Ruggedization levels

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>0°C to +55°C</td>
<td>0°C to +55°C</td>
<td>-40°C to +85°C</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Non-Operating Temperature</td>
<td>0°C to +65°C</td>
<td>0°C to +65°C</td>
<td>-40°C to +105°C</td>
<td>-40°C to +105°C</td>
</tr>
<tr>
<td>Operating Vibration (Random)</td>
<td>0.15 to 500 Hz, 20g</td>
<td>0.15 to 500 Hz, 20g</td>
<td>0.15 to 500 Hz, 20g</td>
<td>0.15 to 500 Hz, 20g</td>
</tr>
<tr>
<td>Operating Shock</td>
<td>30g, 11 millisecond, half-sine</td>
<td>30g, 11 millisecond, half-sine</td>
<td>40g, 11 millisecond, half-sine</td>
<td>40g, 11 millisecond, half-sine</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 95% non-condensing</td>
<td>0% to 95% non-condensing</td>
<td>0% to 95% non-condensing</td>
<td>0% to 95% non-condensing</td>
</tr>
<tr>
<td>Altitude</td>
<td>@ 0 to 10,000 ft with adequate air flow</td>
<td>@ 0 to 30,000 ft</td>
<td>@ 0 to 30,000 ft</td>
<td>@ 0 to 60,000 ft</td>
</tr>
<tr>
<td>Conformal Coating</td>
<td>No</td>
<td>Optional (black acrylate 1B31)</td>
<td>Yes (black acrylate 1B31)</td>
<td>Yes (black acrylate 1B31)</td>
</tr>
</tbody>
</table>

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3U VPX, Virtex 7 FPGA
Triple QSFP+ interfaces
conduction or air-cooled

Features
- Three QSFP (Quad Small Form-Factor Pluggable) interface
- Supports QSFP copper or optical transceivers up to 10 Gbps/lanes
- Three on board low jitter reference clock generators
- User programmable Xilinx® Virtex® 7 VX415T or VX690T FPGA
- Two banks 667 MHz 256M16 DDR3 SDRAM
- 3U OpenVPX standard compliant
- Air-cooled and conduction cooled rugged versions
- FPGA firmware cores
- Windows® and Linux® drivers

Applications
- Real time processing
- Wideband data communication
- Data storage interface

3U VPX, Virtex 7 FPGA
Triple QSFP+ interfaces
conduction or air-cooled

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Contact us online at:
e2v-us.com

e2v inc.
765 Sycamore Drive, Milpitas, CA 95035, USA

Phone: +1 408 737 0992
Fax: +1 408 736 8708
The AV109 is part of e2v's range of high speed data conversion and signal processing solutions based on the ANSI/VITA 65, OpenVPX standard.

The AV109 is fully compliant with the OpenVPX standard, with default support for the MOD3-PHY-1x2U-1.2-1.3 and MOD3-PHY-2x2U-1x2.1-2.3 module profiles, PCIe Gen 1 or Gen 2 on data planes and expansion plane plus 1000BASE-BX on control planes.

The AV109 combines the very high processing power delivered by Xilinx® Virtex® 7 FPGA with three independent QSFP (Quad Small Form-Factor Pluggable) interface, making it ideally suited for embedded signal processing applications for data communication and data storage interface with support for datamane at up to 10 Gbps per link.

### High speed data conversion & signal processing solutions

The AV109 provides three on board, user programmable, low jitter clock generator supporting reference clocks as required for PCIe, SATA, SDIO, Fiber Channel, Aurora, Gbit Ethernet or XAUI protocols.

The AV109 includes one Xilinx® Virtex® 7 FPGA VX415T or VX690T for an impressive processing capability of up to more than 2 TMCs (Multiply Accumulate per second), two banks 667 MHz 256Mx6 DDR3 SDRAM memory for data processing and 1 Gb synchronous FLASH memory for multiple firmware storage.

The AV109 features a 32-bit microcontroller with USB 2.0 and 10/100 Ethernet interfaces intended to be used for system monitoring and supervision.

The AV109 comes with complete software drivers for Windows and Linux. An FPGA firmware package is provided including all cores necessary to build user FPGA applications.

