Overview

The VPX3-716 is an industry-leading rugged 3U OpenVPX™, high performance graphics processor based on the AMD Radeon™ E8860 Graphics Processing Unit (GPU). The E8860 is the latest embedded discrete GPU from AMD that meets the long lifecycle availability required for military programs through the use of a suite of CoreAVI® software drivers and 20-year component supply program. It features four independent and simultaneous graphics outputs, 2 GB of dedicated video memory, video decoders, video compression encoder and an XMC mezzanine site supporting both peripheral and processor mezzanines. Its large complement of dedicated video memory, combined with its high bandwidth, make it ideal for use in demanding graphics-rich applications that require extensive video processing and display capabilities. Designed for high reliability and a long lifecycle, the VPX3-716 is especially well-suited to support embedded training, moving maps, Geographic Information Systems (GIS), 360 degree situational awareness, Diminished Vision Enhancement (DVE) and other graphics, video and compute intensive applications.

Key Features

- AMD Radeon E8860 GPU
  + 2 GB dedicated video memory
  + H.264 codec for accelerated video encode and decode
- Four independent display outputs
  + Dual DVI with support for dual-link
  + Dual DisplayPort supporting up to 4K
- 1 x XMC site including processor mezzanine and peer-peer support
  + Low SWaP-C with processor XMC
  + Low latency with peer-to-peer support for XMC
- RTOS driver support for Power Architecture, Intel and Arm
- x86 Windows and Linux drivers
- Air- and conduction-cooled

Applications

- High performance graphics and display systems
- Applications such as:
  + Moving maps
  + Synthetic Vision Systems & Degraded Visual Environments (SVS/DVE)
  + Geographic Information Systems (GIF)
- Small form factor systems requiring high performance and low power
- Systems requiring safety certification

Figure 1: VPX3-716 block diagram

TRUSTED PROVEN LEADER

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XMC
VPX3-716

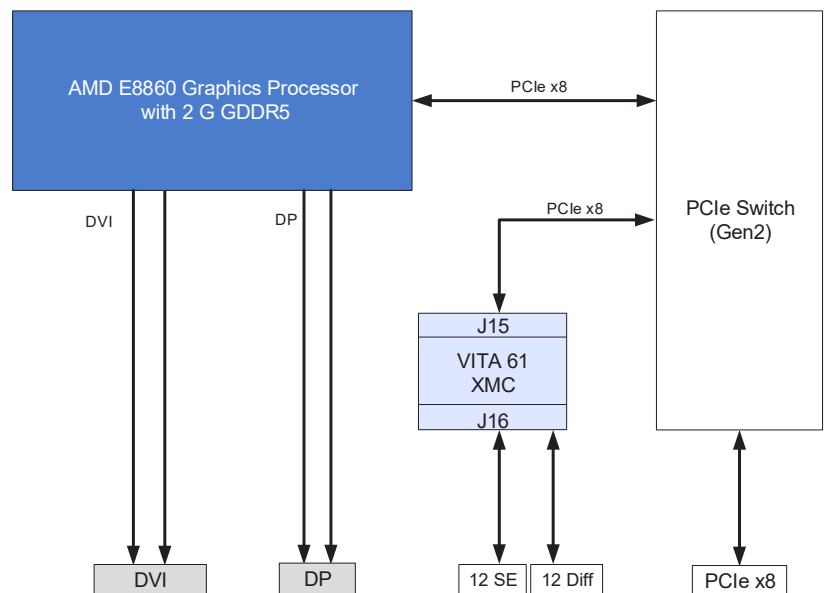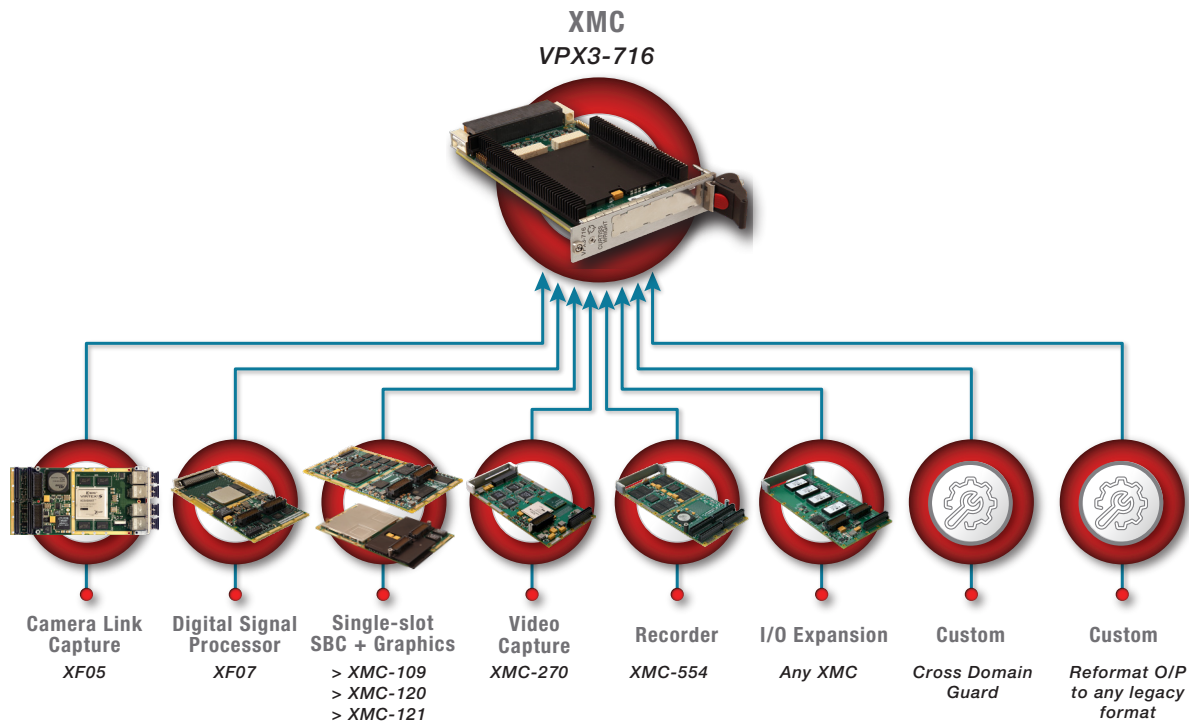| Camera Link Capture	Digital Signal Processor	Single-slot SBC + Graphics	Video Capture	Recorder	I/O Expansion	Custom	Custom
XF05	XF07	> XMC-109 > XMC-120 > XMC-121	XMC-270	XMC-554	Any XMC	Cross Domain Guard	Reformat O/P to any legacy format

