

EnsembleSeries™ SFM6104

6U OpenVPX 40 Gb/s Ethernet or InfiniBand switch with system management

- **40 Gigabit Ethernet or InfiniBand™ switching:**
 - Ethernet ecosystem; 40GBASE-KR4 and 10GBASE-KX4
 - Or InfiniBand ecosystem; FDR-10, QDR, DDR and SDR
- Switching for up to 18 payloads
- Single point OpenVPX chassis management
- Optional MOTs+ rugged packaging for extreme environmental protection
- SOSA compatible profiles

The EnsembleSeries™ SFM6104 switch applies the latest Ethernet and InfiniBand™ bridging technology from Mellanox's 6th generation SwitchX®-2 VPI for bandwidths of up to 40 Gb/s with a theoretical maximum duplex bandwidth of 2Tb/s. This 6U OpenVPX switch is designed to VITA 65 (OpenVPX), provides comprehensive layer-2 switching and system management for up to 18 OpenVPX payload slots.

Optional MOTs+

The EnsembleSeries SFM6104 family of switch fabric modules have options for modified off the shelf plus (MOTS+) packaging for extreme durability. MOTs+ configurations leverage enhanced commercial components, board fabrication rules, and subsystem design techniques for extra ruggedness and withstand extreme temperature cycles better than other rugged designs. Please contact Mercury directly for MOTs+ configurations.

SOSA profiles

EnsembleSeries SFM6104 switches are optionally available in Sensor Open Systems Architecture (SOSA) compatible configurations.

Data Plane Switching

- Standard open architecture switching for net-centric processing and control applications with:
 - Ethernet (10GBASE-KX4, 40GBASE-KR4)
 - or InfiniBand (FDR-10, QDR, or DDR)
- Up to 18 OpenVPX payload slots in a single chassis

Control Plane Switching

The EnsembleSeries SFM6104 supports an Ethernet (1000BASE-KX) control plane that removes the need for an external control plane based on cabling.

Fabric Management

The control and data plane ports are managed by the fabric management software. The software accesses the management command line interface (MCLI) and management information base (MIB). The following features are supported by fabric management:

- SNMP MIB Support
- Inbound and outbound telnet
- Inbound and outbound SSH, with passwords
- FTP client
- SCP client
- ASCII editable configuration file
- Industry standard CLI – mcli
- Event log (syslog)
- Serial console
- ping
- trace route
- IF MIB
- Entity MIB
- Entity sensor MIB (also accessible from the system manager)

* - 10.4 and 12.4 may change depending upon the version of the OpenVPX standard being referenced

Mercury Systems is a leading commercial provider of secure sensor and safety-critical processing subsystems. Optimized for customer and mission success, Mercury's solutions power a wide variety of critical defense and intelligence programs.



OpenVPX profiles

Profile Names*	Control Plane	Data Plane
SLT6-SWH-20U19F-10.4.1	20 UTP Ports	19 FP Ports
MOD6-SWH-20U19F-12.4.1	20 UTP Ports	19 FP Ports
MOD6-SWH-20U19F-12.4.1-5 (SOSA compatible)	20 UTP Ports	19 FP Ports
MOD6-SWH-16U20F-12.4.2-5 (SOSA compatible)	16 UTP Ports	20 FP Ports
MOD6-SWH-16U20F-12.4.2-10 (SOSA compatible)	16 UTP Ports	20 FP Ports
MOD6-SWH-16U20F-12.4.2	16 UTP Ports	20 FP Ports
SLT6-SWH-16U20F-10.4.2	16 UTP Ports	20 FP Ports

Software/Firmware/Protocols

- Data/control plane link aggregation including LACP, IPv4, and IPv6 based fabric management
- VLAN, spanning tree protocols (including MSTP, RSTP and STP), IGMP snooping, port mirroring, unicast and multicast forwarding with support for jumbo packets (10K)

Front-Panel I/O

- One RJ45 10/100 Ethernet port (system manager)
- One RJ45 10/100/1000 Ethernet port (fabric manager, soft/firmware updates)
- Two RJ45 1000 Ethernet ports (control plane)
- Four QSFP Ethernet ports (control or data planes)

System Management

The EnsembleSeries SFM6104 switch implements the advanced system management functionality architected in the OpenVPX specification to enable remote monitoring, alarm management, and hardware revision and health status.

