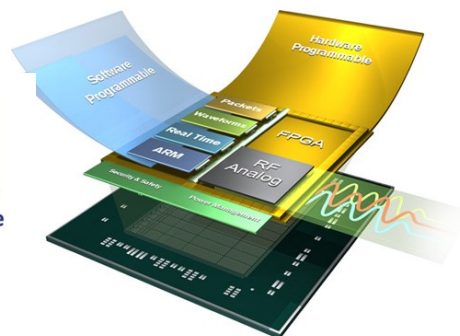


3U VPX Module Xilinx Zynq UltraScale+ RFSoc Gen3



Overview

PanaTeQ's VPX3-RFSOC is a 3U VPX module based on the Zynq UltraScale+ RFSoc Gen3 device from Xilinx.

The board is offered in two models with different possible options :

VPX3-RFSOC-A : Cost Effective model ZU43DR RFSOC with Front and Rear Analog I/O (4x ADC, 4x DAC, 1x REFCLKIN, 1x TRIGGER)

VPX3-RFSOC-B : High-End model ZU47/48DR with Front Analog I/O and Rear Analog I/O (8x ADC, 8x DAC, 2x REFCLKIN, 2x TRIGGER) (**SOSA Aligned**).

The Zynq® UltraScale+™ RFSoc family integrates key subsystems for multiband, multi-mode cellular radios and cable infrastructure (DOCSIS) into an SoC platform that contains a feature-rich 64-bit quad-core ARM® Cortex™-A53 and dual-core ARM Cortex-R5F based processing system.

Combining the processing system with UltraScale™ architecture programmable logic and RF-ADCs, RF-DACs, and soft-decision FECs, the Zynq UltraScale+ RFSoc family is capable of implementing a complete software-defined radio including direct RF sampling data converters, enabling CPRI™ and gigabit Ethernet-to-RF on a single, highly programmable SoC.

Zynq UltraScale+ RFSocs integrate **up to 8 channels** of RF-ADCs and RF-DACs. The RF-ADCs can sample input frequencies up to 6GHz at 5GSPS with excellent noise spectral density. The RF-DACs generate output carrier frequencies up to 6GHz using the 2nd Nyquist zone with excellent noise spectral density at an update rate of 10.554GSPS.

The RF data converters also include power efficient digital down converters (DDCs) and digital up converters (DUCs) that include programmable interpolation and decimation, NCO, and complex mixer. The DDCs and DUCs can also support dual-band operation. The soft-decision FEC (SD-FEC) is a highly flexible forward error correction engine capable of operating in Turbo decoding mode for wireless applications such as LTE and LDPC encode/decode mode used in 5G wireless, backhaul, and DOCSIS 3.1 cable modems.

The board can be ordered with different versions of the Zynq UltraScale+ RFSoc family of devices, coupled up to 8GB 64-bit DDR4-2400 Processing Memory with 8-bit ECC.

Up to 2/4GB 32/64-bit of DDR4-2400 is also available as the Programmable Logic Memory, allowing data streaming signal processing applications. 64GB of soldered eMMC managed NAND Flash is available for local data storage.

Front-end and Rear Analog I/O interfaces are available using on-board **SSMC** or **VITA 67.3 NanoRF** connectors depending of the models.

A large number of the Zynq Ultrascale+ PS peripherals are available on the VPX backplane: ETH 1000Base-T, USB 3.0, RS-232/422/485, GPIOs.

PanaTeQ offers the **VPX3-RFSOC-PSDK-A/B** System Development Kit. Please contact us for more details.

