VPX3-ZU1-SDR Products Brief

3U OpenVPX Solutions for SDR/EW with ADI’s RadioVerse RF Transceivers

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Overview

**PanaTeQ's VPX3-ZU1-SDR** are 3U OpenVPX modules based on the Zynq UltraScale+ MPSoC device from Xilinx coupled to RadioVerse Analog Devices RF Wideband Transceivers AD9371, AD9375 or ADRV9009 for a broad range of applications such as Software Defined Radio, MILCOM, massive MIMO, Phase Array Radar and Electronic Warfare.

PanaTeQ provides solutions for **Ruggedized Air-Cooled** and **Conduction Cooled** systems.

These VPX3-ZU1-SDR modules are based on the following PanaTeQ’s sub-modules (boards):

- VPX3-ZU1, FMC-ZU1RF-A/B, FMC-ZU2RF-A/B, XMC-SDR-A and VPX3-XMC-SDR-A

  The **VPX3-ZU1** is a 3U OpenVPX module based on a Xilinx Zynq Ultrascale+ MPSoC with a FMC 57.1 site, HW/SW compatible with ZCU102 Evaluation board from Xilinx.

  The **FMC-ZU1RF-A** is a FMC based on an Analog Devices AD9371, HW/SW compatible with ADRV9371 Evaluation Board from Analog Devices.

  The **FMC-ZU1RF-B** is a FMC based on an Analog Devices AD9375, HW/SW compatible with ADRV9371 Evaluation board from Analog Devices.

  The **FMC-ZU2RF-A** is a FMC based on an Analog Devices ADRV9009, HW/SW compatible with ADRV9009 Evaluation board from Analog Devices.

  The **FMC-ZU2RF-B** is a FMC based on two Analog Devices ADRV9009.

  The **XMC-SDR-A** is a XMC based on two Analog Devices ADRV9009, HW/SW compatible with ADRV9009-11EG RF SOM from Analog Devices.

  The **VPX3-XMC-SDR-A** is a optimized 3U OpenVPX carrier module for the **XMC-SDR-A**.
Typical Application: Software Defined Radio System (SWaP-C)

VPX3-ZU1-SDR-A/B/C/D
Air Cooled

Conduction Cooled
<table>
<thead>
<tr>
<th>Part #</th>
<th>RF Tuning Range</th>
<th>Bandwidth</th>
<th>Channels</th>
<th>Interface</th>
<th>Digital Pre Distorsion (DPD)</th>
<th>Hop Time</th>
<th>IQ Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD9361</td>
<td>70MHz – 6GHz</td>
<td>56MHz Rx &amp; Tx</td>
<td>2Rx, 2Tx</td>
<td>JESD207 CMOS/LVDS</td>
<td>N/A</td>
<td>250us</td>
<td>50MSPS</td>
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<tr>
<td>AD9371</td>
<td>300MHz – 6GHz</td>
<td>100 MHz Rx 250MHz Tx</td>
<td>2Rx, 2Tx, 2ORx, 3SnRx</td>
<td>6Gbps JESD204B</td>
<td>N/A</td>
<td>1ms</td>
<td>125MSPS</td>
</tr>
<tr>
<td>AD9375</td>
<td>300MHz – 6GHz</td>
<td>100 MHz Rx 250MHz Tx</td>
<td>2Rx, 2Tx, 2ORx, 3SnRx</td>
<td>6Gbps JESD204B</td>
<td>Linearization BW up to 40MHz</td>
<td>1ms</td>
<td>125MSPS</td>
</tr>
<tr>
<td>ADRV9009</td>
<td>75MHz – 6GHz</td>
<td>200MHz Rx, 450MHz Tx &amp; ORx</td>
<td>2Rx, 2Tx &amp; 2ORx</td>
<td>12Gbps JESD204B</td>
<td>N/A</td>
<td>70us</td>
<td>250MSPS</td>
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## PanaTeQ 3U VPX SDR Products Table