Using the standard I2C bus and intelligent platform management controller (IPMC) protocol, the on-board system management block implements the IPMC. This allows SFM6104 switches to:

- Read sensor values
- Read and write sensor thresholds, allowing an application to react to thermal, voltage or current variations that exceed those thresholds
- Reset the switch
- Power up/down the switch
- Retrieve field replaceable unit (FRU) information
- Be managed remotely by a chassis management controller at the system level, such as implemented on Mercury's 6U OpenVPX chassis or system management modules

Open Software Environment

Mercury leverages over 35 years of multicomputer software expertise, including recent multicore processor expertise, across its many platforms.

Mercury Sensor Processing Ecosystem

Modern sensor compute subassemblies are customized assemblies of interoperable building blocks built to open standards. Mercury's hardware and software portfolio of building blocks are physically and electrically interoperable as defined by international industrial standards, including VITA's OpenVPX standards. Mercury subsystems are designed from a suite of sophisticated open architecture building blocks that are combined and scaled to meet a broad range of advanced sensor chain processing requirements.

Mercury subsystems may include analog, digital and mixed-signal receiver modules, single-board computers and signal processing payload modules. Payloads may have acquisition, digitization, processing, and exploitation and dissemination elements and include FPGA, CPU, GPU or ADC/DAC technology, and be made up of multiple subsystems developed to multiple standards, including OpenVPX and others such as ATCA, ATX/E-ATX, or VME/VXS.

Module Packaging

VPX-REDI

The VPX (VITA 46) standard defines 6U and 3U board formats with high-performance interconnects capable of supporting today's high-speed fabric interfaces. VPX may be paired with the ruggedized enhanced design implementation standard — REDI (VITA 48). SFM6104 switches, when implemented as conduction-cooled or Air Flow-By™, are VPX-REDI compatible. Air-cooled equivalents conform to the same OpenVPX form-factor and are suitable for less challenging environments. Targeted for harsh embedded environments, VPX-REDI supports higher functional density and two-level maintenance (2LM). 2LM allows maintenance personnel to replace a failed module.

Rugged Air Cooling, Air Flow-By

Air- and conduction-cooled subsystems rely on filtration to remove contaminants from their cooling air streams. Mercury's Air Flow-By technology eliminates filtration with the most elegant cooling solution available within a sealed and rugged package. Fully compliant to the VITA 48.7 standards, Air Flow-By maintains OpenVPX's 1-inch pitch requirement, is highly resilient to liquid and particle contamination, boosts SWaP, reduces operating temperature, extends MTBF by an order of magnitude and enables embedded deployment of the most powerful and reliable processing solutions.

SFM6104 switches are available as air-cooled (various levels of ruggedness), and rugged Air Flow-By, Liquid Flow Through, and conduction-cooled variants.

