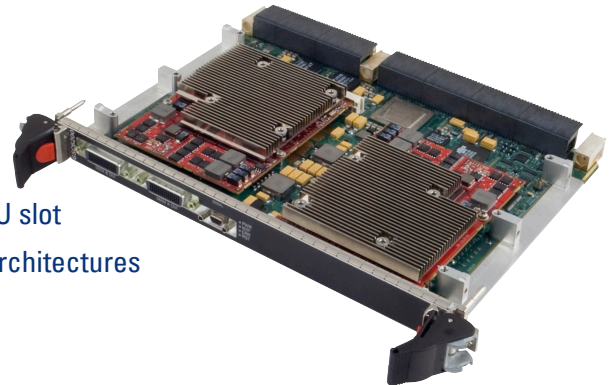


# Ensemble 6000 Series 6U OpenVPX GSC6200 GPU Processing Module

## Embedded Smart Processing of Unrelenting Streams of Data in Rugged OpenVPX

- 6U OpenVPX™-compliant VITA 65/46/48 (VPX-REDI) module
- Supports up to 2 high-end nVIDIA® or ATI® GPU compute nodes per 6U slot
- MxM form factor preserves rapid technical insertion of latest GPU architectures
- Advanced power management capabilities
- Conduction-cooled and air-cooled versions



The Ensemble™ 6000 Series 6U OpenVPX™ GSC6200 GPU Processing Module from Mercury Computer Systems harnesses the tremendous processing power of commercial graphics processing units (GPUs) for rugged, high-performance, embedded signal and image processing in a broad range of defense and commercial applications.

### Mercury MxM Module Advantage – Easily Upgradeable to the Latest GPUs

Upgrading to the most recent GPUs as new versions become available would generally require a complete board respin, but Mercury’s unique industry-first MxM advantage enables customers to upgrade when new, faster, general-purpose graphics processing units (GPGPUs) are available. Adherence to the MxM specification ensures easy upgradeability for technology updates.

The GSC6200 module is a dual-site MxM carrier module that can be populated with either one or two MxM modules. The MxMs on the GSC6200 can support either ATI or nVIDIA GPUs. Each MxM module supports two single-link DVI interfaces from each MxM site to the front panel and the backplane for carrying uncompressed digital video data. The MxMs communicate with the backplane of the GSC6200 module through a 48-lane, 12-port PCI Express® Gen2 switch.

### Embedded Smart Processing

The new generation of defense platforms for C4ISR, EO/IR, and SatComm applications is more sophisticated, and the operations are more demanding, requiring the most powerful embedded size, weight, and power (SWaP)-optimized solutions to support critical missions. One of the toughest challenges is to improve the war-

fighter’s situational awareness through speedy and precise delivery of actionable information by improved processing, exploitation, and dissemination (PED) capabilities.

Mercury Embedded Smart Processing (ESP) subsystems are uniquely designed to provide the crucial PED capabilities, enabling sensors to be “smarter,” able to accept unrelenting streams of data, and extract and deliver situational awareness and other crucial information to war-fighters, empowering them to decide and react.

Due to its parallel stream computing capabilities, the GSC6200 is a foundational processing module to support Mercury’s Embedded Smart Processing approach.

### Stream Computing on GPUs

Historically, GPUs have been viewed as compelling, programmable floating-point graphics-rendering engines designed specifically for personal computers, workstations, and gaming consoles. However, the availability of embedded GPU solutions suitable to the stringent requirements of high-performance signal processing has been scarce.

With recent architectural advancements, the algorithmic scope of GPUs has grown dramatically. Non-video applications, such as intelligence, surveillance, reconnaissance, signals intelligence, and electronic warfare, can now be addressed by GPU technology with excellent results. GPUs excel at traditional signal processing algorithms like the fast Fourier transform (FFT). Industry performance benchmarks on implementing GPUs in high-performance signal processing applications have shown that GPUs can obtain 22x performance improvement and more over other processors.

## Enhanced Power Management Capabilities Support SWAP Metrics

Real-time imaging systems in deployed environments, such as persistent surveillance, on-board exploitation, and electronic warfare applications, require minimal power dissipation to meet deployed performance requirements. The GSC6200 module offers software-controlled power management features that allow the user to tune the clock speed of the GPU, so that power can be conserved during periods of inactivity, while maximum throughput is available at times of high activity.

## VPX-REDI

The VPX (VITA 46) standard defines 6U and 3U board formats with a modern high-performance connector set capable of supporting today's high-speed fabric interfaces. VPX is most attractive when paired with the Ruggedized Enhanced Design Implementation standard – REDI (VITA 48). The GSC6200 module is implemented as a 6U conduction-cooled implementation of VPX-REDI, with air-cooled variants in the same VPX form factor available for less rugged environments.

Targeted primarily for harsh-environment embedded applications, VPX-REDI offers extended mechanical configurations supporting higher functional density, such as two-level maintenance (2LM). 2LM allows relatively unskilled maintenance personnel to replace a failed module and restore the system to an operational state in a limited time period, minimizing potential damage to the module.

## Software Environments

Two types of software environments exist for the GSC6200 module:

- nVIDIA-based GPUs: the software environment consists of CUDA, a parallel computing architecture that is accessible to software developers through industry-standard programming languages, and Mercury's Scientific Algorithm Library (SAL), a high-throughput, low-latency signal processing library containing efficient algorithms with the fewest possible instructions and computing resources.
- ATI-based GPUs: the software environment consists of CAL, a complete abstraction layer interface that does not require the user to learn graphics-oriented languages or video and multi-media details to program the GPU.

Mercury's software support for GPUs is evolving. Contact Mercury for additional information about other software programming and imaging application tool kit offerings for the GSC6200.

