing *without* Compromise



- Single Width PMC
- PCI-X 64-bit @ 133 MHz Host Interface
- AMD Radeon E8860 (Adelaar) GPU
  - 6 Independent Graphics Heads
  - 2 GB GDDR5
- Analog Video Inputs
- Analog and Digital Video Outputs
- Full Video Switching Capabilities
- Video Capture and Overlay
- Video Resize and Customized Formats
- Full 2D/3D Processing Capabilities
- Enhanced Graphics & Video Support
  - DirectX® 11.1
  - Shader 5.0
  - OpenGL 4.2
  - OpenCL 1.2
- Operating System Support
  - Windows™
  - Linux®
  - VxWorks®
  - INTEGRITY®

M598

Radeon™ E8860 (Adelaar) Video & Graphics PMC

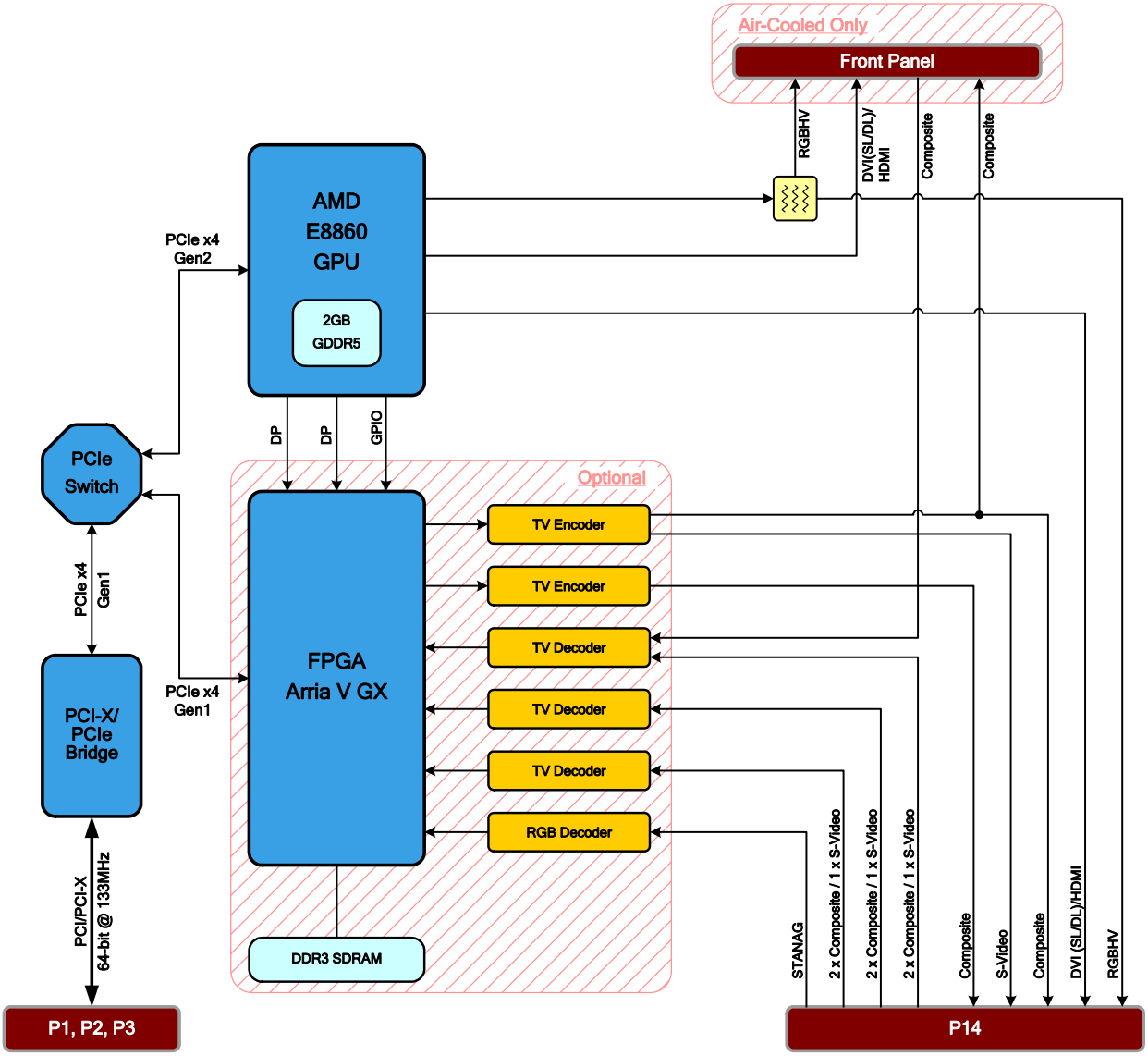
Aitech
Embedded Computing *without* Compromise

Aitech's M598 6-Head Multiple Output Graphics PMC provides a high-performance, highly versatile embedded video and graphics solution for harsh environment applications. Designed around the AMD E8860 Six Head Graphics Processing Unit with its 2 GB of GDDR5, the M598 can simultaneously drive several independent video streams in a wide variety of output formats.

