Components for AMD's Embedded Radeon™ E8860 GPU

INTRODUCTION

The E8860 Embedded Radeon GPU available from CoreAVI is comprised of temperature screened GPUs, safety certifiable OpenGL®-based drivers, and safety certifiable GPU tools which have been pre-integrated and validated together to significantly de-risk the challenges typically faced when integrating hardware and software components. The platform is an off-the-shelf foundation upon which safety certifiable applications can be built with confidence.
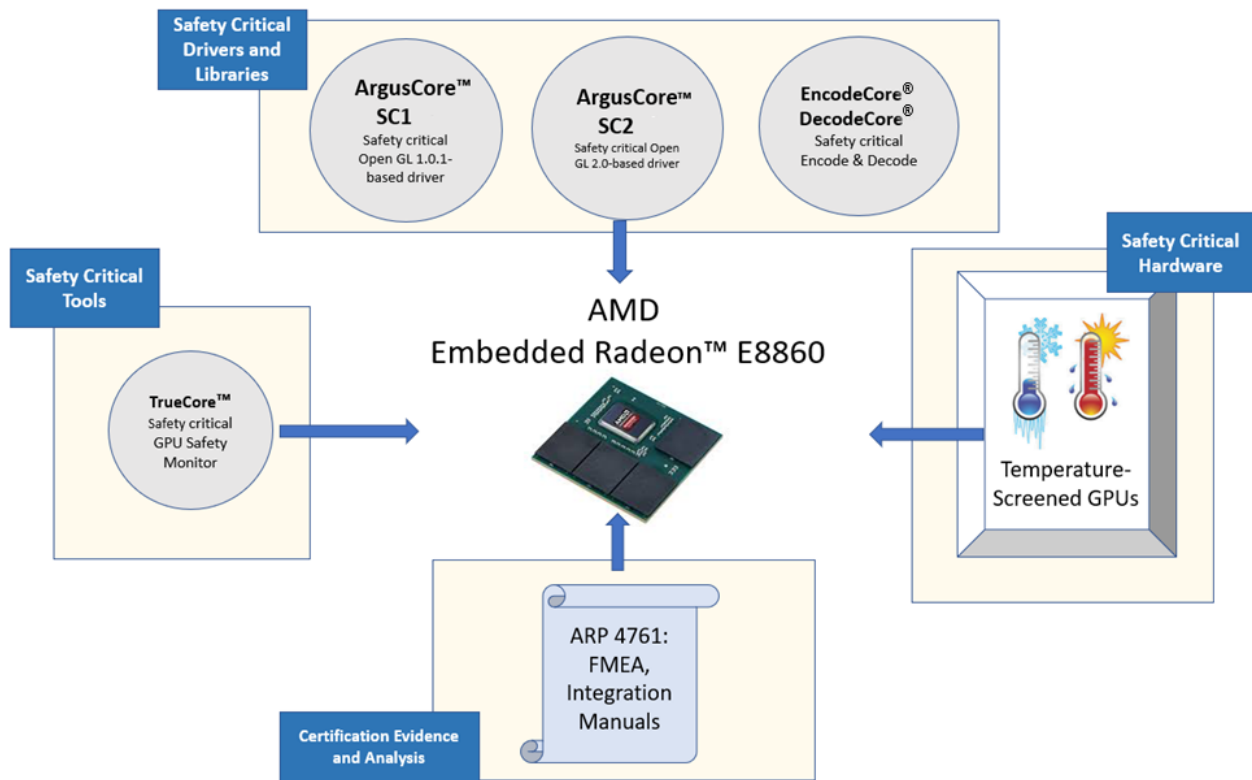

Figure 1: CoreAVI Support for E8860 GPU

EXTENDED TEMPERATURE RANGE

CoreAVI provides extended temperature versions of the E8860 GPU to facilitate its use in rugged embedded applications. CoreAVI functionally tests the E8860 over -40C Tj to +85 Tj, increasing the manufacturing yield for hardware suppliers while reducing supply delays to end customers.

E8860 GPU LONG TERM SUPPLY AND SUPPORT

CoreAVI has provided consistent and dedicated support for the supply and use of the AMD embedded GPUs within the rugged Mil/Aero/Avionics market segment for over a decade. With the E8860, CoreAVI will continue that focused support to ensure that the software, hardware and long-life support are provided to meet the needs of customers' system life cycles.

CoreAVI has extensive environmentally controlled storage facilities which are used to store the GPUs supplied to the Mil/Aero/Avionics marketplace, ensuring that a ready supply is available for the duration of any program.

CoreAVI also provides the post Last Time Buy storage of GPUs and is often able to provide additional quantities of components when COTS hardware partners receive increased volume for existing products / systems requiring additional inventory.