## Open Standards Mean Interoperability and Planning for the Future

The OpenVPX Industry Working Group is an industry initiative launched by defense prime contractors and COTS system developers, to take a proactive approach to solving the interoperability issues associated with the VITA 46 (VPX) family of specifications. This group has created an overarching System Specification defining VPX system architecture through pin-out definitions to establish a limited set of application-specific reference solutions. These OpenVPX standard solutions provide clear design guidance to COTS suppliers and the user community, assuring interoperability across multi-vendor implementations. The OpenVPX System Specifications were ratified by the VSO in February 2010.

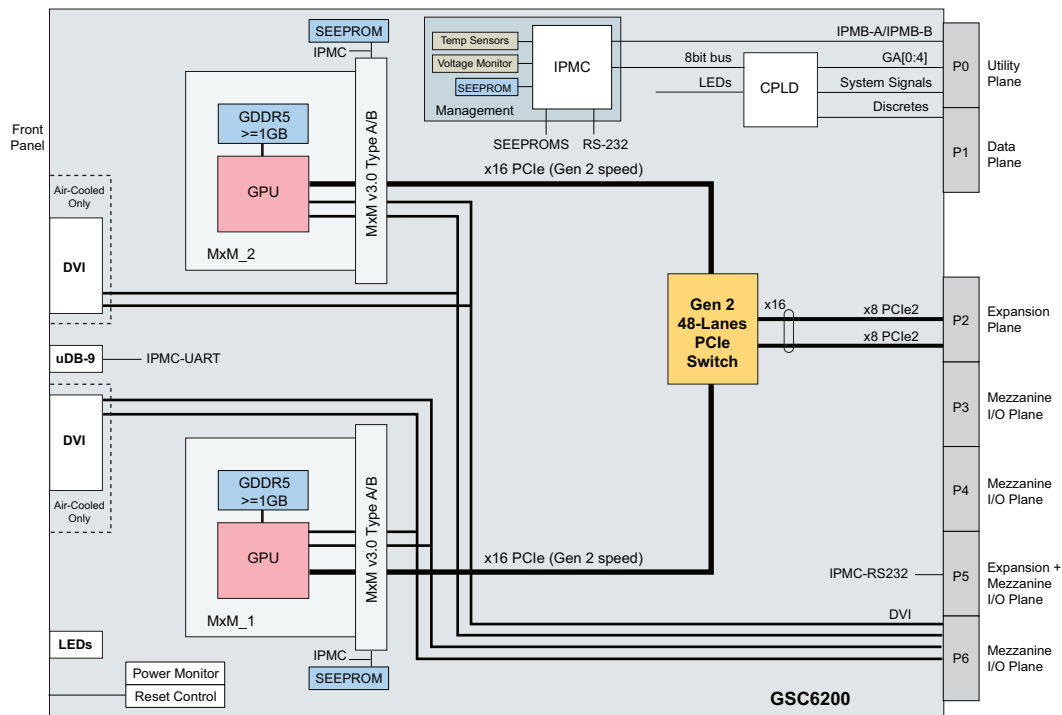


Figure 1. GSC6200 Module functional block diagram

## Specifications

### PCIe Switch

- x16 PCIe connection to each MXM site
- x16 PCIe connection to the backplane
  - Configurable as a single x16 upstream port
  - Configurable as a single x8 upstream port and a single x8 downstream port

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### MXMs

- MXM revision 3.0 compliant
- Support for Type A and Type B MXM modules
- Two single-link DVI display interfaces per site
  - Configurable per interface for front panel or backplane connector connectivity
- One x16 PCIe connection per site

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### GPUs Supported

- nVIDIA GeForce GTS280M
  - 562 GFLOPS
  - 7 GFLOPS per watt (1.1 CC compliant)
- ATI Radeon 4870M
  - 880 GFLOPS
  - 18 GFLOPS per watt

Note: More current GPU MxMs may be released from nVIDIA and ATI.  
Contact Mercury Sales for updates to the supported GPU processors.

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### IPMI (System Management)

- Renasas® HD64F2166 IPMI Controller
- Voltage monitor
- Geographical address monitor
- Temperature monitor
- Power/reset control
- FRU and on-board MxM EEPROM interfaces
- CPLD interfaces

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### OpenVPX Connector

- IPMB-A and IPMB-B link management plane
- Dual x16 PCIe Gen2 speed expansion plane

## Mechanical

- 6U VPX
- 1.0" slot width pitch
- OpenVPX and VPX REDI

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## Environmental

### Air-Cooled

- Temperature
  - Operating 0°C to 55°C\*
  - Storage -55°C to +85°C
  - \*Customer must maintain required cfm level.
- Humidity
  - Operating 5-95%, non-condensing
- Vibration 0.04 g<sup>2</sup>/Hz, based on 20-2000 Hz, 1 hr/axis
- Shock 50g, z-axis; 80g, x-, y-axes; 11 ms half-sine
- Altitude
  - Operating 0-30,000 ft\*
  - \*Customer must maintain required cfm level.

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### Conduction-Cooled

- Temperature
  - Operating 0°C to 71°C at the card edge\*
  - Storage -55°C to +100°C
  - \*Customer chassis must maintain card edge at 71°C.
- Humidity
  - Operating 0-100%
- Vibration 0.1 g<sup>2</sup>/Hz, based on 5-2000 Hz, 1 hr/axis
- Shock 50g, z-axis; 80g, x-, y-axes; 11 ms half-sine
- Altitude
  - Operating 0-70,000 ft

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## Compliance

- OpenVPX System Specification encompasses
  - VITA 46.0, 46.3, 46.4, 46.6, 46.11
- Compatible with VITA 65
- VITA 46/48.1/48.2 (REDI)
- PCI Express

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