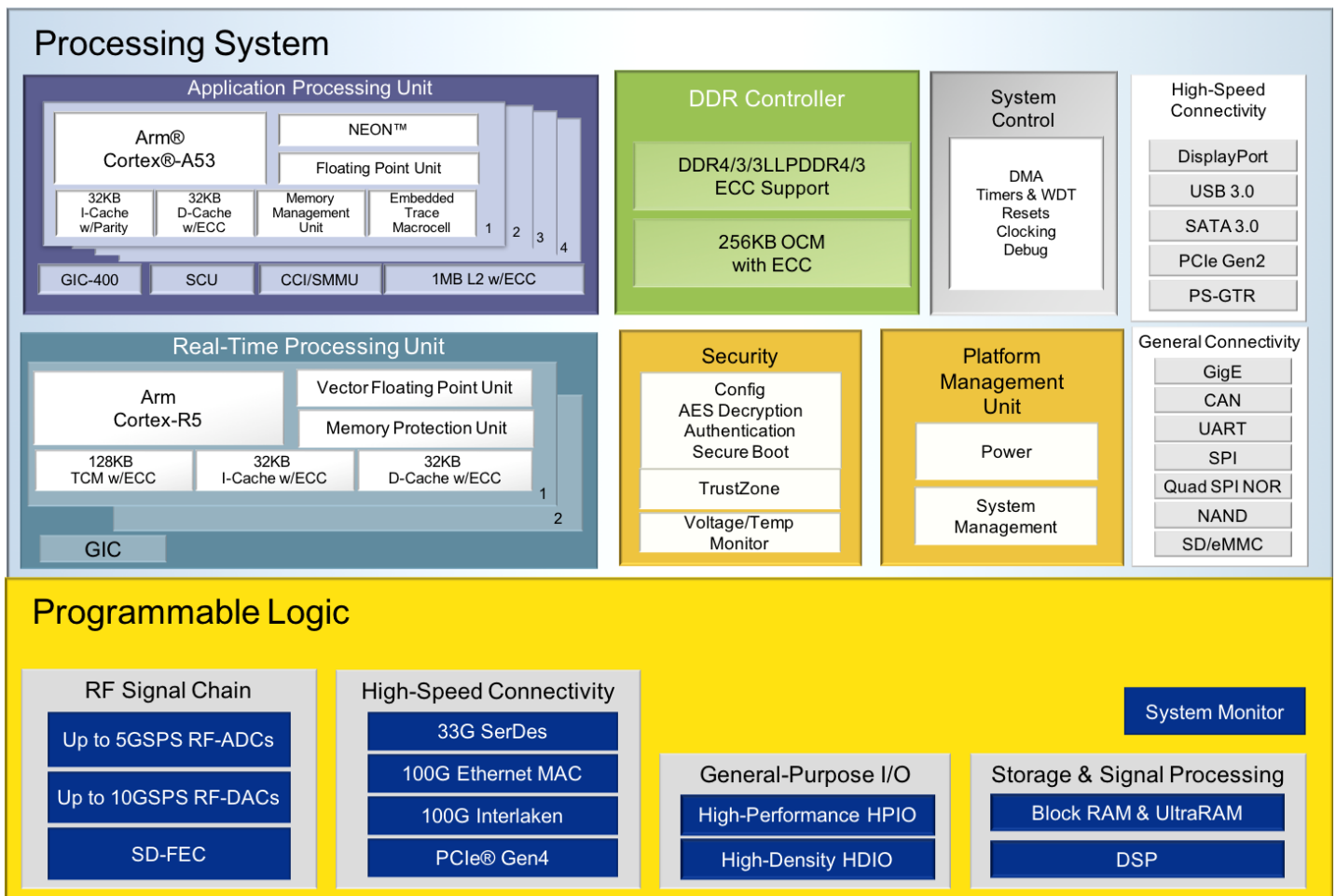
Key Features

- 3U VITA 46.0 46.4 46.6 46.11 48.1 48.2 65.0 Compliant
- Xilinx Zynq UltraScale+ RFSoc Gen3
- SOSA aligned, VITA 67.3D (**Model B**) .
- **Model A** : ZU43DR FFVE1156 Package
- **Model B** : ZU47/48DR FFVG1517 Package
- Quad-Core Cortex-A53 up to 1.3GHz
- Dual-Core Cortex-R5F up to 533MHz
- 4/8GB DDR4-2400 64-bit PS memory with 8-bit ECC
- **Model A** : 2/4GB DDR4-2400 32-bit PL memory
- **Model B** : 4/8GB DDR4-2400 64-bit PL memory
- eMMC 128GB, MRAM 512KB
- Integrated RF Data Converter Subsystem
- **Model A** : 4x 14-bit 5GS/s ADCs, 4x 14-bit 10 GS/s DACs
- **Model B** : 8x 14-bit 5GS/s ADCs, 8x 14-bit 10 GS/s DACs
- Front RF SSMC Connectors
- Rear RF VITA 67.3 NanoRF Connectors (**Optional**)
- 1x GTYx4 (**Model A**), 2x GTYx4 (**Model B**) on VPX
- 2x ETH 1000Base-BX on VPX Control Plane
- 1x ETH 1000Base-T on VPX
- **Model A** : 1x USB 3.0, 2x RS.232/422/485, LVCMOS or 8x LVDS GPIO on VPX
- **Model B** : 1x USB 3.0, 2x RS.232/422/485, LVCMOS GPIO on VPX
- **Model A** : 67.3C. Please contact us for more details
- **Model B** : 67.3D. Please contact us for more details
- Board Management Controller ARM Cortex-M3 based
- Smart Power Management technology
- Board Management Controller SmartFusion based
- VPX System Controller
- Air Cooled and Conduction Cooled

Typical Applications

- Electronic Warfare, Signal Intelligence
- MILCOM, Software Defined Radio, Massive MIMO
- LIDAR/RADAR/SONAR Systems
- Rugged Signal Processing

Xilinx Zynq Ultrascale+ RFSoc Processing System Highlights



Applications processing unit (APU) with quad-core ARM® Cortex™-A53 processors up to 1.5GHz:

- Next-generation ARMv8 architecture supporting 32- or 64-bit data widths
- Ideal for Linux and bare-metal SMP/AMP application systems

Real-time processing unit (RPU) with dual-core ARM Cortex-R5 processors up to 600MHz:

- Low-latency, highly deterministic performance APU offloading

New RF Data Converter SubSystem:

- 14-bit RF-ADCs support sample rates up to 5GSPS
- 14-bit RF-DACs support sample rates up to 10GSPS

