

# VPX006

## 3U OpenVPX Switch, CBS with Integrated Health Management



VPX006

### Key Features

- Unified 1 GHz quad-core CPU for, Shelf Manager, and Fabric management
- Automatic fail-over with redundant VPX006s
- 1GbE base switch with dual 100/1000/10G uplink
- Full Layer 3 managed Ethernet switches
- Non-blocking Crossbar Switch (CBS)
- PLL synthesizer for generating any clock frequency disciplined to GPS/SyncE/IEEE1588
- VITA 46 and VITA 65 compliant

### Benefits

- Sophisticated clocking features enabling GPS/IEEE1588/SyncE/NTP Grand Master Clock
- Optional virtual JTAG capability for remote programming and debugging eases FPGA code development
- VadaTech's Scorpionware® Shelf Management Software included at no additional cost



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# VPX006

The VadaTech VPX006 is the most feature-rich VPX Switch with health management in the market. Its management software is based on VadaTech's robust Carrier Manager and Shelf Manager which have been deployed for years with proven results. The MCMC manages the Power Modules, Cooling Units, and up to 12 payload modules within the chassis. It also manages the CBS and the standard GbE with 10GbE uplink Base Channel switch. The Ethernet switch is managed with an enterprise grade Layer 2 or 3 switching/routing stack which supports Synchronous Ethernet.

The CBS is protocol-agnostic and so allows multiple protocols to be supported, including low-latency (e.g. Aurora) and proprietary.

The VPX006 runs Linux on its centralized quad-core CPU and is fully redundant when used in conjunction with a second instance of the module. The firmware is HPM.2 compliant which allows for easy upgrades. It provides Master JTAG services to the payload modules via the JSM. The VPX006 has advanced clocking features including grand master clock and high-quality clock distribution/synthesis.

