

EnsembleSeries™ SFM6126

6U OpenVPX PCIe Gen3 and Ethernet switch with mezzanine sites and system management

- Full Gen3 PCIe high-bandwidth switching
- 16 ports of 10 Gigabit Ethernet control plane switching
- I/O distribution for PCIe data plane or expansion/sensor plane
- Transparent or non-transparent port-by-port bridging
- Dual XMC I/O mezzanine sites
- VITA 46.11 system management
- Optional MOTS+ rugged packaging for extreme environmental protection



EnsembleSeries™ SFM6126 switches are critical building blocks in forming a composable, embedded data center architecture for artificial intelligence (AI), sensor fusion and other “big data” processing problems. When integrated with other EnsembleSeries OpenVPX modules, including Intel Xeon Scalable-powered blades and powerful GPU co-processors, a truly composable and rugged embedded edge computing (HPEEC) environment can be realized.

EnsembleSeries SFM6126 are the first OpenVPX PCIe switches to feature on-board XMC I/O sites and mezzanine switching. Hosting I/O at the switch enables direct, low-latency PCIe data distribution to directly target CPU, GPU, FPGA and storage devices, thus bypassing store-and-forward approaches in CPU memory. This lowers latency, enables multicast support to multiple different targets, and delivers the real-time performance necessary to meet the most critical timing loops in sensor processing applications.

SFM6126 switches utilize PCIe as the primary high-bandwidth data/expansion plane or sensor ingest platform. Designed to VITA 65 OpenVPX standard, SFM6126 software is configurable to support data movement architectures across a variety of applications and backplane topologies.

High-Speed Switching

EnsembleSeries SFM6126 switches have 20 backplane x4 PCIe lanes which default to high-speed Gen3. There are also two x8 PCIe interfaces dedicated to the XMC sites. These interfaces are switched by a Microsemi PFX PM8536 PCIe switch that switches up to 96 Gen3 PCIe lanes. Each x4 interface is configurable as a transparent or non-transparent bridge per the PCIe open specification, enabling the development of complex data movement architectures aligned with application needs.

Additionally, by virtue of the PCIe protocol, link-level hardware-based retry guarantees data delivery without the latency introduced by software-based QoS mechanisms. Each link is backwards compatible, and can configure to Gen2 or Gen1 PCIe data rates. SFM6126 switches can be utilized to switch a 6U OpenVPX PCIe data plane, or can be used to route and direct incoming sensor data over the OpenVPX expansion or sensor planes to intended targets.

Fabric Management

EnsembleSeries SFM6126 switches utilize Broadcom 53570 (XGS-III) system-on-chip (SoC) as the control plane network switch. The Ethernet control plane ports are managed by Mercury networking software (MNS). MNS is developed and supported by U.S. persons for operation on the network switch and is customer inspectable.

Mercury Systems is the better alternative for affordable, secure processing subsystems designed and made in the USA. These capabilities make us the first commercially based defense electronics company built to meet rapidly evolving next-generation defense challenges.



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PROCESS



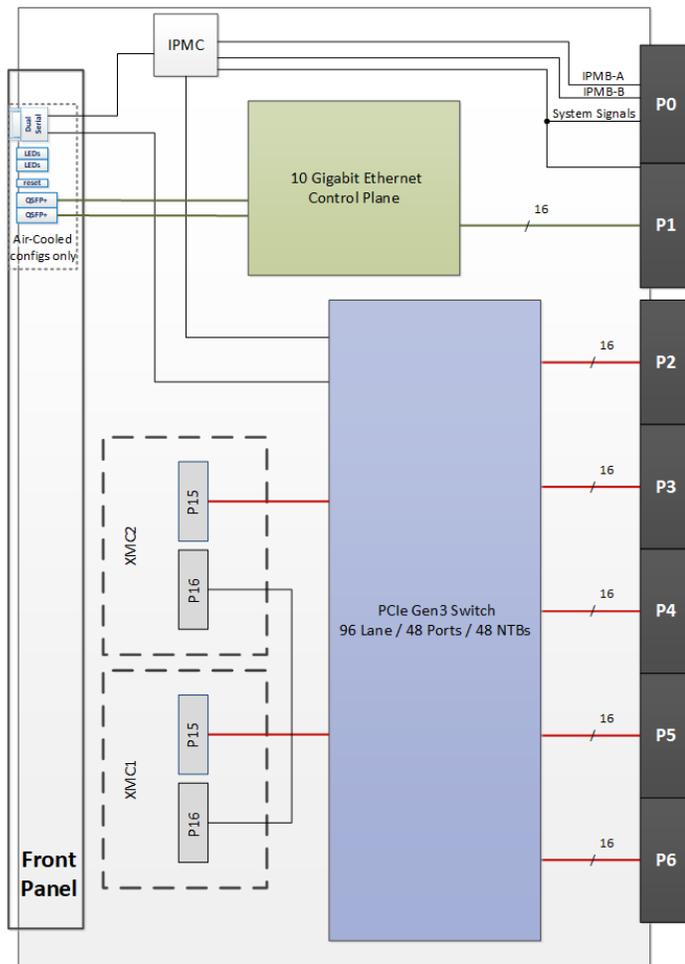
STORAGE



EXPLOIT



DISSEMINATE



SFM6126 block diagram

The switch management software ensures that the SFM6126 Ethernet management stack does not include any security vulnerabilities or back doors via management software whose provenance is unknown.