The M598 supports the most advanced graphics and video standards including DirectX, OpenGL, and H.264, as well as multiple and versatile graphics and video input/output protocols. A number of the standard M598 output video channels are provided through E8860 native integrated video ports. Additional video protocols/formats and signal conditioning are provided by an optional sophisticated FPGA residing alongside the E8860 GPU, to complement the GPU's capabilities.

In addition, the M598 provides advanced video overlay functionality. The E8860 processor generates the graphics images, superimposes an input from one of the various video formats, and drives the result to a monitor. Several independent overlay processes may be implemented simultaneously. The resultant video streams can be routed to the FPGA for output on an interface not supported natively by the GPU.

To ensure high-speed transfer of graphics and video, the M598 interconnects with the host system via a 64-bit PCI-X link.



M598

Radeon™ E8860 (Adelaar) Video & Graphics PMC

Aitech
Embedded Computing *without* Compromise

Board Architecture

GPU	AMD Radeon E8860 (Adelaar) • 6 Independent Graphics Heads • Embedded GPU Operating @ up to 625 MHz • 2 GB GDDR5 @ up to 1125 MHz • 640 shader processors • UVD 4th generation supports the decoding of H.264, VC-1, MPEG4, and MPEG2 • DirectX®11, Shader 5.0, OpenGL 4.2, OpenCL 1.2 • 768/480 GFLOPs single/double precision peak (600e/4.5 Gbps) • ~3x 3D performance of AMD Radeon™ E4690 GPU • Overlay Support
PCIe Fabric	• The PCIe switch manages connections between the GPU, FPGA, and PCIe to PCI-X bridge • Internal PCIe fabric enables high-throughput communication between the GPU and FPGA
Board Resources	• High Performance FPGA for Video Capture and Generation • DDR3 SDRAM Supporting Video Processing • Configurable Thermal Shutdown • On-board Temperature Sensor

Video Inputs (backplane)

See *Configuration Options* for available combinations

Analog Inputs	• 6x Composite (interlaced RS-170A (NTSC)/PAL) or • 3x S-Video (NTSC/PAL) • 1x STANAG 3350 (B, C)

Video Outputs (backplane)

See *Configuration Options* for available combinations

Digital Outputs	• 2x DVI (single or dual-link) or • 1x HDMI + 1x DVI (single or dual-link)
Analog Outputs	• 2x Composite (interlaced RS-170A (NTSC)/PAL) • 1x S-Video (NTSC/PAL) • 1x RGBHV Note: The Composite and S-Video outputs are all the same signal (clones)

Front Panel I/O

See *Configuration Options* for available combinations

Digital	• 1x DVI (Single or Dual-Link)/HDMI (via passive DVI to HDMI adaptor) Output
Analog	• 1x Composite (interlaced RS-170A (NTSC)/PAL) Output • 1x Composite (interlaced RS-170A (NTSC)/PAL) Input • 1x RGBHV Output
Connectors	• 1x DVI-I • 2x SMB

M598

Radeon™ E8860 (Adelaar) Video & Graphics PMC

Aitech
Embedded Computing *without* Compromise

Supported Resolutions

Other resolutions and aspect ratios are available as special order options

Video Standard	Video Signal Format	Resolution Specification					Input Interface		Output Interface			
		Total Lines	Active Lines	Aspect Ratio	Frame Rate	Interlaced/ Progressive	STANAG 3350	Composite/ S-Video	DVI	HDMI	RGBHV	Composite/ S-Video
TV	RS-170A (NTSC)	525	483	4:3	60	I		•				•
	PAL	625	576	4:3	50	I		•				•
VESA	VGA (640 x 480)	525	480	4:3	60	P			•		•	
	SVGA (800 x 600)	628	600	4:3	60	P			•		•	
	XGA (1024 x 768)	806	768	4:3	60	P			•		•	
	SXGA (1280 x 1024)	1066	1024	5:4	60	P			•		•	
	UXGA (1600 x 1200)	1250	1200	4:3	60	P			•		•	
	WUXGA (1920 x 1200)	1235	1200	16:10	60	P					•	
	WQXGA (2560 x 1600)	1658	1600	16:10	60	P			•			
SMPTE/ HDTV	480/60i	525	483	4:3	60	I						
	576/50i	625	576	4:3	50	I						
	720/60p	750	720	16:9	60	P				•		
	1080/60i	1125	1080	16:9	60	I				•		
	1080/30p	1125	1080	16:9	30	P				•		
	1080/60p	1125	1080	16:9	60	P				•		
STANAG 3350	Class B (PAL)	625	575	4:3	50	I	•					
	Class C (NTSC)	525	485	4:3	60	I	•					