## Block Diagram

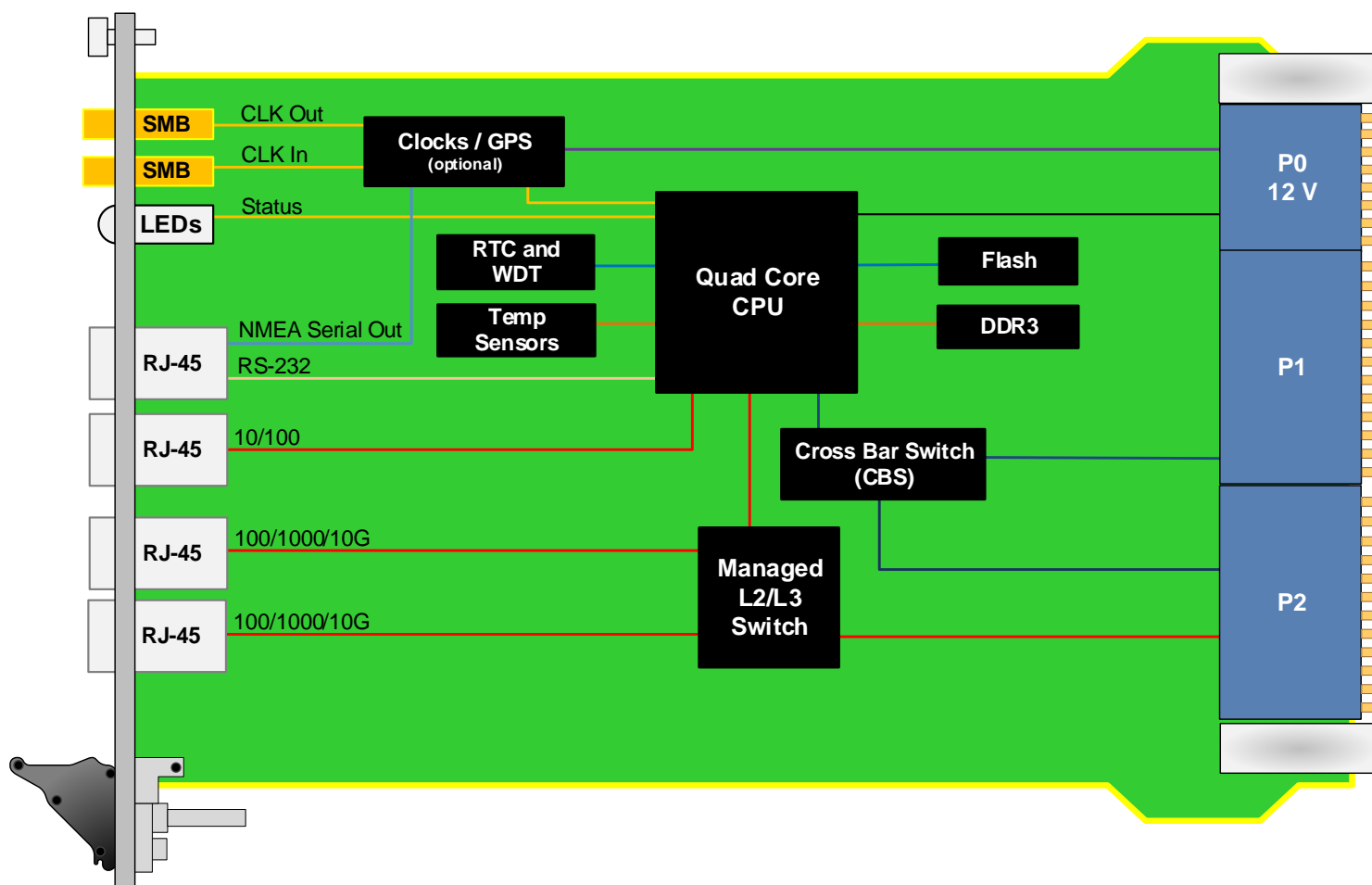


Figure 1: VPX006 Functional Block Diagram

## Front Panel

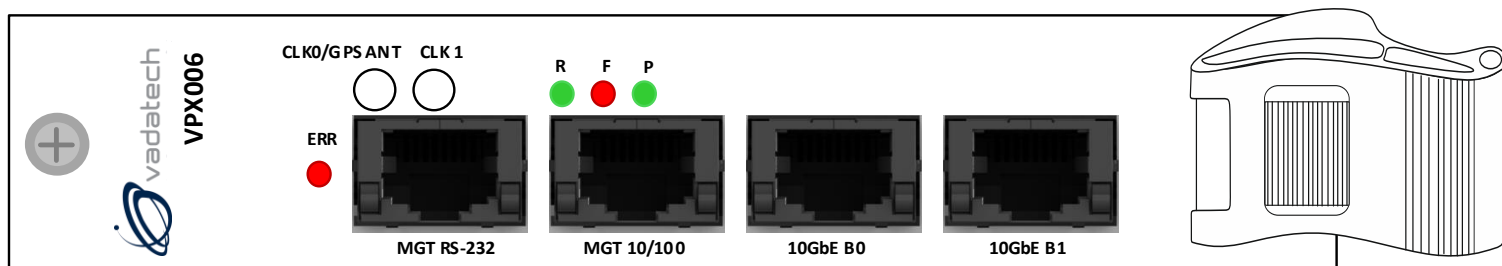


Figure 2: VPX006 Front Panel

# Architecture

## IPMI Carrier Manager, Shelf Manager and Protocol Analyzer

The VPX006 utilizes the same proven standards-compliant IPMI management stack that has been utilized successfully in our previous generation products. It supports carrier manager, shelf manager, and protocol analyzer operations to help facilitate a seamless chassis integration experience. The IPMI stack enables a rich feature set including:

- IPMI v2.0 with IPMI v1.5 compatibility
- SDR, FRU, and SEL storage interfaces (SEL stored in MRAM for high-speed/non-volatile/no-wear-out access)
- Intelligent temperature, voltage, and current sensing
- Shelf cooling policy
- Shelf activation and power management/Automatic fail-over/redundancy management
- Alarm controls
- Event notification and flexible alerting policies
- CLI, SNMP, RMCP+, HTTP, and HPI
- IPMB Protocol Analyzer GUI for use on PC
- ScorpionWare GUI system manager integration tool on PC available separately

## Base Channel Ethernet Switch

The VPX006 provides as standard a GbE base channel switch. This switch is fully Layer 3 managed enabling a comprehensive enterprise-grade routing and switching feature set. It supports Synchronous Ethernet (SyncE) and IEEE1588.