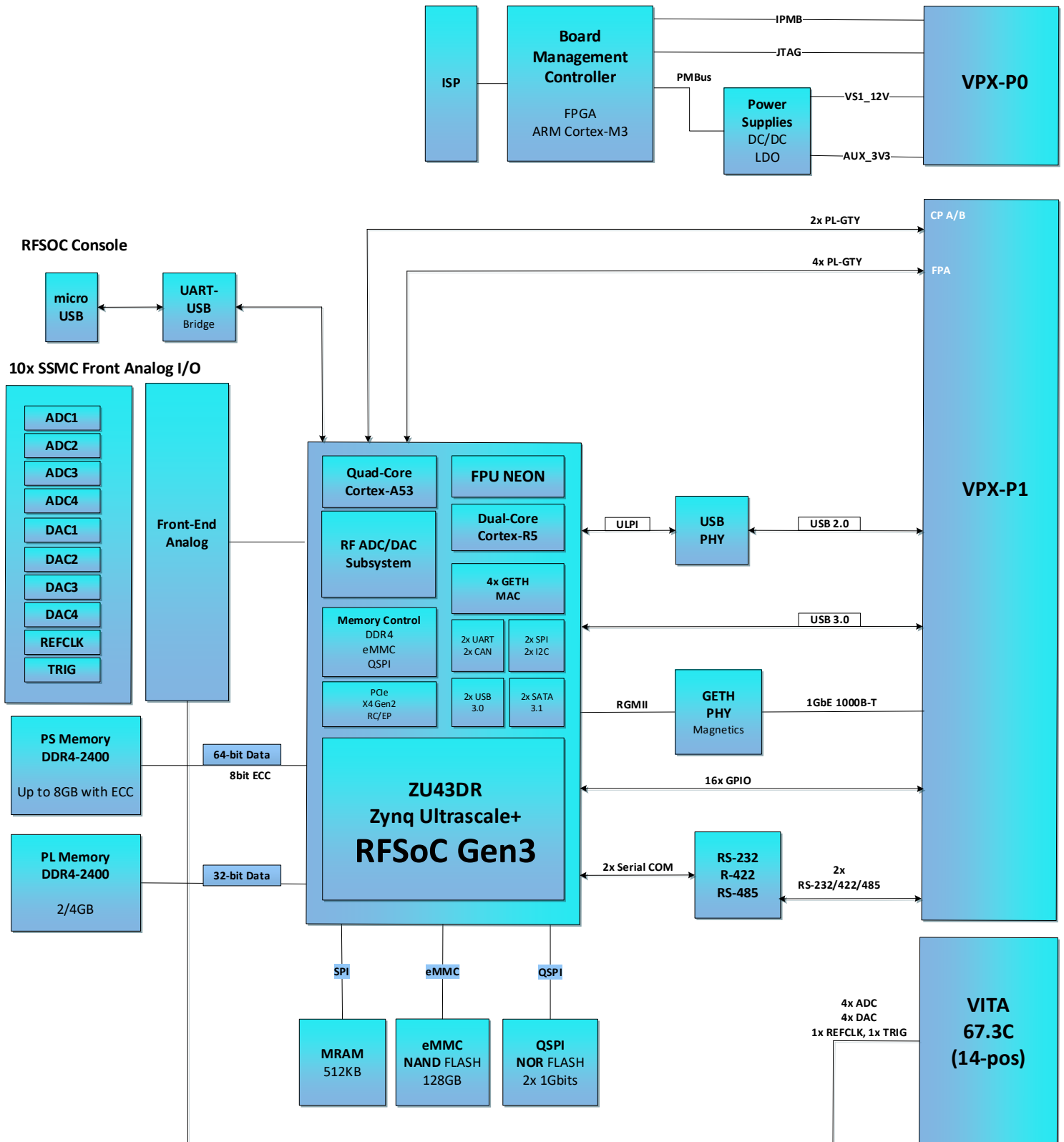
New integrated high-speed peripherals:

- PCIe® Gen1 or Gen2 root complex and integrated Endpoint block in x1, x2, and x4 lanes
- USB 3.0/2.0 with host, device, and OTG modes
- Gigabit Ethernet with jumbo frames and precision time protocol
- SATA 3.1 host
- Dedicated quad transceivers up to 6Gb/s