ARGUSCORE™ SC OPENGL SC EMBEDDED GRAPHICS DRIVERS

The E8860 is supported by ArgusCore SC, a suite of real time OpenGL SC 1.0.1 and OpenGL SC 2.0 scalable graphics drivers that are designed to enable the best performance capabilities of the E8860 and achieve the highest levels of safety critical certifications, including FAA DO-178C / EASA ED-12C Level A. The ArgusCore SC family of products are industry proven solutions that are currently deployed in civil, commercial and defense aircraft display systems worldwide. Today, the products are being deployed by avionics manufacturers into a wide range of avionics display systems, such as primary flight displays, multifunctional mission computers, UAV ground control stations, and synthetic vision enhancement systems.

CoreAVI's ArgusCore SC1 drivers are a superset of Khronos' OpenGL SC 1.0.1 API specification (OpenGL for safety critical applications). The OpenGL SC 1.0.1 graphics drivers are implemented to support a fixed function graphics rendering pipeline and are used extensively in certified avionics display systems utilizing fixed function safety critical graphics applications. CoreAVI's ArgusCore SC2 drivers are a superset of Khronos' OpenGL SC 2.0 API specification. The OpenGL SC 2.0 graphics libraries support a programmable graphics rendering pipeline. The drivers allow safety critical applications to take greater advantage of the performance gains provided by the E8860 shader engines while still maintaining the ability to achieve the highest levels of safety certification. ArgusCore SC2 enables users to deploy modern GPU shader programs in safety certifiable environments. For more information, please see our ArgusCore SC1 and ArgusCore SC2 datasheets.

CoreAVI's complete FAA DO-178C and EASA ED-12C Level A certification data packages support the use of ArgusCore SC graphics drivers in any FAA DO-178C / EASA ED-12C avionics safety certification.

ENCODECORE® VIDEO ENCODER

CoreAVI's EncodeCore is a real time and safety critical H.264 video encode driver that enables the hardware video encoder that is built-in to the E8860. The driver architecture and API ensure high efficiency and low latency between a frame buffer and the video encode hardware to capture the graphics output being sent to a frame buffer. The resulting compressed video is made available on the host SBC as raw H.264 data. The raw encoded data can then be packaged by the application into a desired format that can be transmitted, recorded and played back on video players supporting the packaged format.

DECODECORE® VIDEO DECODER

CoreAVI's DecodeCore is a real time and safety critical H.264 video decode driver that enables the hardware video decoder that is built-in to the E8860. The driver architecture and API ensure high efficiency and low latency between the video decode hardware and the graphics hardware. The de-compressed video is made available as a texture, enabling complex hardware accelerated image manipulation and integration with 2D or 3D graphics.

TRUECORE™

TrueCore is a GPU safety monitor library designed to interoperate with CoreAVI GPU drivers.

TrueCore uses a patented approach to provide a suite of highly engineered Initiated Built-In-Tests (IBIT). These provide test coverage of the intended function of the GPU's graphics rendering pipeline (graphics command to framebuffer memory). Through the use of several tests, each with a unique test pattern that is verified independently by the CPU, applications are provided with flexibility in optimizing test execution and result filtering that may not be present with FPGA-based approaches. In testing the graphics rendering pipeline, TrueCore is testing one or more instances of each functional IP block, thereby providing test coverage for design errors, common-mode failures, and incorrect function caused by unused and undocumented functions.

CERTIFICATION SUPPORT

CoreAVI provides support for DO-254/APR-4761 processes with a CoreAVI developed Failure Modes & Effects Analysis (FMEA) which is used to determine BIT routines required for fault detection coverage.

VBIOS SUPPORT

CoreAVI GPU and graphics driver customers work directly with CoreAVI to obtain a new VBIOS image. With this process, CoreAVI provides its customers with a VBIOS service that best meets their needs and expectations, eliminates reliance on AMD and significantly reduces the complexity of obtaining a new VBIOS. In addition, customers will benefit from a rapid turnaround for urgently needed VBIOS versions, will be able to use their existing points of contact at CoreAVI, will receive support for product development phases, as well as for their VBIOS for the full term of their extended lifecycle support program.

E8860 GPU

Features and Benefits

- Compact, power efficient GPU module from AMD's Embedded Radeon series of GPUs
  - Up to six independent display controller outputs
  - 2 GB of dedicated memory
  - 640 shader processing units providing:
    - 760 GFLOPS floating point performance (single-precision, peak)
    - Pixel fillrate of 10 Gpixels/second and Texel fillrate of 25 Gtexels/second
  - Supported display interfaces:
    - Analog RGB (1) – triple 10-bit DAC, 400 MHz
    - DisplayPort 1.2 (5)
    - HDMI™ 1.4a (1)
    - DVI single-link (4)/dual-link (2)
    - LVDS single-link (1)/dual-link (1)
- Available with extended temperature screening to meet the needs of rugged embedded systems
- Supported with CoreAVI's ArgusCore SC1 and ArgusCore SC2 OpenGL-based graphics drivers
- Supported with CoreAVI's EncodeCore and DecodeCore drivers
- Data to support DO-254/ARP-4761 processes:
  - GPU functional block level (gray box) Failure Modes and Effects Analysis (FMEA)
  - User Integration Manual (Safety Manual)
- TrueCore GPU safety monitor
- VBIOS image services

The AMD Embedded Radeon E8860 is a high performance graphics processor from AMD that is targeted towards the embedded market space and the rugged Mil/Aero/Avionics market.