## Fat Pipe Fabric

The VPX006 CBS Switch provides:

- Supports unicasting or multi-casting of any input SERDES lane to one or more output SERDES lane
- 771 Gbps aggregate bandwidth/asynchronous/non-blocking architecture passes through any data rate up to 10.709 Gbps
- SERDES protocol agnostic (no packet framing/handling within the switch, only the payload modules need to understand the protocol)

## Fabric Clock Option

The VPX006 has the capability to provide a 100 MHz HCSL CBS compliant fabric clock to each VPX. This option enables the recommended synchronous CBS clocking approach within the chassis when used in combination with the CBS fabric.

## GPS and General-Purpose Clocks

The MTCA specification defines a set of clocks for telecom and non-telecom applications. The VadaTech VPX006 has the most sophisticated clocking distribution in the market to meet the most stringent requirements such as wireless infrastructure, high speed A/D, etc. The VPX006 supports the following GPS and general-purpose clocking features:

- Open VPX-compliant low-jitter/low-skew backplane routing
- Clock disciplining with arbitrary clock frequency output and holdover (Stratum-3 option) including 1PPS regeneration and holdover
- Flexible integration and synchronization between GPS, IEEE1588/SyncE, and NTP clocking enabling Grand Master clock functionality
- 'Any Frequency' high-quality clock generation/jitter cleaning for up to two user clocks
- Supports hitless automatic clock failover for improved reliability
- Optional built-in GPS receiver enables direct time/clock synchronization to the GPS satellite constellation

The VPX006 supports flexible front panel clock port ordering options:

- Two DC-coupled LVCMOS Inputs/Outputs, or two AC-coupled Sine-wave Inputs, or one of each
- Built-in GPS receiver for time/location/clock synchronization plus a DC-coupled LVCMOS Input/Output

## GPS Receiver Enabled Features

The VPX006 can be ordered with a GPS Receiver option. The receiver disciplines an on-board high-quality DPLL which is phase/frequency aligned to the atomic clocks in the GPS satellite constellation. The on-board clock synthesis/jitter cleaning capability can be utilized to convert this frequency into any frequency desired while still remaining locked to the GPS atomic clocks.

When the GPS Receiver option is purchased the VPX006 has the capability to re-transmit the incoming GPS data via Ethernet to other network nodes in the Trimble TSIP binary protocol format. This GPS data is also sent out the front panel GPS RS-232 serial port in the standard NMEA format for use by external equipment.

## IEEE1588 PTP and NTP Grand Master Clock

The VPX006 provides Ethernet time service to the chassis network on the GbE fabric port. It can be subordinate to an external PTP or NTP master server or when the GPS receiver option is purchased can act as a Grand Master clock utilizing the precision timing information provided via the GPS receiver and on-board disciplined oscillator.

## Synchronous Ethernet

The VPX006 provides a Synchronous Ethernet (SyncE) on the GbE fabric port. With this feature, ports on the 1G Ethernet switch can be designated as master or slave ports and the Ethernet fabrics within the chassis can be synchronized from end-to-end with external equipment. This feature utilizes advanced telecom-grade network synchronization PLLs to provide exceptional SyncE performance.

## JTAG Master/JTAG via Ethernet Virtual Probe

The VPX006 provide JTAG Master Capability to send out configuration data streams via the chassis JTAG Switch Module (JSM) to configure arbitrary JTAG Slave devices on VPX cards. Virtual Probe services are also available to provide JTAG via Ethernet for Xilinx FPGAs. This allows for standard development tools such as Xilinx iMPACT/ChipScope to treat the switch/JSM combination as if it was a standard JTAG probe. This approach frees the developer from having to attach JTAG probes directly to the VPX or JSM which can be difficult when systems are already fully assembled. It also allows for remote debugging across long distances when required without the need to install additional JTAG equipment on-site.