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Zynq MPSOC</th>
<th>RF Transceiver</th>
<th>MIMO</th>
<th>ADI Eval Board</th>
<th>Availability</th>
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<tr>
<td>VPX3-ZU1-SDR-A</td>
<td>ZU6/ZU9/ZU15</td>
<td>AD9371</td>
<td>2x2</td>
<td>ADRV9371-W</td>
<td>Now</td>
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<tr>
<td>VPX3-ZU1-SDR-B</td>
<td>ZU6/ZU9/ZU15</td>
<td>AD9375</td>
<td>2x2</td>
<td>ADRV9375-W</td>
<td>Now</td>
</tr>
<tr>
<td>VPX3-ZU1-SDR-C</td>
<td>ZU6/ZU9/ZU15</td>
<td>ADRV9009</td>
<td>2x2</td>
<td>ADRV9009-W</td>
<td>Contact Us</td>
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<tr>
<td>VPX3-ZU1-SDR-D</td>
<td>ZU6/ZU9/ZU15</td>
<td>2x ADRV9009</td>
<td>4x4</td>
<td>ADRV9009-11EG</td>
<td>Contact Us</td>
</tr>
<tr>
<td>VPX3-XMC-SDR-A</td>
<td>ZU7/ZU11</td>
<td>2x ADRV9009</td>
<td>4x4</td>
<td>ADRV9009-11EG</td>
<td>Contact Us</td>
</tr>
</tbody>
</table>
VPX3-ZU1-SDR-A/B Features

Technical Specifications

- 3U VPX (VITA 46.0) and OpenVPX (VITA 65) specifications compliant
- Compatibility with ADI Eval boards ADRV9371 (-A model), ADRV9375 (-B model)
- AD9371 (-A model), AD9375 (-B model) RF Wideband Transceivers
- Two TX and Two RX coherent channels synchronized in frequency and phase
- Wide tuning range 300MHz to 6GHz
- Max receiver BW 100MHz. Up to 200MHz using 2 receivers
- Max transmitter synthesis BW 250MHz
- On-board Xilinx Zynq UltraScale+ MPSoC as Baseband processor
- Compatibility with Xilinx Eval Board ZCU102
- ZU6/ZU9/ZU15 FFVC-900 Package
- Up to 8GB DDR4-2400 64-bit Processing System (PS) memory with 8-bit ECC
- Up to 2GB DDR4-2400 16-bit Programmable Logic (PL) memory
- eMMC 64GB (V4.51), MRAM 512KB
- On-board PCIe Gen2 Switch PEX8619, 16-Ports 16-Lanes. No SBC required in the VPX System
- 1x 1000Base-T on VPX-P2 and 2x 1000Base-X/SGMII on VPX-P1
- 2x RS-232/422/485, 2x CAN 2.0B and 20x GPIOs (LVCMOS 2.5V or LVDS 2.5V) on VPX-P2
- 2x USB 3.0/2.0, 2x USB 2.0, 1x SATA 3.1 and DisplayPort 1.2 Video Out on VPX-P2
- Advanced PanaTeQ Board Management Controller (BMC) ARM M3 based and Power Management Bus (PMBus)
- Industrial Air Cooled and Conduction Cooled (VITA 48.0) versions available
VPX3-ZU1-SDR-C Module Features

Technical Specifications

- 3U VPX (VITA 46.0) and OpenVPX (VITA 65) specifications compliant
- Compatibility with ADI Eval boards ADRV9009
- ADRV9009 RF Wideband Transceiver
- Two TX and Two RX coherent channels synchronized in frequency and phase
- Wide tuning range 75MHz to 6GHz
- Max receiver BW 200MHz. Up to 400MHz using 2 receivers
- Max transmitter synthesis BW 450MHz
- On-board Xilinx Zynq UltraScale+ MPSoC as Baseband processor
- Compatibility with Xilinx Eval Board ZCU102
- ZU6/ZU9/ZU15 FFVC-900 Package
- Up to 8GB DDR4-2400 64-bit Processing System (PS) memory with 8-bit ECC
- Up to 2GB DDR4-2400 16-bit Programmable Logic (PL) memory
- eMMC 64GB (V4.51), MRAM 512KB
- On-board PCIe Gen2 Switch PEX8619, 16-Ports 16-Lanes. No SBC required in the VPX System
- 1x 1000Base-T on VPX-P2 and 2x 1000Base-X/SGMII on VPX-P1
- 2x RS-232/422/485, 2x CAN 2.0B and 20x GPIOs (LVCMOS 2.5V or LVDS 2.5V) on VPX-P2
- 2x USB 3.0/2.0, 2x USB 2.0, 1x SATA 3.1 and DisplayPort 1.2 Video Out on VPX-P2
- Advanced PanaTeQ Board Management Controller (BMC) ARM M3 based and Power Management Bus (PMBus)
- Industrial Air Cooled and Conduction Cooled (VITA 48.0) versions available
VPX3-ZU1-SDR-D Module Features (Q1 2019)