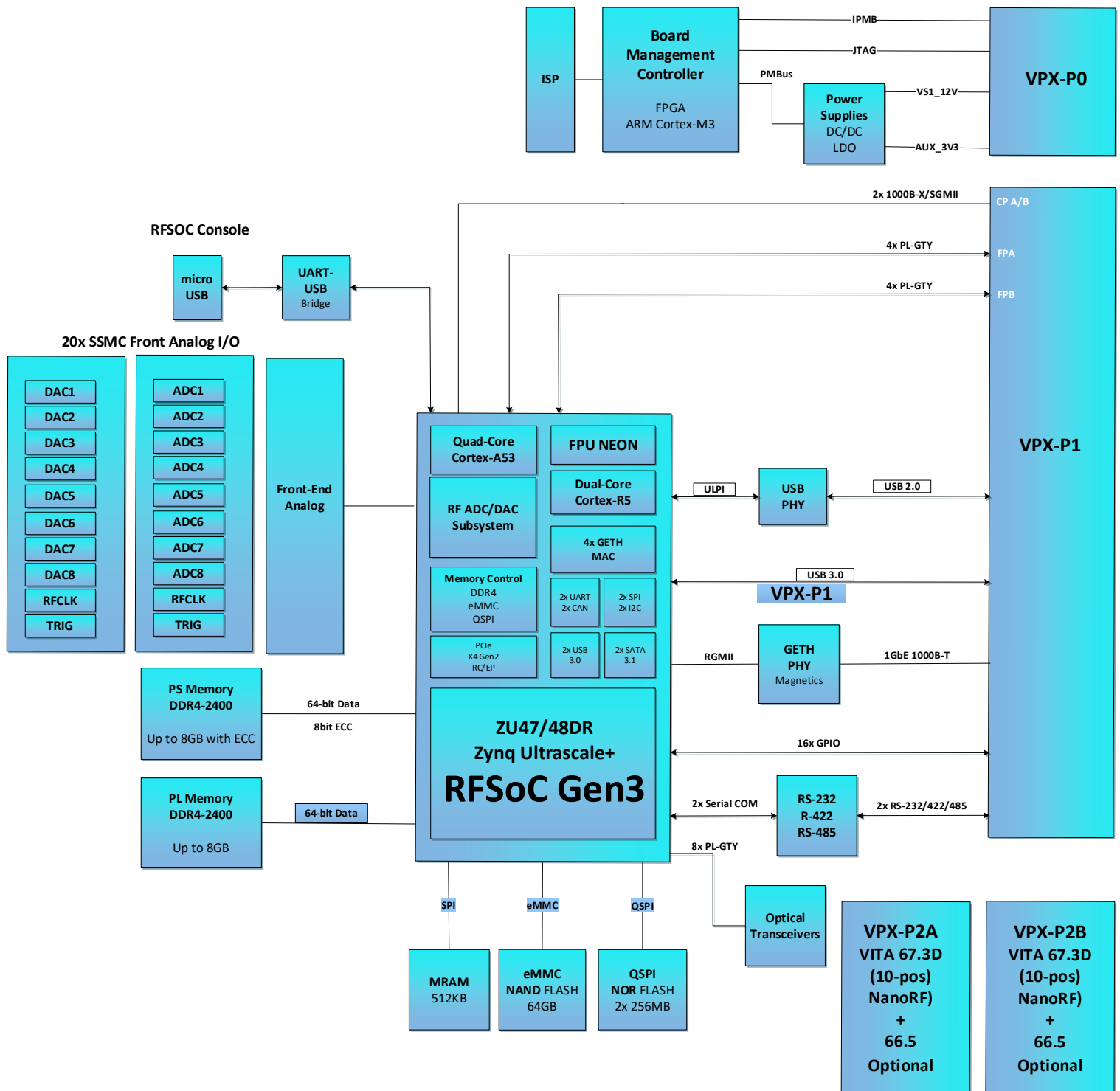
General and boot peripherals:

- CAN, I2C, QSPI, SD, eMMC, and NAND flash interfaces
- GPIO, UART, and trace ports
- 6-port DDR controller with ECC, supporting x32 and x64 DDR3, DDR3L, LPDDR3, LPDDR4, DDR4
- Integrated platform management unit (PMU) supporting multiple power domains
- Integrated configuration security unit (CSU)
- TrustZone support

Block Diagram VPX3-RFSOC-A



Block Diagram VPX3-RFSOC-B



Board Specifications VPX3-RFSOC-A

3U VPX Interfaces

- VITA 46.0, 46.4, 46.11, 65.0, 67.3 VPX/OpenVPX Specifications compliant
- 4x MGT GTY connected to/from Zynq Ultrascale+ RFSOC Programming Logic to/from VPX-P1 FP0
- 1x 1GbE 1000BASE-T, 2x RS-232/422/485, 1x USB 3.0, 1x USB 2.0 16x GPIO
- Board Management Controller (BMC) Interface. VITA 46.11 Ready
- System Controller capability
- JTAG

