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Find the *Mercury Computer Systems SFM6101* at our website: ***Click HERE***

DATASHEET

Ensemble 6000 Series OpenVPX SFM6101 Module

Next-Generation Switching, System Management and Front Panel I/O in a Single Slot



- **High-bandwidth, next-generation, serial RapidIO® switching with up to 5.0 Gbaud serial RapidIO data rates**
- **On-board Layer 2–managed Ethernet switching and front-panel Gigabit Ethernet ports**
- **Intelligent OpenVPX™ system management capabilities from a single point**
- **Built-in accordance with OpenVPX design principles**
- **Air-cooled and conduction-cooled variants available**
- **Identical software infrastructure across Mercury products**

The Ensemble™ 6000 Series OpenVPX SFM6101 Next Generation Switch Fabric Module from Mercury Computer Systems is a VITA 46/48 switch board that provides full inter-board Gen2 serial RapidIO and Gigabit Ethernet connections in an OpenVPX system. Built to comply with the VITA 65 OpenVPX specification, the SFM6101 delivers data plane switching, control plane switching and chassis management. in a single OpenVPX slot. The module has five 12-port Gen2 serial RapidIO crossbars in a two-level hierarchy, providing full connectivity for up to 18 OpenVPX payload modules at up to 2 GB/s per link in both directions simultaneously.

The SFM6101 module provides Gigabit Ethernet switching for up to 18 VPX payload slots via the on-board Broadcom BCM56312 Level 2 managed switch. Up to two front-panel Gigabit Ethernet ports are available, allowing external Ethernet traffic access to the backplane Ethernet links. Two 10 Gigabit Ethernet interfaces to the control plane are also available to the front panel, allowing high-bandwidth data streams to access the control plane. The SFM6101 module also implements OpenVPX chassis management capabilities, allowing the switch module to intelligently manage the entire system from a single point.

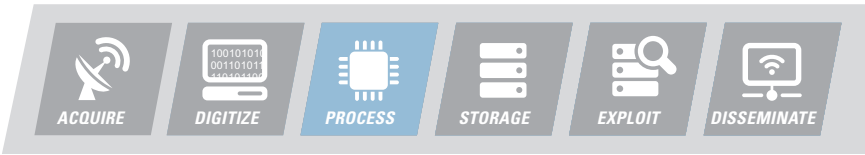
Full-Featured Switch Fabric Technology

The SFM6101 module utilizes five IDT CPS-1848™ Gen2 serial RapidIO crossbars to create a dual-star switching hierarchy among the payload slots per the VITA 65 OpenVPX specification. All crossbars provide a full-duplex 4x link on each of their 12 ports. The crossbars can be configured to operate at 5.0 Gbaud for enhanced serial RapidIO bandwidth under the second generation Serial RapidIO protocol, or 3.125 Gbaud for backward compatibility. The SFM6101 module implements inter-switch serial RapidIO links for switch-to-switch communication.

A single SFM6101 module provides full connectivity for up to 18 payload modules in an OpenVPX chassis. A second SFM6101 module can be configured as an additional full-duplex connection for payload modules, supporting applications with increased bandwidth requirements. Smaller configurations can create high-bandwidth interfaces by routing all four standard OpenVPX data plane ports from a payload slot to a single SFM6101 switch module.

A variant of the SFM6101 is also available; it routes twenty 1000BASE-BX Gigabit Ethernet interfaces to the backplane at the expense of one data plane port.

Mercury Systems is a best-of-breed provider of commercially developed, open sensor and Big Data processing systems, software and services for critical commercial, defense and intelligence applications.