# Specifications

<b>Architecture</b>		
<b>Physical</b>	<b>Dimensions</b>	3U, 1" pitch
<b>Type</b>	<b>Controller</b>	OpenVPX Switch with Health Management
<b>Standards</b>		
<b>VPX</b>	<b>Type</b>	VITA 46.x
<b>VPX</b>	<b>Type</b>	VITA 65 OpenVPX
<b>Module Management</b>	<b>IPMI</b>	IPMI v2.0 HPM v1.0
<b>Configuration</b>		
<b>Power</b>		Option load dependent (as the MCMC and Shelf only < 4 W) On P0; VS1 =12 V
<b>Front Panel</b>	<b>Interface Connectors</b>	100/1000/10G from L2/L3 Base Switch Fabric (x 2 RJ-45) CPU 10/100 (RJ-45) CPU RS-232 (RJ-45) Option for GPS NMEA serial data in/out (RJ-45) LEDs Status Two CLK IN/OUT (SMB); CLK IN becomes GPS ANT IN with GPS receiver option
<b>VPX Interfaces</b>	<b>Slot Profiles</b>	See ordering options
	<b>Rear IO</b>	CPU on P0 Clocks/GPS (Optional) on P0 Protocol-agnostic SERDES on P1/P2 GbE on P2
<b>Software Support</b>	<b>Operating System</b>	Linux Switch CBS
<b>Other</b>		
<b>MTBF</b>		MIL Hand book 217-F@ TBD hrs
<b>Certifications</b>		Designed to meet FCC, CE and UL certifications, where applicable
<b>Standards</b>		VadaTech is certified to both the ISO9001:2000 and AS9100B:2004 standards
<b>Warranty</b>		Two (2) years

## INTEGRATION SERVICES AND APPLICATION-READY PLATFORMS

VadaTech has a full ecosystem of OpenVPX, ATCA and MTCA products including chassis platforms, shelf managers, AMC modules, Switch and Payload Boards, Rear Transition Modules (RTMs), Power Modules, and more. The company also offers integration services as well as pre-configured Application-Ready Platforms. Please contact VadaTech Sales for more information.

# Ordering Options

## VPX006 – A00-DEF-GHJ

A = Fabric Switch	D = Front Panel Clocking	G = Applicable Slot Profile
0 = None (GbE channel switch only) <sup>1</sup> 1 = CBS	0 = None 1 = Dual LVCMOS Clock In/Out 2 = Sine Wave In + LVCMOS In/Out 3 = Built-in GPS receiver + LVCMOS In/Out 4 = Dual Sine Wave In 5 = GPS receiver + Sine Wave In	0 = 5HP 1 = Reserved
E = Clock Holdover Stability		H = Environmental
0 = Standard (XO) 1 = Stratum-3 (TCXO)		See Environmental Specification Table below
F = JTAG Virtual Probe		J = Conformal Coating
0 = None 1 = Included		0 = None 1 = Humiseal 1A33 Polyurethane 2 = Humiseal 1B31 Acrylic

Notes: <sup>1</sup>The GbE with 10GbE uplink switch is always included regardless of the fabric switch option.

## Environmental Specification

Air Cooled			Conduction Cooled		
Option H	H = 0	H = 1	H = 2	H = 3	H = 4
Operating Temperature	AC1* (0°C to +55°C)	AC3* (-40°C to +70°C)	CC1* (0°C to +55°C)	CC3* (-40°C to +70°C)	CC4* (-40°C to +85°C)
Storage Temperature	C1* (-40°C to +85°C)	C3* (-50°C to +100°C)	C1* (-40°C to +85°C)	C3* (-50°C to +100°C)	C3* (-50°C to +100°C)
Operating Vibration	V2* (0.04 g2/Hz max)	V2* (0.04 g2/Hz max)	V3* (0.1 g2/Hz max)	V3* (0.1 g2/Hz max)	V3 (0.1 g2/Hz max)
Storage Vibration	OS1* (20g)	OS1* (20g)	OS2* (40g)	OS2* (40g)	OS2* (40g)
Humidity	95% non-condensing	95% non-condensing	95% non-condensing	95% non-condensing	95% non-condensing

\* Nomenclature per ANSI/VITA 47. Contact local sales office for conduction cooled (H = 2, 3, 4).

## Related Products

VPX516



- 3U FPGA carrier for FPGA Mezzanine Card (FMC) per VITA 46 and VITA 57
- Xilinx Virtex-7 690T FPGA in FFG-1761 package
- High-performance clock jitter cleaner

VPX518



- 3U FPGA carrier for FMC per VITA 46 and VITA 57
- Xilinx Zynq-7000 FPGA in FFG-900 package (XC7Z100 or XC7Z045)
- High-performance clock jitter cleaner

VPX599



- 3U FPGA Dual DAC and dual ADC per VITA 46
- Xilinx Kintex UltraScale™ XCKU115 FPGA
- Dual ADC @ 6.4GSPS 12-bits



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