OpenVPX VITA 65.0 Profiles

- Please contact us for other VITA 65.0 Profiles support

Xilinx Zynq Ultrascale+ RFSoc

- Supported Devices: **ZU43DR** (Speed Grade –1/2) FFVE1156 package
- Processing System : Quad-Core ARM A53, Dual-Core ARM R5F, 2x SATA, 2x USB, 4x GETH MACs
- Programmable Logic: 930K Logic Cells
- On-Chip Memories: 60.5Mb
- DSP Slices: 4272
- High Speed Serial Links: 8 full duplex, high performance, GTY Multi-Gigabit Transceivers (MGT) @ up to 28.0 Gb/s
- Supported by Xilinx standard development tools

Integrated RF Subsystem

- Four 14-bit ADCs 5GSPS
- Four 14-bit DACs 10GSPS

External Memories

- 4GB or 8GB of DDR4-2400 Processor System (PS) memory, 64-bit data, 8-bit ECC
- 2GB or 4GB of DDR4-2400 Programmable Logic (PL) memory, 32-bit data, no ECC
- 128GB eMMC of managed NAND Flash memory. HS200 support @ up to 100MB/s
- 512KB of SPI MRAM (NVRAM)
- 2x 2Gb of QSPI NOR Flash memory for booting Zynq Ultrascale+ RFSOC Programmable Logic and Firmware

Board Management Controller (BMC)

- Based on Microsemi SmartFusion Customizable System-on-Chip (**cSoC**) with on-chip ARM Cortex-M3 at up to 100MHz
- Real-Time Monitoring+Alarms: Voltages, Currents, Temperatures, 6-Axis Accelerometer, Magnetometer and Humidity
- Reset Management, Power-Up and Power-Down Sequencing. Built-In Test (**BIT**)
- Watchdogs (Avionics type)
- Large private 32MB Event Log Flash Memory.
- UART communication with host using RTM-ZU1-A1 Rear-Transition Module
- Smart Power Management technology using LTM467x with PMBus
- Hardware Ready for full Vita 46.11 compliance

Environnemental Specifications

- Compliant with VITA 47 specification. Please contact PanaTeQ for more information

Board Specifications VPX3-RFSOC-B

3U VPX Interfaces

- VITA 46.0/46.4/46.11/65.0 VPX/OpenVPX Specifications compliant
- 8x MGT GTY connected to/from Zynq Ultrascale+ RFSOC Programming Logic to/from VPX-P1 DP0 DP1
- 2x1000BASE-X links on VPX Control Plane
- 1x 1GbE 1000BASE-T, 2x RS-232/422/485, 1x USB 3.0, 1x USB 2.0, 16x GPIO
- Board Management Controller (BMC) Interface. VITA 46.11 Ready
- System Controller capability
- JTAG

SOSA Profile

- Please contact us

Xilinx Zynq Ultrascale+ RFSoc

- Supported Devices: **ZU47DR** / **ZU48DR** (Speed Grade –1/2) FFVG 1517 package
- Processing System : Quad-Core ARM A53, Dual-Core ARM R5F, 2x SATA, 2x USB, 4x GETH MACs
- Programmable Logic: 930K Logic Cells
- On-Chip Memories: 60.5 Mb
- DSP Slices: 4272
- High Speed Serial Links: 16 full duplex, high performance, GTY Multi-Gigabit Transceivers (MGT) @ up to 28 Gb/s
- Supported by Xilinx standard development tools

Integrated RF Subsystem

- Eight 14-bit ADCs 5GSPS
- Eight 14-bit DACs 10GSPS

External Memories

- 4GB or 8GB of DDR4-2400 Processor System (PS) memory, 64-bit data, 8-bit ECC
- 4GB or 8GB of DDR4-2400 Programmable Logic (PL) memory, 64-bit data, no ECC
- 128GB eMMC of managed NAND Flash memory. HS200 support @ up to 100MB/s
- 512KB of SPI MRAM (NVRAM)
- 2x 2Gb of QSPI NOR Flash memory for booting Zynq Ultrascale+ RFSOC Programmable Logic and Firmware

