XMC AMD Zynq UltraScale+ RFSoC Gen3

Overview

PanaTeQ's XMC-RFSOC-A is a XMC module based on the Zynq UltraScale+ RFSoC Gen3 device from AMD.

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-R5 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 inter polation 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.

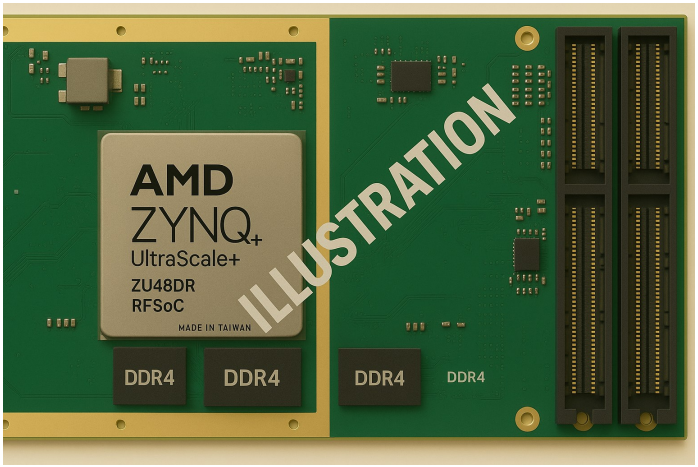
Up to 4GB 32-bit of DDR4-2400 is also available as the Programmable Logic Memory, allowing data streaming signal processing applications. 256GB of soldered eMMC managed NAND Flash is available for local data storage.

Frond-end Analog I/O interfaces are available using on-board **RF connectors**.

The board can act as a **PrPMC** in the system.

A large number of the Zynq Ultrascale+ RFSOC PS peripherals are available on the XMC connectors: ETH 1000Base-T, USB 3.0/2.0 , SATA 3.1, RS-232/422/485, DisplayPort 1.2, GPIOs.