Similar to the existing E4690 GPU, the E8860 is a 37.5mm x 37.5 mm multi-chip module (MCM) comprised of the GPU with integrated graphics memory on a single substrate. The embedded memory makes it a very compact, power efficient solution ideal for embedded applications and for use on space constrained modules.

Supporting thermal design power of 37 watts, the AMD Radeon E8860 GPU provides an optimal performance-per watt profile for embedded applications that require outstanding multi-display experiences and superior visual quality but have exacting power efficiency and heat dissipation requirements. Low thermals help enable superior system cooling flexibility that helps developers conserve valuable board space and increase system ruggedization for harsh environments.

With an integrated 2 GB of dedicated graphics memory and support for up to eight simultaneous displays, the E8860 graphics module can drive multiple displays with powerful applications.

The E8860 is an ideal replacement for any system currently using the E4690. Table 1 provides a comparison between the E4690 and E8860 GPU solutions.

FEATURE	AMD E4690	AMD E8860
Chip Process	55nm	28nm
Package Size	35mm x 35mm	37.5mm x 37.5mm
Bus Interface	PCIe 16x Gen2	PCIe 16x Gen3
Bus Bandwidth	8 GB/sec (full duplex)	16 GB/sec (full duplex)
Video Memory	128-bit GDDR3	128-bit GDDR5
	512MB	2GB
Max GPU Clock Speed (MHz)	600	625
Max Memory Clock Speed (MHz)	700	1,125
Video Memory Bandwidth (GB/sec)	22.4	72.2
Pixel Fillrate (Gpixels/sec)	4.8	10
Texel Fillrate (Gtexels/sec)	19.2	25
Floating Point Performance (GFLOPS)	384	760
Display Controllers	2	6
Video Decode	H.264	H.264
Video Compression Encoder	--	H.264
TDP (W)	30	37
Last Time Buy(1)	2014	2020

Table 1: GPU Comparison Chart

(1) Based on AMD lifecycle dates. CoreAVI offers a long term supply program to extend the availability of our supported GPUs past the Last Time Buy date set by the manufacturer. Please contact CoreAVI for more details.

DEDICATED GRAPHICS MEMORY

The E8860 graphics module includes 2 GB of dedicated 128-bit wide GDDR5 SDRAM accessible from the PCIe interface through a 256 MB aperture, simplifying the mapping of one or more modules into an SBC PCI address space. The size of the aperture may be changed through a VBIOS configuration.

The dedicated graphics memory is used by the GPU and graphics driver libraries to store OpenGL images, buffers, descriptors, shaders and textures including application data such as moving map data or decoded video streams.

MEMORY MANAGEMENT UNIT (MMU)

CoreAVI's drivers utilize the E8860's Memory Management Unit hardware protection mechanism to protect the memory space of each application, in a similar manner to how this is performed on CPUs.

E8860 PCIE INTERFACE

Lane Width

The E8860 GPU supports the following PCIe interface lane widths:

- x1
- x2
- x4
- x8
- X16

Should the very high bandwidth provided by 16 lanes of PCIe Gen 3 not be required, by reducing the lane utilization, power savings can be achieved.

PCIe Interface Speed

The E8860 GPU supports the following PCIe interface speeds:

- PCIe Gen 1 – 2.5 GT/s
- PCIe Gen 2 – 5.0 GT/s
- PCIe Gen 3 – 8.0 GT/s

VIDEO ENCODER

The dedicated Video Codec Engine (VCE) hardware provides the following video encoding features:

- H.264 encoding is based on the ISO/IEC 14496-10 specification.
  - Up to Main Profile @ level 4.1 I & P-frame (no B-frame) encode.

VIDEO DECODER

The dedicated Unified Video Decoder hardware (UVD) provides the following video decoding features:

- H.264 decoding based on the ISO/IEC 14496-10 specification.
  - Up to HP@L4.1 decoding with a maximum bit rate of 40 Mbps.

APPLICABILITY

This datasheet is applicable to the following part numbers for:

ORDER PART NUMBER	GPU IDENTIFICATION	DESCRIPTION	NOTES
100-CK4762E	216-0846079	Temperature screened Radeon E8860 w/ CoreAVI device ID	Replaced by 100-CK5157E
100-CK5157E	216-0846107	Temperature screened Radeon E8860 w/ CoreAVI device ID	
100-CK4762	216-0846079	Non-screened Radeon E8860 w/ CoreAVI device ID	Replaced by 100-CK5157
100-CK5157	216-0846107	Non-screened Radeon E8860 w/ CoreAVI device ID	

For more information on CoreAVI's support for the E8860 GPU, contact Sales@CoreAVI.com.