Board Management Controller (BMC)

- Based on Microsemi SmartFusion Customizable System-on-Chip (**cSoC**) with on-chip ARM Cortex-M3 at up to 100MHz
- Real-Time Monitoring+Alarms: Voltages, Currents, Temperatures, 6-Axis Accelerometer, Magnetometer and Humidity
- Reset Management, Power-Up and Power-Down Sequencing. Built-In Test (**BIT**)
- Watchdogs (Avionics type)
- Large private 32MB Event Log Flash Memory.
- UART communication with host using RTM-ZU1-A1 Rear-Transition Module
- Smart Power Management technology using LTM467x with PMBus
- Hardware Ready for full Vita 46.11 compliance

Environmental Specifications

- Compliant with VITA 47 specification. Please contact PanaTeQ for more information

Product Codification

The VPX3-RFSOC-A can be assembled with different versions of the Zynq Ultrascale+ RFSoc devices and various amounts of memory storage. The cooling technique et ruggedization level are also available options. The following table shows the product coding for all these options.

VPX3-RFSOC-A-**A****1****N**-**AS**

	Device	RF-ADC 14-bit 5GSPS	RF-DAC 14-bit 10GSPS	System Logic Cells	DSP Slices	Memory
A	ZU43DR	4	4	930K	4272	60.5 Mb

	Device Speed Grade
1	Slowest
2	Mid

	PS / PL Memory Size
N	4GB/2GB
M	8GB/4GB

	Ruggedization Level	VITA 47
AS	Air Standard	EAC4
AR	Air Rugged	EAC6
CC	Conduction Cooled	ECC3
CR	Conduction Rugged	ECC4

Ordering Information

The following product references are offered by Panateq as standard products. Other combinations of devices, speed grade, memory and cooling can be specially ordered. Please contact us for details

Reference	Device	Speed Grade	Memory PS/PL	Ruggedization Level
VPX3-RFSOC-A-A1N-AS	ZU43DR	-1	4GB/2GB	Standard Air Cooled

Reference	Description
RTM-RFSOC-A	Rear Transition Module for VPX3-RFSOC-A
VPX3-RFSOC-A-PSDK	VPX3-RFSOC System Development Kit

Product Codification

The VPX3-RFSOC-B can be assembled with different versions of the Zynq Ultrascale+ RFSoc devices and various amounts of memory storage. The cooling technique et ruggedization level are also available options. The following table shows the product coding for all these options.

VPX3-RFSOC-B-**A****1****N**-**AS**

	Device	RF-ADC 14-bit 5GSPS	RF-DAC 14-bit 10GSPS	System Logic Cells	SD- FEC	DSP Slices	Memory
A	ZU47DR	8	8	930K	0	4272	60.5 Mb
B	ZU48DR	8	8	930K	8	4272	60.5 Mb

	Device Speed Grade
1	Slowest
2	Mid

	PS / PL Memory Size
N	4GB/4GB
M	8GB/8GB

	Ruggedization Level	VITA 47
AS	Air Standard	EAC4
AR	Air Rugged	EAC6
CC	Conduction Cooled	ECC3
CR	Conduction Rugged	ECC4

Ordering Information

The following product references are offered by Panateq as standard products. Other combinations of devices, speed grade, memory and cooling can be specially ordered. Please contact us for details

Reference	Device	Speed Grade	Memory PS/PL	Ruggedization Level
VPX3-RFSOC-B-A1N-AS	ZU47DR	-1	4GB/4GB	Standard Air Cooled

Reference	Description
RTM-RFSOC-B	Rear Transition Module for VPX3-RFSOC-B
VPX3-RFSOC-B-PSDK	VPX3-RFSOC-B System Development Kit