Software

The M598 is available with several GPU versions for use with different operating systems (see *Ordering Information*). Two versions support VxWorks and INTEGRITY, and the other supports Windows and various distributions of Linux.

The general Windows/Linux version of the M598 is supported by AMD's freely available standard driver package.

The standard VxWorks/INTEGRITY version of the M598 includes the CoreAVI driver, which supports x86 and PowerPC architectures. A second VxWorks/INTEGRITY version is available without the CoreAVI driver. This version is only for customers who have a licensing agreement with CoreAVI as it cannot be used without the CoreAVI driver.

For systems requiring DO-178B certification, the CoreAVI DO-178B OpenGL package is also available.

M598

Radeon™ E8860 (Adelaar) Video & Graphics PMC

Aitech
Embedded Computing *without* Compromise

Supported Operating Systems and Video Driver Capabilities

Driver Provider	OS	Enhanced Graphics & Video						Input Interface		Output Interface			
		DirectX 11.1	Shader 5.0	OpenGL 4.2	OpenGL ES 2.0	OpenGL SC	OpenCL 1.2	STANAG 3350	Composite/ S-Video	DVI	HDMI	RGBHV	Composite/ S-Video
AMD	Linux®			•	•		•			•	•	•	•*
	Windows™	•	•	•			•	•	•	•	•	•	•*
CoreAVI	VxWorks®				•	•	•	•	•	•	•	•	•
	INTEGRITY®				•	•	•	•	•	•	•	•	•

* Composite/S-Video interfaces are partially supported under Windows.
Refer to the M598 User's Guide for a complete description of available functionality.

Power

M598 Power Consumption

Power Supply (1)		+3.3 V [A]	+5 V [A]	Total [W]
Consumption	Typ (2)	1.1	6.5	36.1
	Max (3)	1.5	9.2	51

Notes: (1) +12V, -12V, and VIO of the PMC standard not required
(2) GPU clock @ 400 MHz, GPU memory clock @ 550 MHz, running 3DMark 11 Benchmark @ 1280 x 720
(3) GPU clock @ 625 MHz, GPU memory clock @ 1125 MHz, running 3DMark 11 Benchmark @ 1280 x 720

GPU Performance vs. Power Consumption

Clocks [MHz]		Power [W]		Performance
GPU	Memory	Idle (1)	Max (2)	Score
300	150	7.2	14.4	969
400	550	12.6	24.2	1925
500	950	14.9	29.6	2471
625	1125	15.7	33.8	3023
Power Play Configuration (3)		7.2	33.5	2968

Notes: (1) Idle Power measured in Windows 7 idle mode
(2) Max Power measured during 3DMark11 Benchmark tests @ 1280 x 720
(3) Power Play can be used with AMD driver only

Test Platform: Gigabyte Technology Co. Ltd. H77-DS3H Motherboard with Intel Core i7 3770K Quad Core @ 3.9 GHz and 8 GB DDR3 @ 667 MHz, Windows 7 32-bit OS with AMD VENUS PRO MCM(6822) Ver. 13.251.0.0 Driver

M598

Radeon™ E8860 (Adelaar) Video & Graphics PMC

Aitech
Embedded Computing *without* Compromise

Mechanical

Form Factor & Dimensions	Single-Width PMC per IEEE 1386-2001 (air-cooled) & ANSI/VITA 20-2001 (conduction-cooled)
Weight	Conduction-cooled: <200 g [0.45 lbs] Air-cooled: <270 g [0.60 lbs]