PanaTeQ's XMC-RFSOC-A-PSDK-A is also available for developpers



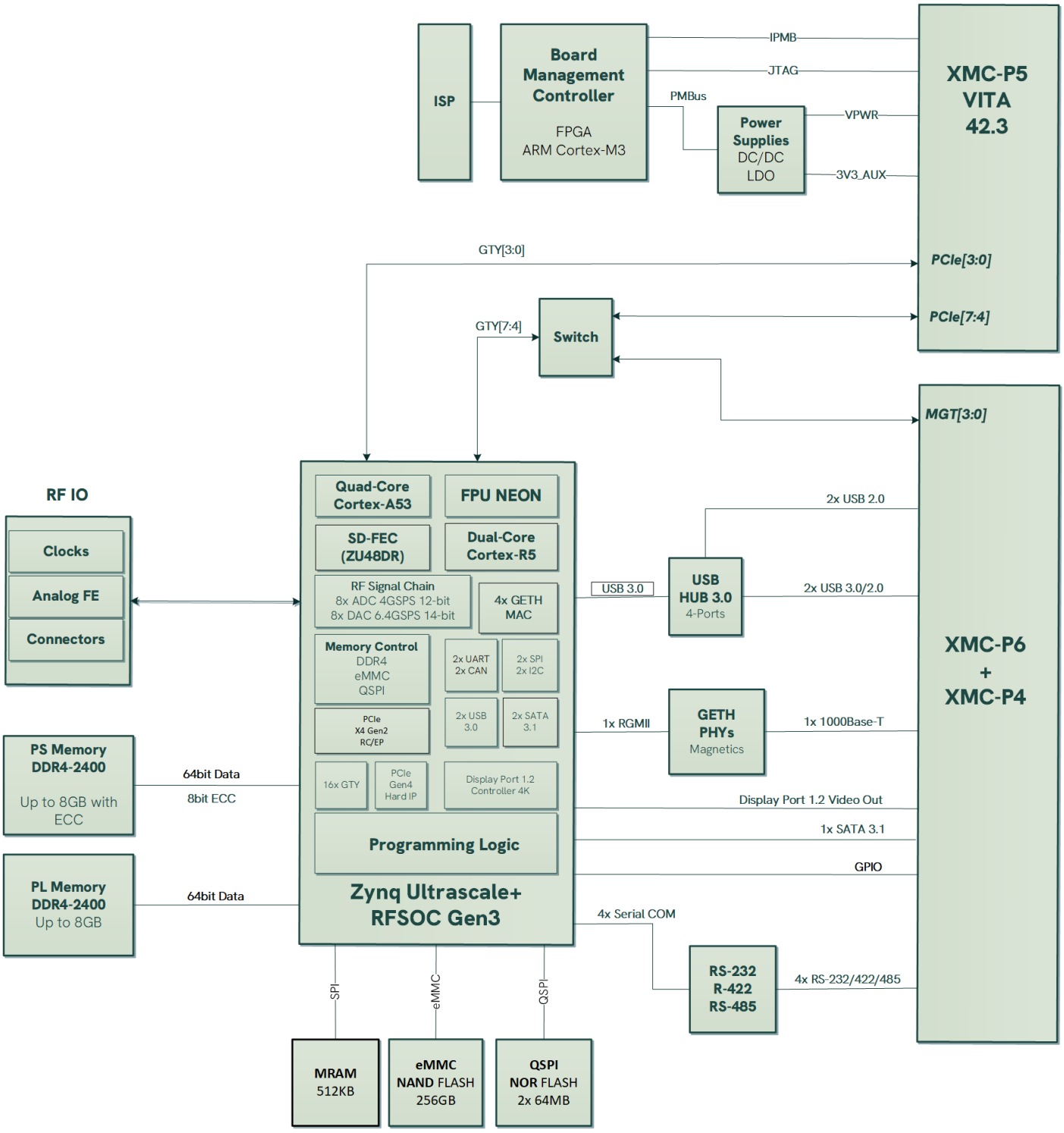
Key Features

- Vita 42.3 XMC Compliant
- AMD Zynq UltraScale+ RFSOC Gen3
- ZU43DR/ZU47DR/ZU48DR FFVE-1156 Package
- Integrated RF Data Converter Subsystem
- 8x ADC 14-bits @5GS/s (4x ZU43DR)
- 8x DAC 14-bits @10GS/s (4x ZU43DR)
- Up to 8GB DDR4-2400 64-bit PS memory with 8-bit ECC
- Up to 8GB DDR4-2400 64-bit PL memory
- eMMC 64GB (V4.51), MRAM 512KB
- Up to PCIe x8 Gen1/2/3/4 on XMC-P5
- 4x GTY on XMC-P6 (muxed with XMC-P5)
- 1x Display Port 1.2 Video Out on XMC-P6
- 1x ETH 1000Base-T on XMC-P4
- 2x USB 3.0/2.0, 2x USB 2.0, 1x SATA 3.1 on XMC-P6
- 1x DisplayPort 1.2 on XMC-P6
- 4x RS.232/422/485 and GPIO on XMC-P4
- Up to 20x Front Panel RF IO
- Board Management Controller ARM Cortex-M3 based
- Air Cooled and Conduction Cooled

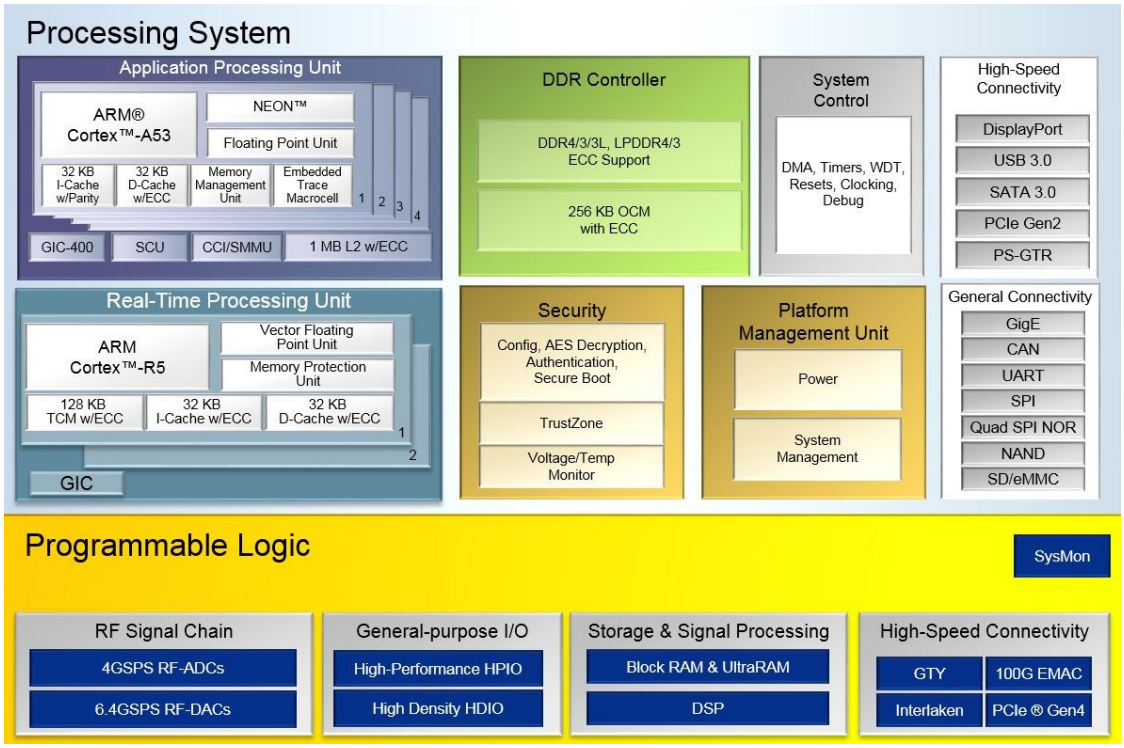
Typical Applications

- Instrumentations
- MILCOM
- Software Defined Radio,
- Massive MIMO
- Electronic Warfare,
- Signal Intelligence