Technical Specifications

- 3U VPX (VITA 46.0) and OpenVPX (VITA 65) specifications compliant
- Compatibility with ADI Eval boards ADRV9009 (single Transceiver)
- Dual ADRV9009 RF Wideband Transceiver
- Four TX and Four RX coherent channels synchronized in frequency and phase
- Wide tuning range 75MHz to 6GHz
- Max receiver BW 200MHz. Up to 800MHz using 4 receivers
- Max transmitter synthesis BW 450MHz
- On-board Xilinx Zynq UltraScale+ MPSoC as Baseband processor
- Compatibility with Xilinx Eval Board ZCU102
- ZU6/ZU9/ZU15 FFVC-900 Package
- Up to 8GB DDR4-2400 64-bit Processing System (PS) memory with 8-bit ECC
- Up to 2GB DDR4-2400 16-bit Programmable Logic (PL) memory
- eMMC 64GB (V4.51), MRAM 512KB
- On-board PCIe Gen2 Switch PEX8619, 16-Ports 16-Lanes. No SBC required in the VPX System
- 1x 1000Base-T on VPX-P2 and 2x 1000Base-X/SGMII on VPX-P1
- 2x RS-232/422/485, 2x CAN 2.0B and 20x GPIOs (LVCMOS 2.5V or LVDS 2.5V) on VPX-P2
- 2x USB 3.0/2.0, 2x USB 2.0, 1x SATA 3.1 and DisplayPort 1.2 Video Out on VPX-P2
- Advanced PanaTeQ Board Management Controller (BMC) ARM M3 based and Power Management Bus (PMBus)
- Industrial Air Cooled and Conduction Cooled (VITA 48.0) versions available
VPX3-XMC-SDR-A Module Features (Q2 2019)

Technical Specifications

- 3U VPX (VITA 46.0) and OpenVPX (VITA 65) specifications compliant
- Compatibility with ADI Eval boards ADRV9009-11EG
- Dual ADRV9009 RF Wideband Transceiver
- Four TX and Four RX coherent channels synchronized in frequency and phase
- Wide tuning range 75MHz to 6GHz
- Max receiver BW 200MHz. Up to 800MHz using 4 receivers
- Max transmitter synthesis BW 450MHz
- On-board Xilinx Zynq UltraScale+ MPSoC as Baseband processor
- ZU7/ZU11/ FFVC-1156 Package
- Up to 8GB DDR4-2400 64-bit Processing System (PS) memory with 8-bit ECC
- Up to 4GB DDR4-2400 32-bit Programmable Logic (PL) memory
- eMMC 64GB (V4.51), MRAM 512KB
- On-board PCIe Gen3 Switch. No SBC required in the VPX System
- 1x 1000Base-T on VPX-P2 and 2x 1000Base-X/SGMII on VPX-P1
- 2x RS-232/422/485, Optional10GE Optical Interface (VITA 66.4) on VPX-P2
- 2x USB 3.0/2.0, 2x USB 2.0, 1x SATA 3.1 and DisplayPort 1.2 Video Out on VPX-P2
- Advanced PanaTeQ Board Management Controller (BMC) ARM M3 based and Power Management Bus (PMBus)
- Industrial Air Cooled and Conduction Cooled (VITA 48.0) versions available
Estimated Power Budget (VPX 12V)

Estimated Worst Case Power Budget

- Xilinx Zynq UltraScale+ ZU9G = 10-30 W
- 6 x 4 Gbit DDR4-2400 (2 GB + 512MB) = 4W
- PCIe Switch = 3W
- Miscellaneous = 4W
- DC/DC = 4W
- FMC RF = 10W

Summary

- Low Power configuration = 35 W
- Standard configuration = 45W
- High-performance configuration = 55W
FMC-ZU1RF-A/B-W
FMC Wideband RF Transceiver AD9371/AD9375 based