Environmental

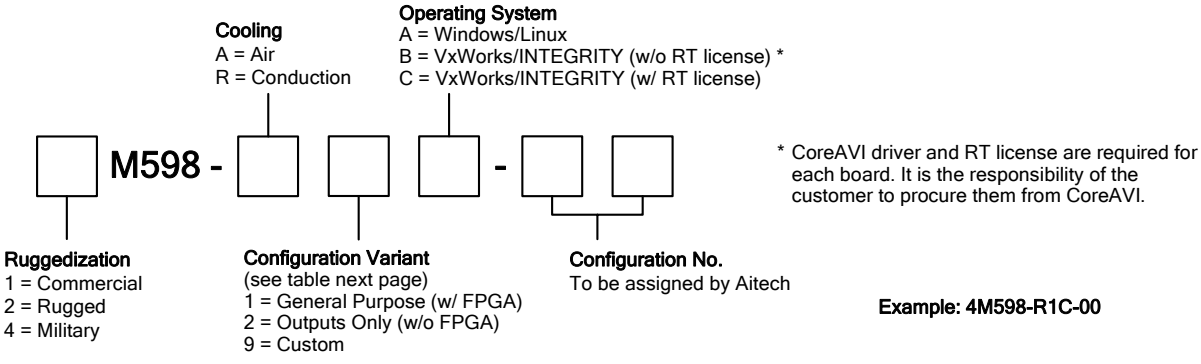
Specs per VITA 47	Air-Cooled			Conduction-Cooled	
	Commercial	**Rugged**	**Military**	**Rugged**	**Military**
Operating Temp.	AC1 (0 to +55 °C) (2)	AC3 (-40 to +70 °C) (2)	AC4 (-40 to +85 °C) (1,2)	CC3 (-40 to +70 °C) (3)	CC4 (-40 to +85 °C) (1,3)
Non-Operating Temp.	C1 (-40 to +85 °C)	C3 (-50 to +100 °C)	C4 (-55 to +125 °C)	C3 (-50 to +100 °C)	C4 (-55 to +125 °C)
Vibration	V1	V2	V2	V3	V3
Operating Shock	OS1	OS1	OS1	OS2	OS2
Altitude	15,000 ft.	35,000 ft.	70,000 ft.	35,000 ft.	70,000 ft.
Relative Humidity (4)	0 - 90%	0 - 100%			
Conformal Coating	N/A	Acrylic (Silicone and Urethane Optional)			

Notes: (1) **-55 °C available, contact an Aitech representative for more information**
(2) Operating ambient air temperature (with sufficient airflow)
(3) Operating card edge temperature
(4) Non-condensing

Accessories

TM530	Rear Transition Module (RTM) providing convenient access to M598 I/O interfaces via standard connectors when the M598 is mounted on a CM870 PMC Carrier. Supports both air and conduction-cooled M598 mounted in commercial air-cooled chassis. Refer to the TM530 datasheet for further information.

Ordering Information



* CoreAVI driver and RT license are required for each board. It is the responsibility of the customer to procure them from CoreAVI.

Example: 4M598-R1C-00

M598

Radeon™ E8860 (Adelaar) Video & Graphics PMC

Aitech
Embedded Computing *without* Compromise

Configuration Variants [8]

This table lists the number of I/O channels for each of the standard M598 variants.

Interface		Variant 1	Variant 2
Video Outputs	HDMI/DVI [1]	2 [2]	2 [2]
	RGBHV	1 [3]	1 [3]
	S-Video	1 [4]	0
	Composite	2 [4, 5]	0
Video Inputs	S-Video	3 [7]	0
	Composite	6 [6, 7]	0
	STANAG 3350	1	0

Notes:
(1) Software selectable as 2x DVI or 1x DVI + 1x HDMI. DVI auto configures as single or dual-link depending on the monitor (or other device) connected.
(2) In air-cooled boards one of these channels is available only at the front panel (not at P14).
(3) In air-cooled boards the RGBHV output is available only at the front panel (not at P14).
(4) These three outputs are all the same signal (clones).
(5) A clone of P14 Composite Output 0 is routed to the front panel of air-cooled boards; the channel cannot be used simultaneously at both locations.
(6) One additional composite input is available at the front panel of air-cooled boards.
(7) Because ports are routed to shared pins, each S-Video input is available at the expense of two Composite inputs. Due to shared decoders, a maximum of three Composite/S-Video inputs can be used simultaneously.
(8) Pinout compatibility with Aitech M591 and M597 PMCs (with some limitations) is available by special order.

Contact Aitech

Contact your Aitech sales representative for additional product information, and for inquiries regarding customized configurations of the M598 and additional software support.

All names, products, and/or services mentioned are trademarks or registered trademarks of their respective holders.
All information contained herein is subject to change without notice.