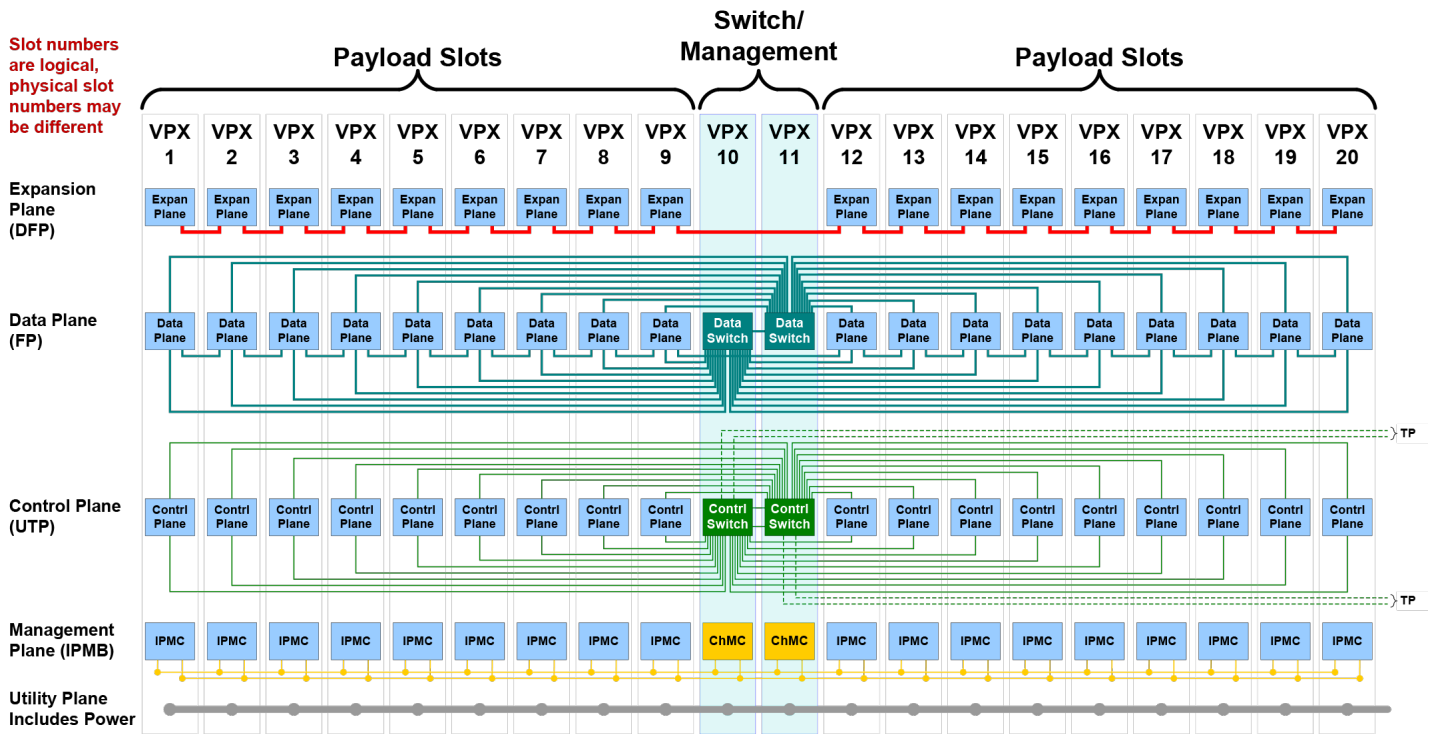


Figure 1 - Typical OpenVPX subsystem topology with dual SFM6104 switches supporting eighteen payloads. Backplane OpenVPX profile: BKP6-CEN20-11.2.3.