Technical Specifications

- Vita 57.1-2010 specification compliant
- FMC High Pin Connector (HPC)
- Analog Devices AD9371 (-A) or AD9375 (-B) RF Transceiver
- JESD024B interface up to 6144 Mbps (4x TX, 4x RX)
- LA Bus LVDA and Single-Ended
- Operates with VAdj = 2.5V to 1.8V
- ADRV9371 (-A) ADRV9375 (-B) ADI eval boards HW/SW
- Dual Receivers (Rx)
- Observation Receiver (ORx) with two input
- Sniffer Receiver (SnRx) with 1 input
- TX Ext LO Input/Output. RX Ext LO Input/Output
- Reference Clock Input
- RF Coverage 300MHz to 6.0 GHz. Tx Synthesis Bandwidth (BW) to 250MHz. Rx Bandwidth: 7MHz to 100MHz
- Industrial Air Cooled and Conduction Cooled versions
FMC-ZU2RF-A-W
FMC Wideband RF Transceiver ADRV9009 based

Technical Specifications

- Vita 57.1-2010 specification compliant
- FMC High Pin Connector (HPC)
- Analog Devices ADRV9009 RF Transceiver
- JESD024B interface up to 12288 Mbps (4x TX, 4x RX)
- LA Bus LVDA and Single-Ended
- Operates with VAdj = 2.5V to 1.8V
- ADRV9009 ADI eval board HW/SW compatible
- Dual Transmitters (Tx)
- Dual Receivers (Rx)
- Observation Receiver (ORx) with two input
- RF Ext LO Input/Output. RX Ext LO Input/Output
- Dual FPGA GPIO Input/Output 3.3V to/from FMC
- Reference Clock Input
- RF Coverage 75MHz to 6.0 GHz. Tx Synthesis Bandwidth (BW) to 450MHz. Rx Bandwidth: 7MHz to 200MHz
- Industrial Air Cooled and Conduction Cooled versions
FMC-ZU2RF-B-W (Q1 2019)
FMC Dual Wideband RF Transceiver ADRV9009 based

Technical Specifications

- Vita 57.1-2010 specification compliant
- Dual Analog Devices ADRV9009 RF Transceivers
- FMC High Pin Connector (HPC)
- JESD024B interface up to 12288 Mbps (8x TX, 8x RX)
- LA Bus LVDA and Single-Ended
- Operates with VAdj = 2.5V to 1.8V
- ADRV9009 (single chip) ADI eval board HW/SW compatible
- Quad Transmitters (Tx)
- Quad Receivers (Rx)
- Four TX and Four RX coherent channels synchronized in frequency and phase
- RF Ext LO Input/Output. RX Ext LO Input/Output
- Reference Clock Input
- RF Coverage 75MHz to 6.0 GHz. Tx Synthesis Bandwidth (BW) to 450MHz. Rx Bandwidth: 7MHz to 200MHz
- Industrial Air Cooled and Conduction Cooled versions
Xilinx Development Tools Support

Xilinx SDSoC: Familiar Embedded C/C++ Application Development Experience for SoCs and MPSoCs

Xilinx Vivado HLx: Accelerating High Level Design
Third Party Development Tools Support

Platform development environment support includes Industry Standard:

- Linux Industrial I/O Applications
- MATLAB
- SIMULINK
- GNU RADIO
- Streaming Interface for custom C, C++, PYTHON and C#

Analog Devices (Open Source) HDL reference design and driver to allow optimized Time To Market
Software BSP Support

**LINUX**

- Xilinx PetaLinux (from PanaTeQ and free of charge)
- Yocto Linux
- Mentor Embedded Linux
- Windriver Linux

**RTOS & Bare Metal**

- Xilinx SDK
- FreeRTOS
- Wind River VxWorks 7
- Sysgo PikeOS
- QNX
## Product Codification for Ordering

### VPX3-ZU1-SDR- a - b c d – rl

<table>
<thead>
<tr>
<th>a</th>
<th>RF Tranceiver</th>
<th>b</th>
<th>Device Size</th>
<th>ARM A53 Cores</th>
<th>GPU Mali</th>
<th>Logic Cells</th>
<th>DSP Slices</th>
<th>Memory</th>
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<tbody>
<tr>
<td>A</td>
<td>1x AD9371</td>
<td>A</td>
<td>XCZU6EG</td>
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<td>469K</td>
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<td>XCZU9EG</td>
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<td>32 Mb</td>
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<td>CR</td>
<td>Conduction Rugged</td>
<td>ECC4</td>
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Thank You

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