Figure 2: VPX3-716 application space

Specifications

Form factor

- 3U OpenVPX, supporting module format MOD3-PAY-1D, MOD-PAY-2F, and MOD-PER-2F
- VITA 46-, VITA 48-, and VITA 65-compliant

Graphics processor

- AMD Radeon E8860 GPU
- Graphics memory: 2 GB GDDR5 SDRAM (72 GBps)
- Host interface: 8-lane PCI Express® (PCIe) Gen2
- Supports CoreAVI HyperCore™ graphics hypervisor GPU manager
- Supports CoreAVI TrueCore™ GPU safety monitor for avionics DAL A certification

Video interfaces

- Up to four independent simultaneous outputs selectable:
  + 2 x DVI outputs
    › Single-link DVI, 162 MP/s, up to 1920 x 1200 @ 60 Hz
    › Dual-link DVI, 268 MP/s, up to 2560 x 1600 @ 60 Hz
  + 2 x DisplayPort, HBR up to 3840 x 2160 x 30 Hz

XMC mezzanine site

- 8-lane PCIe Gen2 with configurable PCIe switch
- Backplane Pn6 I/O mapping of X12s+X12d
- Up to 25W XMC power

Software support

- CoreAVI drivers available for OpenGL® 1.3, OpenGL ES 2.0, OpenGL SC 1.0, OpenGL SC 2.0
- Support for Built-in Test (BIT)
- Operating system support for Linux, VxWorks, Micrsoft Windows
- Safety Certifiable Operating Systems – Wind River VxWorks 653, Green Hills INTEGRITY-178 and tuMP, LynxOS-178

Power

- 47W (max)
- Note: The graphics drivers include support for power management which can be utilized to reduce power

Weight

- Air-cooled, Level 0: 0.992 lb (450 g)
- Conduction-cooled, Level 200: 1.543 lb (700 g)

Environmental

- Air-cooled: Level 0 available, 1.0" pitch
- Conduction-cooled: L200 available
  + 0.8" pitch without XMC
  + 1.0" pitch with XMC installed

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TABLE 1	Output interfaces	
FEATURE	MAXIMUM PIXEL RATE	FORMAT/RESOLUTION
Digital single-link DVI	162 MP/s for 24 bpp output	› Standard VESA resolutions › Up to 1920 x 1200 @ 60 Hz reduced blanking
Digital dual-link DVI	268.5 MP/s for 24 bpp output	› Standard VESA resolutions › Up to 2560 x 1600 @ 60 Hz
Digital DisplayPort	4, 2 or 1 link at 5.4 GHz link rate per link	› Standard VESA resolutions › Up to 3840 x 2160 x 30 Hz

Note: MP/s = megapixels per second

VPX Module Format

The VPX standard provides support for higher power modules and improved cooling, among other benefits. This capability enables running the E8860 GPU at higher core clock frequencies than could be afforded with the lower thermal management capability for mezzanines while maintaining full rugged conduction cooled compliance.