Block Diagram



AMD 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

Integrated RF Signal Chain:

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

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
- Peripheral and memory protection

Board Specifications

XMC Interfaces

- VITA 42.3 Specifications compliant
- XMC P5: Up to 8 lanes PCIe Gen1/2/3 (2x PCIe x4 ot 1x PCIe x8)
- XMC P6: 4x MGT GTY @ up to 28 Gb/s connected to/from Zynq RFSOC Programming Logic
- XMC P4; 1x ETH 1000BASE-T, 4x RS-232/422/485, GPIO
- XMC P6: 1x SATA 3.1, 1x Display Port 1.2 VIDEO OUT, 2x USB 3.0/2.0, 2x USB 2.0
- XMC P5: IPMI EEPROM, Temperatures, Voltages, Currents, Board Management Controller (BMC), JTAG

AMD Zynq Ultrascale+ RFSOC

- Supported Devices:**ZU43DR** / **ZU47DR** / **ZU48DR** FFVE1156 package (Speed Grade -1/2/3)
- Processing System : Quad-Core ARM A53, Dual-Core ARM R5, 2x SATA, 2x USB, 4x GETH MACs
- Programmable Logic: 930K Logic Cells (ZU43DR) / 930K Logic Cells (ZU47DR) / 930K Logic Cells (ZU48DR)
- On-Chip Memories: 60.1Mb (ZU43DR) / 60.1Mb (ZU47DR) / 60.1Mb (ZU48DR)
- DSP Slices: 4272 (ZU43DR) / 4272 (ZU47DR) / 4272 (ZU48DR)
- High Speed Serial Links: 8 full duplex, high performance, GTY Multi-Gigabit Tranceivers (MGT) @ up to 28 Gb/s

External Memories

- Up to 8GB of DDR4-2400 Processor System (PS) memory, 64-bit data, 8-bit ECC
- Up to 8GB of DDR4-2400 Programmable Logic (PL) memory, 64-bit data, no ECC
- 256GB eMMC v4.51 of managed NAND Flash memory. HS200 support @ up to 100MB/s
- 512KB of SPI MRAM (NVRAM)
- 2x 1Gb of QSPI NOR Flash memory for booting Zynq RFSoC Programmable Logic and Firmware Processing System

Integrated RF Subsystem

- Four (ZU43DR) or Eight (ZU47DR, ZU48DR) 14.bit ADCs 5GSPS
- Four (ZU43DR) or Eight (ZU47DR, ZU48DR) 14.bit DACs 10GSPS

Front RF I/O

- Up to 20 RF I/O (8x ADC, 8x DAC, 2x RefClkIn, 2x Trigger)

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. Buit-In Test (**BIT**) with Watchdogs (Avionics type)
- Large private 32MB Event Log Flash Memory.
- UART communication with host
- Smart Power Management technology using LTM467x wiith PMBus
- Hardware Ready for full Vita 46.11 compliance

Environnemental Specifications

- Commercial Ruggudized 0-50C
- Conduction Cooled -40C to 70C at Thermal Interface

Product Codification

The XMC-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.

XMC-RFSOC–A– abc – rl

a	Device Size	ADC	DAC	System Logic Cells	DSP Slices	Memory	SD-FEC
A	ZU43DR	4	4	930K	4272	60.5 Mb	No
B	ZU47DR	8	8	930K	4272	60.5 Mb	No
C	ZU48DR	8	8	930K	4272	60.5 Mb	Yes

b	Device Speed Grade
1	Slowest
2	Faster

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

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

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	Memory PS/PL	Ruggedization Level
XMC-RFSOC-A1N-AS	ZU43DR	-1	4GB/2GB	Standard Air Cooled
XMC-RFSOC-B1N-AS	ZU47DR	-1	4GB/2GB	Standard Air Cooled
XMC-RFSOC-C1N-AS	ZU48DR	-1	4GB/2GB	Standard Air Cooled

Reference	Description
XMC-RFSOC-A-PSDK-A	XMC-RFSOC-A System Development Kit
IOC-XMC-RFSOC-A	IO Carrier for XMC-RFSOC-A
VPX3C-RFSOC-A	3U VPX Carrier for XMC-RFSOC-A
PCIeC-RFSOC-A	PCIe Carrier for XMC-RFSOC-A

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Available from: