VPX3-VERSA2

3U VPX AMD Versal™ Prime Module with FMC+ Site

Overview

PanaTeQ's **VPX3-VERSA2** is a 3U OpenVPX module based on the **AMD Versal™ Prime Series adaptive SoC**, supporting the VM1502 and VM1802 devices in the VFVC1760 package.

The Versal Prime device integrates a Dual-Core Arm Cortex-A72 Application Processing Unit (APU), a Dual-Core Arm Cortex-R5F Real-Time Processing Unit (RPU), DSP Engines and a large Programmable Logic fabric in a single device. It also provides high-speed serial transceivers, integrated PCIe and Ethernet resources, on-chip memories and a wide range of peripheral interfaces.

The VPX3-VERSA2 can be configured with **4GB or 8GB of 64-bit DDR4-3200 Processing System memory with 8-bit ECC**. An additional **4GB 32-bit LPDDR4-2133 memory** is connected to the Programmable Logic, providing high-bandwidth local memory for signal processing, data acquisition and streaming applications. A 256GB soldered eMMC device provides local non-volatile mass storage.

For front-end I/O, an on-board **VITA 57.4 FMC+ site** provides a flexible interface for a wide range of mezzanine cards used in Electronic Warfare, Software Defined Radio, high-speed communications, RADAR, SONAR, LIDAR, video and signal-processing applications.

The VPX3-VERSA2 introduces **PanXIO™ — PanaTeQ eXtensible I/O Architecture**, a programmable I/O layer based on an AMD Artix UltraScale+ FPGA. PanXIO provides flexible connectivity and electrical adaptation between the **FMC+ parallel I/O, VPX backplane GPIOs and the AMD Versal Prime device**.

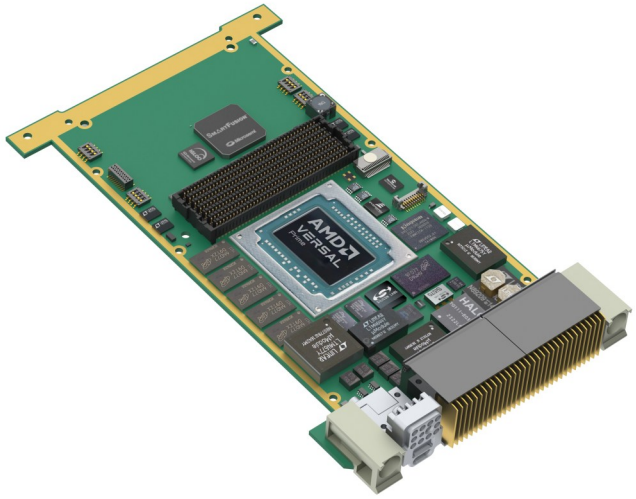
The FMC+ high-speed serial architecture remains optimized for maximum performance, with **24 GTY transceiver lanes directly connected between the FMC+ site and the Versal Prime device**, independently from PanXIO.

The board features advanced digitally controlled power converters with PMBus interfaces together with PanaTeQ's Smart Power Management architecture and an independent Board Management Controller for power sequencing, monitoring, diagnostics and system management.

The VPX3-VERSA2 can operate as a **Single Board Computer and VPX System Controller**, eliminating the need for an additional SBC in many systems and improving overall Size, Weight, Power and Cost (SWaP-C).

A large number of peripheral interfaces are available through the VPX backplane, including Gigabit Ethernet, USB 2.0, RS-232/422, GPIOs and CAN-FD.

The air-cooled **VPX3-VERSA2-PSDK System Development Kit** is available for software and FPGA developers and includes the VPX3-VERSA2 module, RTM-VERSA2, laboratory VPX chassis, BSP, FPGA reference designs and required cables.



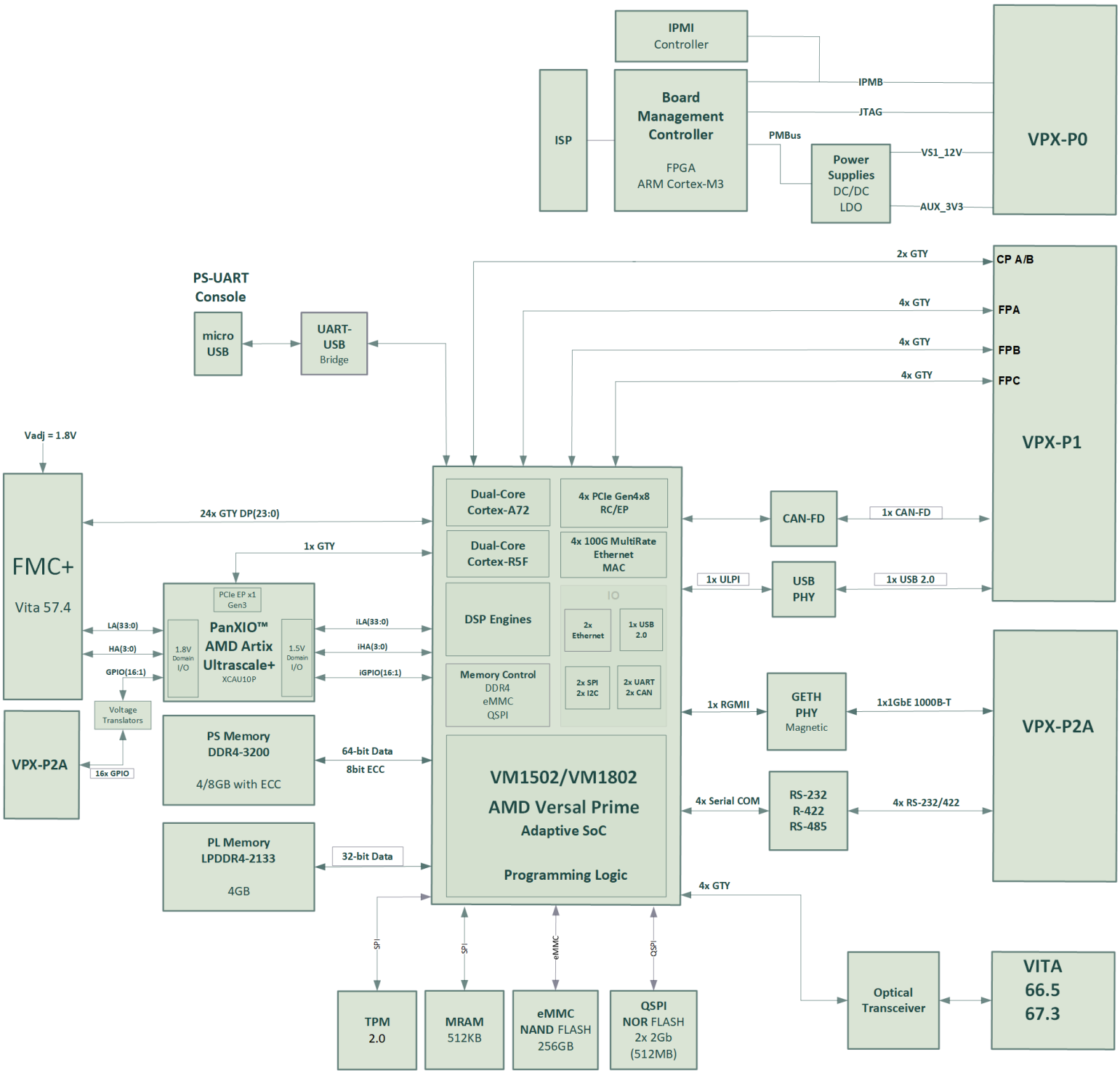
Key Features

- 3U VITA 46.0, 46.4, 46.6, 65.0 Compliant
- Optional **SOSA Aligned** version **VPX3-VERSA2S**
- Based on AMD Versal™ Prime Gen1 Series
- VM1502/VM1802 VFVC1760 Package
- Dual Core Arm A72 up to 1.7 GHz
- Dual Core Arm R5F up to 750 MHz
- DSP Engines up to 1968
- 4GB or 8GB DDR4-3200 64-bit PS memory with 8-bit ECC
- 4GB LPDDR4-2133 32-bit PL memory
- 512MB (2x 2Gb) QSPI NOR, eMMC 256GB, MRAM 512KB
- Flash-memory-based trusted platform module (TPM 2.0) connected to PS-SPI
- 12x GTY on VPX-P1 Data Plane, PCIe up to Gen4 support
- 2x GTY for 1000BASE-X/SGMII on VPX-P1 Control Plane
- 16x GPIOs on VPX-P2A
- 1x ETH 1000Base-T on VPX-P2A
- 4x RS232 or 2x Full-Duplex RS422 on VPX-P2A
- 1x USB 2.0 on VPX-P1
- FMC+ VITA 57.4 site **VAdj = 1.8V** with 24x GTY + 38x differential I/O pairs
- **PanXIO™ PanaTeQ eXtensible I/O Architecture**
- **Programmable FMC+ and VPX I/O interface based on AMD Artix™ UltraScale+ FPGA**
- Optional **VITA 66.5** Full-Duplex Optical Interfaces for 40Gb (4x 10Gbps) or 100Gb (4x 25Gbps) with 10 nanoRF **VITA67.3**
- Smart Power Management using DC/DC with PMBus
- Board Management Controller ARM Cortex-M3 based
- VPX System and IPMI controllers
- Air Cooled and Conduction Cooled
- KVPX Connectors in option