The VPX3-716 was designed with standard processor mezzanine support so a single-slot high performance graphics solution is available. With a P2020 based XMC-109, for example, this effectively inverts the traditional graphics mezzanine on a processor card and in so doing tips the performance to the graphics functionality while providing plenty of processing capability to manage the application.
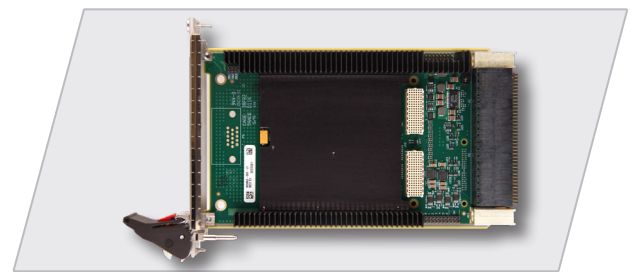

Figure 3: VPX3-716, air-cooled top view

Video Interfaces

The VPX3-716 provides four independent heads of graphics output with the physical outputs having the following configuration:

1. Two heads can be configured for two single-link DVI or combined as a single dual-link DVI. These GPU direct DVI outputs are converted on board to true DVI electrical interfaces, eliminating the need for external dual mode adapters.

2. Two heads that are DisplayPort™.

Figure 4: VPX3-716, conduction-cooled

Unified Video Decoder

The Unified Video Decoder (UVD) on the E8860 is improved over previous generations with added support for MPEG2 in addition to the existing H.264 capabilities. Along with the MPEG2 support, the HD stream handling capability is doubled to support two 1080p streams.

At lower resolutions the design handles up to 10 streams simultaneously with the total resolution not greater than two HD decode streams.
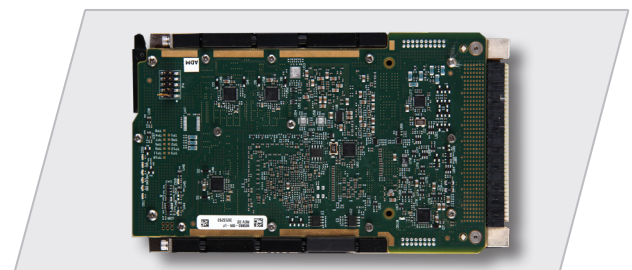

Figure 5: VPX3-716, conduction-cooled bottom view

Video Compression Encoder

The E8860 includes hardware support for H.264 video compression and AMD's VCE engine.

Fabric Ports

The VPX3-716 provides 8-lane PCIe Gen2 backplane connectivity, configurable as 1x8 or 2x4 ports. This flexibility permits PCIe chaining for additional VPX slot to slot expansion. An on-board PCIe switch allows the VPX3-716 to host an extra XMC mezzanine module connected to the PCIe fabric.

XMC Site

The VPX3-716 is equipped with one mezzanine site capable of supporting VITA 61 XMC modules and follows the VITA 46.9 Pn6 pin mapping strategy of X24s+X12d, providing 12 single-ended and 12 pairs of differential I/O from the mezzanine site to the backplane connectors. On the conduction-cooled card configuration, the XMC site adheres to the VITA 20-2001 (R2005) conduction-cooled PCI Mezzanine Card (PMC) standard specifications. To optimize the thermal transfer from XMC modules to the base card, the standard VPX3-716 thermal frame incorporates both the primary and secondary thermal interfaces as defined by VITA 20-2001 and can support mezzanines with a Total Dissipated Power (TDP) of up to 25W with full L200 conduction-cooled environment compliance.

The VPX3-716 mezzanine site is populated with VITA 61 connectors as default. Support for VITA 42 connectors is also available.

To support additional graphics and video processing, two of the GPU DisplayPort outputs can be routed directly to the XMC site with a factory build option. This feature provides a mechanism for additional video output format conversions, video capture and overlay, or use in a cross domain guard application and further customization by either Curtiss-Wright or the system integrator.

Peer-peer transfers are supported to transfer data directly to the GPU dedicated video memory through the onboard PCIe switch, minimizing latency when a video capture module is installed.