### Specifications

**QSFP cage and connector**

- Compliant with QSFP standard
- 98-contact QSFP connector

**Reference clock**

- 100 MHz, supported protocols:
  - PCIe gen 1
  - SATA 1.5 and 3 Gbps
  - SRIO 3.125 Gbps
  - Aurora 1.25 and 2.5 Gbps
  - 250 MHz, supported protocols:
    - XAUI 3.125 Gbps
    - SRIO 3.125 Gbps
    - Aurora 1.25 and 2.5 Gbps
  - 250 MHz, supported protocols:
    - PCIe gen 1
    - 1G
    - Aurora 1.25 and 2.5 Gbps

**FPGA**

- Part Number: Xilinx Virtex 7 VX415T-2
- FPGA Virtex 7 VX415T
- FPGA Virtex 7 VX690T

**VPX interface**

- P0:
  - Data plane: two fat pipes
  - Expansion plane: one fat pipe
  - Control plane: two ultra-thin pipes
  - 2 user-defined ultra-thin pipes
- P1:
  - USB2.0 and 10/100 Ethernet
  - 24 LVDS differential pairs
- Software support
  - Software drivers:
    - Windows 7
    - Linux
  - Application example:
    - Windows and Linux
- Firmware support
  - VHDL cores for all hardware

### Ordering information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>A</th>
<th>V</th>
<th>S0</th>
<th>S1</th>
<th>T</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ruggedization level</strong></td>
<td>Air Standard</td>
<td>Air Rugged</td>
<td>Conduction Standard</td>
<td>Conduction Rugged</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Power dissipation</strong></td>
<td>+24V: 6.9 A max (89W)</td>
<td>+5V: 8.6 A max (49W)</td>
<td>+3.3V: 0.5 A max (1.68W)</td>
<td>+3.3V: 0.3 A max (1.0W)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Air-cooled: 550g</td>
<td>Conduction cooled: 850g</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Design**

- Supported by Xilinx VIVADO 2012.4 and later
- As per VITA 67:
  - Air-cooled: EAC4 and EAC6
  - Conduction cooled: ECC3 and ECC4

**Overview**

- The AV109 supports three independent Quad Small Form-Factor Pluggable (QSFP) transceivers.
- The AV109 combines the very high processing power delivered by Xilinx® Virtex® 7 FPGA with three independent QSFP (Quad Small Form-Factor Pluggable) interface, making it ideally suited for embedded signal processing applications for data communication and data storage interface with support for datamane at up to 10 Gbps per link.

**Clocks**

- The AV109 provides three on board, user programmable, low jitter clock generator generating clock references as required for the high speed serial links (Xilinx® Virtex® 7 GTH).
- The clock frequency can be selected among the following:
  - 100 MHz, supporting PCIe gen 1
  - 106.25 MHz, supporting Serial FPDP and Fibre Channel
  - 125 MHz, supporting PCIe gen 2
  - 150 MHz, supporting SATA
  - 156.25 MHz, supporting XAUI, SRIO and Fibre Channel
  - 187.5 MHz, supporting 2x Ultra-Thin Pipes
  - 250 MHz, supporting PCIe gen 1
  - 312.5 MHz, supporting PCIe gen 2
  - 387.5 MHz, supporting 4x Ultra-Thin Pipes
- The AV109 also supports a USB2.0, a 10/100 Ethernet accessible on the P1 board, USB2.0 and 10/100 Ethernet interfaces intended to be used for system monitoring and supervision.

**Microcontroller**

- The AV109 features an OpenVPX VITA 65 compliant interface with support for two fat pipes for data plane, one fat pipe for expansion plane, two ultra thin pipes for control plane and two user defined ultra thin pipes on P0.
- The AV109 also supports a USB2.0, a 10/100 Ethernet and 24 LVDS differential pairs on P2.
- The AV109 includes one Xilinx® Virtex® 7 FPGA VX415T or VX690T for an impressive processing capability of up to more than 2 TMCs (Multiply Accumulate per second), two banks 667 MHz 256Mx6 DDR3 SDRAM memory for data processing and 1 Gb synchronous FLASH memory for multiple firmware storage.
- The AV109 features a 32-bit microcontroller with USB 2.0 and 10/100 Ethernet interfaces intended to be used for system monitoring and supervision.

**FPGA**

- The AV109 is fitted with a Xilinx Virtex® 7 VX415T or VX690T user programmable FPGA. Only few resources are used to control and communicate with external hardware such as DDR3 SDRAM and monitoring sub-system, leaving most of the logic and block RAM and all DSP resources available for customer processing.
- Dedicated to signal processing, the Xilinx Virtex® 7 VX415T FPGA includes 422,656 logic cells, 880 block RAM (36 16-bit blocks), 2,160 DSPs,681 slices and 2 Pcie interface blocks.
- The most powerful version embeds a Xilinx Virtex® 7 VX690T which provides 893,312 logic cells, 1,420 block RAM and 3,600 DSPs,1,881 slices and 3 Pcie interface blocks.

**Resources**

- Conduction cooled: 650g
- Conduction cooled: 240W
- Power dissipation:
  - +24V: 6.9 A max (89W)
  - +5V: 8.6 A max (49W)
  - +3.3V: 0.5 A max (1.68W)
  - +3.3V: 0.3 A max (1.0W)
- Weight:
  - Air-cooled: 550g
  - Conduction cooled: 850g

**Application example**

- Applications include:
  - Windows and Linux
  - Application example:
    - Windows and Linux
  - Firmware support
    - VHDL cores for all hardware