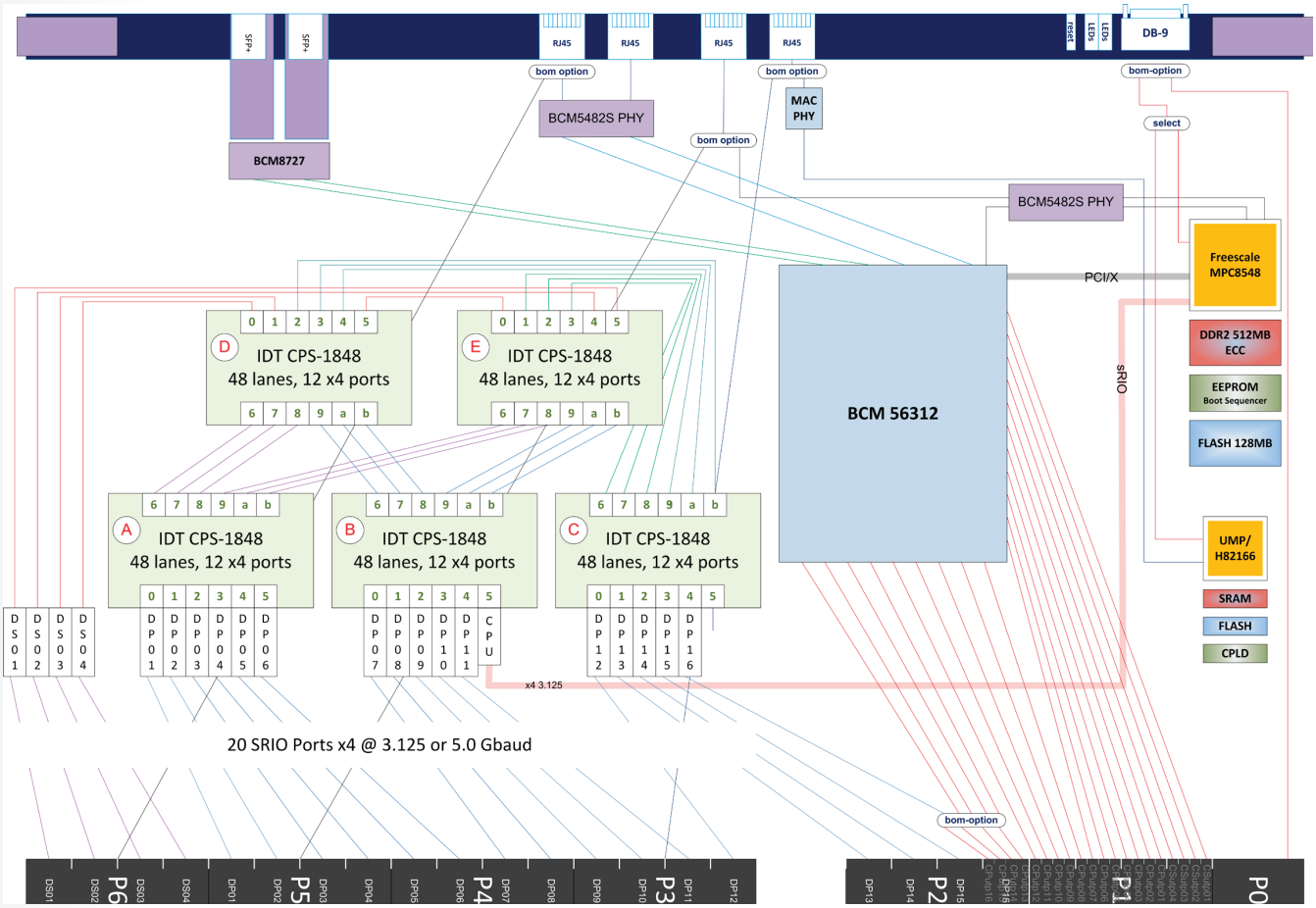


***Figure 1**. Ensemble 6000 Series OpenVPX SFM6101 Module functional block diagram*

Systemwide Gigabit Ethernet Switching

The SFM6101 module provides control plane Gigabit Ethernet switching in addition to RapidIO switching. The SFM6101 module implements the Broadcom BCM56312 switch to provide Gigabit Ethernet connectivity over the backplane to each payload module. System designers can avoid the need for an external Gigabit Ethernet switch and cabling in their configurations. The SFM6101 module embeds this functionality within the OpenVPX system. This design leverages the design of the SFM6100 module, Mercury's Gen1 Serial RapidIO switch module.