Mercury Networking Software Features (control plane)

- SNMP MIB Support
- Inbound and outbound SSH
- 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)
- IPv4 and IPv6 based management

Software/Firmware/Protocols (control plane)

- Link aggregation including LACP
- Layer 2 forwarding
- VLAN
- Spanning Tree protocols (including MSTP, RSTP and STP)
- IGMP snooping
- Port Mirroring
- Unicast, Multicast and Broadcast forwarding with support for jumbo packets (9k)
- PTPv2/1588 Transparent Clock

Mezzanine Card Support

EnsembleSeries SFM6126 switches have two XMC mezzanine sites. Each one may host off-the-shelf mezzanine cards to facilitate additional system I/O. The XMC sites are supported with x8 PCIe VITA 42.3 compliant lanes on the J15/J25 connectors. User I/O connectors on each XMC site interface to each other to facilitate cross XMC communication.

The mezzanine sites are ideally suited to host digital I/O management, including fiber optic management with mezzanines such as the EnsembleSeries IOM400. These I/O mezzanines enable incoming sensor data to be distributed efficiently to all recipients linked via the SFM6126 operating the PCIe protocol. The efficiency of this approach avoids buffering incoming data in the processor's memory and ensures that data distribution is accomplished regardless of the data's formatting or protocols.

A key configuration option for the SFM6126 supports VITA 66 backplane fiber I/O. Fiber optic mezzanines such as Mercury's IOM-400 XMC can be installed on the SFM6126 and the optical cables routed through the mechanical covers to the P6 backplane location with ease. The ability to support VITA 66 fiber optic I/O via XMCs simplifies subsystem optical routing and ensures interoperability across a wide variety of applications. SFM6126 switches utilize VITA 61 XMC connectors for Gen3 PCIe signal integrity and greater ruggedness.

System Management

EnsembleSeries SFM6126 switches implement the advanced system management functionality inherent to VITA 46.11 to enable remote monitoring, alarm management, and hardware revision and health status. Using the standard IPMI-A and IPMI-B bus, SFM6126 switches implement full IPMC onboard system-management. This IPMC enables each switch 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 entire switch
- Power up/down the entire switch
- Retrieve module field replaceable unit (FRU) information
- Interface with and be managed remotely by a VITA 46.11-compliant chassis manager

Optional MOTS+

The EnsembleSeries SFM6126 family of switches are OpenVPX compliant and have options for modified off the shelf plus (MOTS+) manufacturing and packaging for extreme durability. MOTS+ configurations leverage enhanced commercial components, board fabrication rules, and subsystem design techniques for extra durability and withstand extreme temperature cycles better than other rugged designs.

Fiber Optic

SFM6126 P6 backplane connectors can be replaced with a VITA 66 fiber optic interface to provide efficient fiber management within the chassis.

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. OpenVPX is most attractive when paired with the ruggedized enhanced design implementation standard – REDI (VITA 48). SFM6126 switches are a 6U implementation of VPX-REDI, with air and conduction-cooled and Air and Liquid Flow-By™ variants in the same OpenVPX form-factor available for less rugged environments.

Primarily for harsh-environment embedded applications, VPX-REDI offers extended mechanical configurations supporting higher functional density, such as two-level maintenance (2LM). 2LM allows 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.

Specifications

OpenVPX Slot Profile

VITA 65 Slot Profile: SLT6-SWH-16U16F-10.4.5

VITA 65 Module Profile: MOD6-SWH-16U16F-12.4.5-X, where X can vary based on PCIe generation/data rate

Module

Supports 20 Gen3 PCIe x4 interfaces to the backplane

Each link configurable to Gen2 or Gen1 data rates

Supports two XMC mezzanines at x8 PCIe

Supports OpenVPX management plane

Dual IPMB interfaces per VITA 65

Front-panel serial interface to on-board VITA 46.11 IPMC

Routed to backplane in conduction-cooled or Air-Flow-By configurations

Dual-sided PCB assembly

Designed for installation into VITA 46/VITA 65 compliant chassis

Supports routing of a fiber interface through the backplane out (depopulated) P6 per VITA 66

Dimensions

Standard 6U OpenVPX

1.0" pitch

6U form-factor

160mm x 233.33mm

Power Requirements

Input voltages

12V payload power

3.3V_AUX management power

Environmental

See [Environmental Protections for Operation at the Tactical Edge](#) for specific ruggedness levels and cooling options.



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