Reducing SWaP

In addition to supporting peripheral mezzanines, the VPX3-716 mezzanine site also fully supports processor mezzanines. This effectively inverts the traditional graphics mezzanine hosted on a processor card to unleash uncompromised graphics and video processing while not occupying any additional slots within a system. This seamless solution can stream video, overlay, and record all within one 3U OpenVPX slot.

Driver Software Support

The VPX3-716 is supported by CoreAVI's suite of embedded software drivers, including ArgusCore (OpenGL 1.3, OpenGL ES 2.0, OpenGL SC 1.0, OpenGL SC 2.0), DecodeCore (H.264/MPEG 2 video decode), EncodeCore (H.264 encode), TrueCore (GPU safety monitor) and HyperCore (Hypervisor and multicore support). The CoreAVI software drivers are designed to enable advanced graphics, video support and power management on all popular real-time and safety critical operating systems. These drivers are available from Curtiss-Wright, simplifying procurement and support with a single point of contact.

The drivers also include an extensive library of Built-in Tests (BIT).

For Intel architecture platforms running Windows® or Linux®, there are alternative drivers available to download directly from AMD supporting OpenGL 4.2, OpenCL 1.2, DirectX® 11.1 and H.254/MPEG 4 video decode.

Safety Certification

For applications that require safety certification, CoreAVI's software suite includes FAA RTCA DO-178C/EASA ED-12C driver certification packages supporting up to and including Level A certifications.

Rear Transition Module

To gain access to the backplane I/O signals of the VPX3-716, the RTM3-716-000 rear transition module (RTM) is available to access I/O in a lab environment.

Variants and Customization

Curtiss-Wright also has a Modified COTS (MCOTS) program where standard COTS products can be modified for simple changes such as matching existing system pinouts up to more complex modifications like form factor and/or functional customizations. Please contact Curtiss-Wright to discuss your program requirements.

Ruggedization Levels

Air-cooled cards are available at Level 0. Conduction-cooled cards are available in Level 200. Please contact Curtiss-Wright if additional ruggedization level support is required.

Ordering Information

The VPX3-716 is ordered with the following part numbers. Not all possible configurations are offered. Please consult Curtiss-Wright for available configurations.

TABLE 2	Ordering information - VPX3-716-ctmdvzz
PART NUMBER	AVAILABLE OPTIONS AND DESCRIPTION
VPX3-716-A0mdvzz	Air-cooled L0, 0 to 50°C
VPX3-716-C2mdvzz	Conduction-cooled L200, -40 to 85°C card edge
m	Mechanical format › 0: 1.0" pitch, no 2LM covers › 1: 0.8" pitch without XMC, 1.0" pitch with XMC, no 2LM covers › 8: Custom variant
d	Driver compatibility › 0: Embedded RTOS drivers from CoreAVI › 1: AMD Catalyst/Radeon drivers
v	VITA Mezzanine Connector › 0: VITA 61 connectors › 1: VITA 42 connectors
zz	Functional configuration › 00-99: GPU + XMC functionality

Ordering Configurations

A summary of popular ordering configurations are shown below. For other models or configurations, consult Curtiss-Wright for availability.

TABLE 3	Popular configurations	
PART NUMBER	AVAILABLE OPTIONS AND DESCRIPTION	
	DRIVER	RUGGEDIZATION
VPX3-716-A000001	CoreAVI	Air-cooled Level 0
VPX3-716-A001001	AMD Catalyst/Radeon	
VPX3-716-C200001	CoreAVI	Conduction-cooled 200
VPX3-716-C201001	AMD Catalyst/Radeon	

TABLE 4	Accessories
PART NUMBER	DESCRIPTION
RTM3-716-000	Rear Transition Module for VPX3-716

TABLE 5	Software
PART NUMBER	**DESCRIPTION**
DSW-DEV-716-0000	OpenGL 1.3, VxWorks 6.9, x86 (1257)
DSW-DEV-716-0001	OpenGL 1.3, VxWorks 6.9, P4080 (131)
DSW-DEV-716-0002	OpenGL 1.3, VxWorks 6.9, T2080 (133)
DSW-DEV-716-0100	OpenGL ES 2.0, VxWorks 7, T2080 (133)
DSW-DEV-716-0202	OpenGL SC 1.0, VxWorks 6.9, T2080 (133)
DSW-DEV-716-0300	OpenGL SC 2.0, VxWorks 7, x86 (1258)
DSW-DEV-716-1200	OpenGL SC 1.0, VxWorks 653, T2080 (133)
DSW-DEV-716-2000	OpenGL 1.3, Integrity 11, P4080 (131)
DSW-DEV-716-2200	OpenGL SC 1.0, Integrity 11, T2080 (133)
DSW-DEV-716-6200	OpenGL SC 1.0, Linux, T2080 (133)