Typical Applications

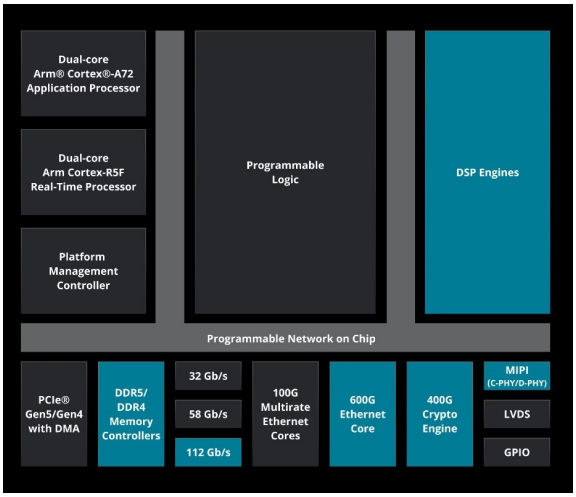
- MILCOM, Software Defined Radio, MIMO
- Situational Awareness Systems
- Electronic Warfare, Signal Intelligence
- LIDAR/RADAR/SONAR Systems
- Advanced Multi-Axes Motors Control
- Video CODEC and Signal Processing

Block Diagram



AMD Versal™ Prime Adaptive SoC Overview

AMD Versal™ Prime Series Architecture



Generic AMD Versal™ Prime Series architecture — available resources and hardened IPs depend on device.

Architecture

The AMD Versal™ Prime adaptive SoCs combine software-programmable processing, programmable logic, high-performance DSP resources and hardened connectivity in a highly integrated device. A programmable Network-on-Chip (NoC) provides high-bandwidth connectivity between the Processing System, Programmable Logic, memory controllers and integrated peripherals. The architecture also includes a dedicated Platform Management Controller responsible for device boot, configuration, security and system monitoring.

Compute and Acceleration

The Processing System integrates a Dual-Core Arm® Cortex®-A72 Application Processing Unit and a Dual-Core Arm Cortex-R5F Real-Time Processing Unit. The Programmable Logic provides high-performance adaptable hardware resources for custom data processing and acceleration. Enhanced DSP58 Engines support fixed-point, floating-point and complex arithmetic operations for demanding signal-processing applications.
The VM1502 provides 981K system logic cells, 448,512 LUTs and 1,312 DSP Engines, while the VM1802 provides 1,968K system logic cells, 899,840 LUTs and 1,968 DSP Engines.

Platform Management

The dedicated Platform Management Controller (PMC) manages device boot and configuration independently from the Processing System. It also provides security, authentication, system monitoring and debug capabilities and controls configuration of the Programmable Logic.

Connectivity

The VM1502 and VM1802 devices provide 44 GTY high-speed serial transceivers operating at up to 32.75 Gb/s, together with hardened PCI Express and Ethernet connectivity. Both devices integrate 4x PCIe Gen4 x8 blocks and 4x 100G Multirate Ethernet MACs.
High-performance XPIO banks provide flexible parallel I/O connectivity and interfaces to external DDR4 and LPDDR4 memories. The programmable NoC provides high-bandwidth data movement between memory, processing resources, Programmable Logic and integrated peripherals.