With the assistance of the SFM6101 module's on-board service processor, the switch can be configured as a Layer 2 managed switch, enabling features such as link aggregation, multicast support via IGMP, Rapid Spanning Tree Protocol (RSTP) support, and support for Jumbo packets. The SFM6101 module enhances interoperability by providing an inter-switch Gigabit Ethernet connection. As a result, the SFM6101 module can communicate seamlessly via standard TCP/IP to either another SFM6101 module or to another switch module with a similar Ethernet connection.

Ethernet Interfaces

The SFM6101 module provides three Gigabit Ethernet ports to the front panel (air-cooled variants only). Two ports are routed to the Ethernet switch (only one routed to the backplane in conduction-cooled configurations), with the third port providing an interface to the on-board support processor. This allows users to direct TCP/IP traffic directly into the on-board Gigabit Ethernet switch for dispersal among the payload modules. It also enables easy integration of the OpenVPX system into the network backbone of the deployed platform.

Additionally, two 10 Gigabit Ethernet interfaces to the on-board Ethernet switch are provided in air-cooled configurations. These high-bandwidth interfaces enable the aggregation of control plane data from multiple payload modules to stream to the next stage in the signal processing chain.

System Management Capabilities

An on-board system management block allows the SFM6101 module to manage the entire OpenVPX system. The on-board shelf manager can query sensor values across the system, reset and power up/down modules, set sensor thresholds, and manage firmware updates. Remote network access to the management subsystem is provided via a front-panel (air-cooled only) or backplane 10/100BASE-T port.

Flexible, Modular System Configurations

OpenVPX systems from Mercury are designed to the system level, with a rich set of fully integrated modules that can be flexibly scaled and combined in a variety of configurations to meet a broad range of embedded application requirements. Many board types are available for end-to-end solutions, including a variety of digital receiver solutions, single-board computers and signal processing modules. In particular, POET-enabled Intel® modules from Mercury, such as the LDS6520, HDS6600 and LDS6521, can support Gen2 serial RapidIO and the SFM6101 by simply upgrading their POET interface with the appropriate image.

A fully loaded VPX system that balances processing power with flexible I/O capabilities could consist of 18 payload modules and two SFM6101 modules, although not all chassis can support this maximum configuration. This configuration could include elements intended to acquire, digitize, process, exploit or disseminate data via the Gen2 Serial RapidIO data plane, and could instantiate FPGA, CPU, GPU or ADC/DAC technology. With up to 90 GB/s of both aggregate and bisection bandwidth via the RapidIO switch fabric, the SFM6101 is designed to solve the most challenging data movement problems. The equivalence of the aggregate bandwidth and bisection bandwidth figures indicates that locality of processing within the system is not a factor when mapping an algorithm to the multicomputer. In essence, the processing resources are position independent.

SFM6101 modules are available in both air-cooled (at various levels of ruggedization) and conduction-cooled variants.

VPX-REDI

The VPX (VITA 46) standard defines 6U and 3U board formats with a modern high-performance connector set that is capable of supporting today's high-speed fabric interfaces, such as Gen2 RapidIO. VPX is most attractive when paired with the Ruggedized Enhanced Design Implementation standard – REDI (VITA 48). The SFM6101 module is implemented as a 6U conduction-cooled implementation of VPX-REDI, with air-cooled variants in the same OpenVPX 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.

Specifications

OpenVPX Slot Profiles

Build option to support SLT6-SWH-16U-20F-10.4.2

Default: SLT6-SWH-20U-19F-10.4.1

OpenVPX Module Profiles

When configured for slot profile SLT6-SWH-16U-20F-10.4.2, the SFM6101 supports module profiles MOD6-SWH-16U 20F-12.4.2-6, and -8.

When configured for slot profile SLT6-SWH-20U-19F-10.4.1, the SFM6101 supports module profiles MOD6-SWH-20U19F-12.4.1-6, and -8.

Module

Supports up to 18 OpenVPX payload modules

Data plane (per VITA 65)

- 18 4x serial RapidIO links at 5.0 or 3.125 Gbaud to payload slots
- 1 or 2 inter-switch serial RapidIO links
- Supports Serial RapidIO versions 1.3, 2.0 or 2.1

Control plane

- 16 Gigabit Ethernet links to control plane (increased to 20 links in configurations with 19 data plane interfaces).

Management plane

- I2C bus between all switch and payload slots

Front panel I/O via two 10 Gigabit Ethernet and two Gigabit Ethernet ports

- Single Gigabit Ethernet port only routed to backplane on conduction-cooled assemblies

Dual-sided PCB assembly

Designed for installation in VITA 46 and VITA 65 OpenVPX compliant chassis

Dimensions

Standard 6U OpenVPX	1.0" pitch
Double-height 6U form factor	
160 mm x 233.3 mm	

Power Requirements

Input voltage	12V from backplane

Environmental

		Air-cooled			Conduction-cooled
		Commercial (L0)	Rugged (L1)	Air Flow-By (Rugged L4)	Rugged (L3)
Ruggedness		•	••	•••	•••
Moisture/dust protection		•	••	•••	•••
Typical cooling performance		~170W*	~150W*	~250W*	~150W**
Temperature	Operating*	-0°C to +40°C	-25°C to +55°C	-40°C to +55°C	-40°C to +71°C
	Storage	-40°C to +85°C	-55°C to +85°C	-55°C to +125°C	-55°C to +125°C
Operating temperatures rate of change		N/A	5°C/min	10°C/min	10°C/min
Humidity	Operating*	10-90%, non-condensing	5-95%, non-condensing	5-95%, non-condensing 100% condensing	5-95%, non-condensing 100% condensing
	Storage	10-90%, non-condensing	5-95%, non-condensing	5-95%, non-condensing 100% condensing	5-95%, non-condensing 100% condensing
Altitude	Operating*	0-10,000ft	0-30,000ft	0-30,000ft	0-70,000ft
	Storage	0-30,000ft	0-50,000ft	0-100,000ft	0-100,000ft
Vibration	Random	0.003 g^2/Hz; 20-2000 Hz, 1 hr/axis	0.04 g^2/Hz; 20-2000 Hz, 1 hr/axis	0.10 g^2/Hz; 5-2000 Hz, 1 hr/axis	0.1 g^2/Hz; 5-2000 Hz, 1 hr/axis
	Sine	N/A	N/A	10G peak; 5-2000 Hz, 1 hr/axis	10G peak; 5-2000 Hz, 1 hr/axis
	Shock	z-axis: 20g; x and y-axes: 32g; (11ms 1/2-sine pulse, 3 postive, 3 negative)	z-axis: 50g; x and y-axes: 80g; (11ms 1/2-sine pulse, 3 postive, 3 negative)	z-axis: 50g; x and y-axes: 80g; (11ms 1/2-sine pulse, 3 postive, 3 negative)	z-axis: 50g; x and y-axes: 80g; (11ms 1/2-sine pulse, 3 postive, 3 negative)
Salt/Fog		N/A	Contact Factory	Designed to 10% NaCl	Designed to 10% NaCl

* Customer must maintain required cfm level

** Card edge should be maintained below 71°C

All products manufactured by Mercury meet elements of the following specifications: All products manufactured by Mercury meet elements of the following specifications: MIL-Q-9858A, MIL-E-5400T, MIL-STD-454M, MIL-STD-45662A, MIL-STD-275E, MIL-STD-883C, MIL-HDBK-217F, MIL-STD-2036 and MIL-I-46058C, and various IPC standards. Mercury's inspection system has been certified in accordance with MIL-I-45208A.

Environmental specifications are as installed on Mercury 6U host/carrier modules.

As altitude increases, air density decreases and, therefore, the cooling effect of a particular number of CFM decreases. Different limits can be achieved by trading among temperature, altitude, frequency and airflow.

Ensemble®

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Corporate Headquarters
50 Minuteman Road • Andover, MA 01810 USA
(978) 967-1401 • (866) 627-6951 • Fax (978) 256-3599

Europe Mercury Systems, LTD
Unit 1 - Easter Park, Benyon Road, Silchester, Reading
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+ 44 0 1189 702050 • Fax + 44 0 1189 702321

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