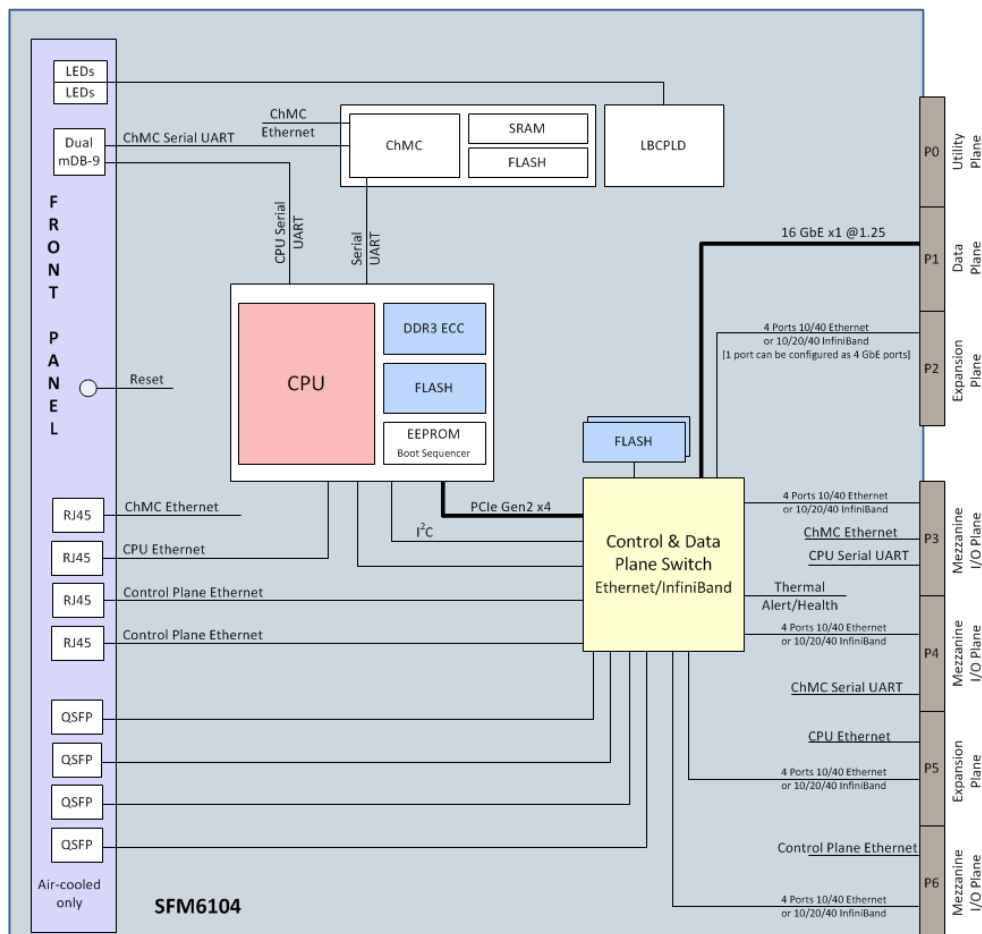


Figure 2. SFM6104 functional block diagram

Specifications

Switch fabric

Bridge

Mellanox 6th generation SwitchX 2 VPI ASIC with Ethernet and InfiniBand capability up to 18 payload slots

Data plane (per VITA 65) either Ethernet or InfiniBand:

Ethernet

40GBASE-KR4

10GBASE-KX4

InfiniBand

FDR10

QDR

DDR

SDR

Control plane

1000BASE-KX Ethernet 16 links (scalable to 20 links via fabric configuration software; sacrifices 1 data plane interface)

Fabric manager

Processor: Freescale P3041 with 2GB DDR3 (ECC enabled)

System manager

Processor: Renesas H8S/2166 or Smart Fusion FPGA

I2C bus between all switch and payload slots

Mechanical

6U OpenVPX

1.0" slot pitch for all packages

Module I/O

	Air-cooled		Conduction-cooled Air Flow-By Air Flow-Through Liquid Flow-Through
	Front Panel	Backplane	Backplane
Ethernet or InfiniBand	DDR/QDR/FDR10 (4 QSFPs)	DDR/QDR/FDR10	DDR/QDR/FDR10
	10GBASE-KX4/40GBASE-KR4		
10/100/1000BASE-T Ethernet	1 (RJ-45)		1
1000BASE-T Gb/s Ethernet	2 (RJ-45)		1
1000BASE-BX SERDES Ethernet		19	19
RS-232	1	1	1
IPMB-A and IPMB-B Link		1	1
IPMI 10/100BASE-T Ethernet	1 (RJ-45)		1
IPMI RS-232	1	1	1

Environmental

Rugged Level		VITA - Standard Product Environmental Qualification Levels					
		Air-cooled			Conduction-cooled	Air Flow-By	Liquid Flow-Through
		Commercial L0*	Rugged L1*	Rugged L2*	Rugged L3**	Rugged L4*	Rugged L6***
Temperature	Operating	0°C to +40°C (at air intake)	-25°C to +55°C (at air intake)	-45°C to +70°C (at air intake)	-40°C to +71°C (at module edge)	-40°C to +55°C (at air intake)	-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	-55°C to +125°C	-55°C to +125°C
	Max Rate of Change	N/A	5°C/min	10°C/min	10°C/min	10°C/min	10°C/min
Humidity	Operating*	10-90%, non-condensing	5-95%, non-condensing	5-95%, non-condensing	5-95%, non- condensing	5-95%, non- condensing	5-95%, 100% con- densing
	Storage	10-90%, non-condensing	5-95%, non-condensing	5-95%, non-condensing	100% condensing	100% con- densing	5-95%, non-condensing
Altitude	Operating*	0-10,000ft	0-30,000ft	0-30,000ft	0-70,000ft	0-70,000ft	0-70,000ft
	Storage	0-30,000ft	0-50,000ft	0-70,000ft	0-70,000ft	0-70,000ft	0-70,000ft
Vibration	Random	0.003 g2/Hz; 20-2000 Hz, 1 hr/axis	0.04 g2/Hz; 20-2000 Hz, 1 hr/ axis	0.04 g2/Hz; 20-2000 Hz, 1 hr/ axis	0.1 g2/Hz; 5-2000 Hz, 1 hr/axis	0.1 g2/Hz; 5-2000 Hz, 1 hr/axis	0.1 g2/Hz; 5-2000 Hz, 1 hr/axis
	Sine	N/A	N/A	N/A	10G peak; 5-2000 Hz, 1 hr/axis	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 positive, 3 negative)	z-axis: 50g; x and y-axes: 80g; (11ms, 1/2-sine pulse, 3 positive, 3 negative)				
Salt/Fog		N/A	Contact Factory	Contact Factory	10% NaCl		
VITA 47, MOTS		Contact Factory					

* Customer must maintain required cfm level. Consult factory for the required flow rates.

** Card edge should be maintained below 71°C

*** Dependant upon flow rate and coolant

Storage Temperature is defined per MIL-STD-810F, Method 502.4, para 4.5.2, where the product under non-operational test is brought to an initial high temperature cycle to remove moisture. Then the unit under non-operational test will be brought to the low storage temperature. The low temperature test is maintained for 2 hours. The product is then brought to the high storage temperature and is maintained for 2 hours. The product is then brought back to ambient temperature. All temperature transitions are at a maximum rate of 10°C/min. One cold/hot cycle constitutes the complete non-operational storage temperature test. This assumes that the board level products are individually packaged in accordance with ASTM-D-3951 approved storage containers. These tests are not performed in Mercury shipping containers, but in an unrestrained condition. Please consult the factory if you would like additional test details.

All products manufactured by Mercury meet elements of the following specifications: MIL-STD-454, MIL-STD-883, MIL-HDBK-217F, and MIL-I-46058 or IPC-CC-830, and various IPC standards. Mercury's inspection system has been certified in accordance with MIL-I-45208A.

Additional Services

Optional Environmental Screening and Analysis Services	Standard Module, Optional Services	
<ul style="list-style-type: none"> • Cold Start Testing • Cold Soak Testing • Custom Vibration • CFD Thermal Analysis • Finite Element Analysis 	<ul style="list-style-type: none"> • Safety Margin Analysis • Temperature Cycling • Power Cycling • Environmental Stress Screening 	<ul style="list-style-type: none"> • Engineering Change Order (ECO) Notification • ECO Control • Custom Certificate of Conformity (CofC) • Custom UID Labeling • Alternate Mean Time Between Failure (MTBF) Calculations • Hazmat Analysis • Diminished Manufacturing Sources (DMS) Management • Longevity of Supply (LOS) • Longevity of Repair (LOR)
Contact factory for additional information		

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