Board Specifications

3U VPX Interfaces

- VITA 46.0/46.4/46.6/65.0 VPX/OpenVPX Specifications compliant
- Optional **SOSA Aligned** VPX3-VERSA2S. Please contact us for more details
- 12x GTY on VPX-P1 Data Plane, PCIe up to Gen4 support
- 2x GTY for 1000BASE-X/SGMII on VPX-P1 Control Plane
- I/O: 1x 1000BASE-T, 4x RS-232 or 2x Full-Duplex RS-422, 1x USB 2.0, 16x GPIOs, 1x CAN-FD
- On-board **IPMI SOSA compliant** from ELMA, VPX System Controller. JTAG Support

OpenVPX VITA 65.0 Profiles

- MOD3-PAY-1F2F2U-16.2.2-n using slot profile **SLT3-PAY-1F2F2U-14.2.2**
- Optional 4x Full-Duplex Optical Links **VITA 66.5** and 10x nanoRF **VITA 67.3**
- Please contact us for more details

SOSA Aligned Profiles

- Please contact us for more details

AMD Versal Prime

- Supported Devices: **VM1502** / **VM1802** VFVC1760 Package (Speed Grade –1/2)
- Processing System : Dual-Core ARM A72, Dual-Core ARM R5F, 2x USB, 2x GETH MACs
- Programmable Logic: 981K Logic Cells (VM1502) / 1968K Logic Cells (VM1802)
- 448,612 LUTs (VM1502) / 899,840 LUTs (VM1802)
- On-Chip Memories: 178Mb (VM1502) / 191Mb (VM1802)
- DSP Engines: 1312 (VM1502) / 1968 (VM1802)
- Hard IPs: 4x PCIe Gen4x8, 4x 100G Multirate Ethernet MAC
- High Speed Serial Links: 44 full duplex, high performance, GTY Multi-Gigabit Transceivers (MGT) @ up to 32.75 Gb/s

External Memories

- Up to 8GB of DDR4-3200 Processor System (PS) memory, 64-bit data, 8-bit ECC
- 4GB of LPDDR4-2133 Programmable Logic (PL) memory, 32-bit data, no ECC
- 256GB eMMC of managed NAND Flash memory. HS200 support @ up to 100MB/s
- 512KB of SPI MRAM (NVRAM), Flash-memory-based trusted platform module (TPM 2.0)
- 2x 2Gb (512MB) of QSPI NOR Flash memory for booting VERSAL Programmable Logic and Firmware Processing System

VITA 57.4 FMC+ Slot

- Compliant with VITA 57.4 specification. **VADJ = 1.8 V**
- 24x high-performance GTY transceivers directly connected to AMD Versal Prime
- FMC+ parallel I/O routed through PanXIO™ programmable I/O architecture
- LA[33:0] and HA[3:0] connected to PanXIO™
- FMC+ clock interfaces connected to PanXIO™

PanXIO™ PanaTeQ eXtensible I/O Architecture

- AMD Artix UltraScale+ XCAU10P based
- Programmable interface between FMC+, VPX I/O and AMD Versal Prime
- 1.8 V FMC+ to 1.5 V Versal XPIO electrical adaptation
- 16x VPX-P2A GPIOs
- PCIe Gen3 x1 internal link between PanXIO™ and AMD Versal Prime

Board Management Controller (BMC)

- Based on Microsemi SmartFusion Customizable System-on-Chip (**cSoC**) with on-chip ARM Cortex-M3
- Real-Time Monitoring+Alarms: Voltages, Temperatures, 6-Axis Accelerometer, Magnetometer and Humidity sensors

Environmental Specifications

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

Product Codification

The VPX3-VERSA2 can be assembled with different versions of the VERSAL devices and various amounts of memory storage.
The cooling technique and ruggedization level are also available options. The following table shows the product coding for all these options.

VPX3-VERSA2– abc–d–rl–e–k

a	Device	DSP Engines	Logic Cells	LUTs	Memory
A	VM1502	1312	981K	448512	178 Mb
B	VM1802	1968	1968K	899840	191 Mb

b	Device Speed Grade
1	Slowest
2	Mid

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

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

d	Optical Links
O	4x 10Gbps
F	4x 25Gbps

e	Tropicalization
E	Conformal Coating

k	Backplane Connectors
K	KVPX Connectors

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	Description
RTM-VERSA2-A	Rear Transition Module for VPX3-VERSA2
VPX3-VERSA2-PSDK-A-A1N-AS	VPX3-VERSA2-A1N-AS System Development Kit

Reference	Device	Speed Grade	Memory PS/PL	Ruggedization Level
VPX3-VERSA2-A1N-AS	VM1502	-1	4GB/4GB	Standard Air Cooled

PanaTeQ Contact

info@panateq.com

Available from: