6U VME64x Airborne Computer

The 6U VME64x Airborne Computer is a single slot, 64-bit PowerPC-based computing system with a wide variety of inputs and outputs as well as multi-function interfaces. The Airborne Computer host board uses a dual-core NXP MPC8640D processor and provides three Gigabit Ethernet channels, two serial UARTs, NAND and NOR flash memory.

Two companion XMC adapters provide multiple I/O options. As standard, the first companion XMC adapter provides two dual-redundant MIL-STD-1553B channels, nine ARINC 429 channels (six input and three output), four RS-232/422/485 channels and 2 MByte of Parallel Non-Volatile Random Access Memory (NVRAM). The second companion XMC adapter provides the modern Xilinx Artix-7 series FPGA which is configured with a dual-channel high-speed 160 MSps Analog-to-Digital converter, eight RS-422/485 channels and 32 Low Voltage Transistor-Transistor Logic (LVTTL) I/O signals routed to the backplane connector, as well as eight SMD LED signals from the User FPGA. This FPGA is user-programmable.

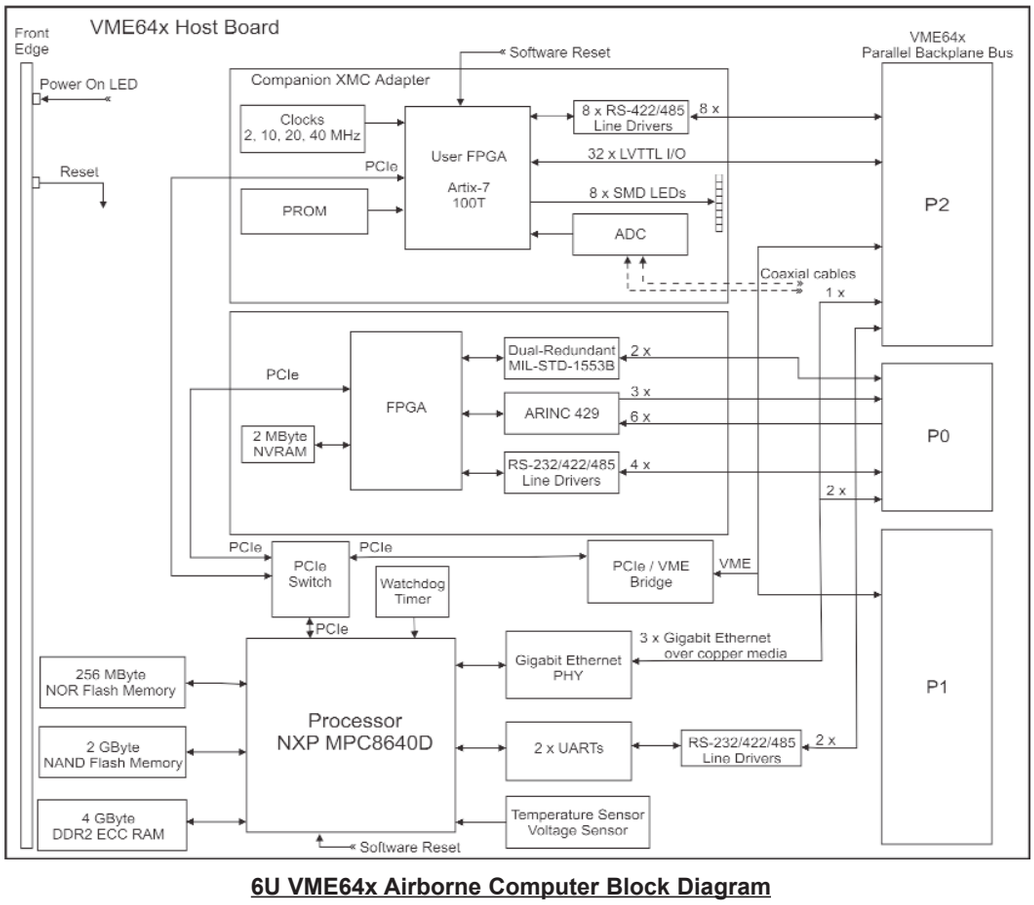
The 6U VME64x Airborne Computer is compatible with any 6U VME64x backplane and complies with VITA 1.1-1997 R2003 with the exception of the reduced depth.

The 6U VME64x Airborne Computer has multiple memory and CPU speed configurations and is available in commercial grade air-cooled, industrial grade air-cooled and ruggedised grade conduction-cooled versions.

Architecture

The Airborne Computer consists of a VME64x host board, having a PowerPC MPC8640D processor and two PMC/XMC sites, with a PCIe switch linking the XMC sites to the MPC8640D processor.

Two companion XMC adapters are used to provide access to multiple I/O interfaces and options, as well as the Xilinx Artix-7 FPGA. The PMC I/O signals are connected to the VME64x P2 and P0 connectors on the backplane.



6U VME64x Airborne Computer Block Diagram

6U VME64x Airborne Computer

Features

- NXP dual-core MPC8640D processor
- 64-bit parallel backplane bus
- 4 GByte of DDR2 ECC SDRAM
- 256 MByte of NOR Flash Memory
- 2 GByte of NAND Flash Memory
- 2 MByte of Parallel NVRAM
- 6 x RS-232/422/485 channels routed to backplane connector
- 3 x Gigabit Ethernet channels over copper media to backplane connector
- I²C Temperature Sensor and Voltage Sensor
- Watchdog Timer and four 32-bit Timers
- Xilinx Artix-7 100T Series FPGA (User FPGA)
- 8 x duplex RS-422/485 channels (routed to User FPGA)
- 2 MHz, 10 MHz, 20 MHz and 40 MHz Clocks (routed to User FPGA)
- Dual-channel 14-bit 160 MSps ADC module (routed to User FPGA)
- 3 x Tx and 6 x Rx ARINC 429 channels
- 2 x dual-redundant MIL-STD-1553B channels (Bus Controller and Remote Terminal)
- 20 x Test Signals from User FPGA
- 32 x Low Voltage TTL (LVTTL) I/O signals
- 8 x SMD LED Signals from User FPGA
- Software Reset for Processor and User FPGA
- Reset Button and Power On LED
- Rear Transition Module (RTM) with 3 x Gigabit Ethernet connectors and 2 x RS-232 connectors

Specifications

Processor	NXP MPC8640D processor with dual PowerPC e600 cores at 1,0 GHz
Cache	32 KByte of L1 Instruction Cache per core 32 KByte of L2 Data Cache per core 1 MByte of L2 Cache per core
RAM Memory	4 GByte of DDR2 ECC SDRAM Memory in two channels
Flash Memory	256 MByte of NOR Flash Memory 2 GByte of NAND Flash Memory
Non-Volatile Memory	2 MByte of Parallel NVRAM (on companion XMC adapter)
Serial I/O	6 x UART channels : 2 x RS-232/422/485 channels with software flow control, routed to backplane connector 4 x RS-232/422/485 channels, routed to backplane connector
Gigabit Ethernet LAN	3 x Gigabit Ethernet channels over copper media, routed to backplane connector
Temperature and Voltage Sensor	I²C Temperature Sensor and Voltage Sensor Accuracy : +/-3% over range -40 C to +85 C
Timers	Watchdog Timer and four 32-bit Timers (Watchdog timeout of 10 seconds)
ADC	Two independent 14-bit ADC channels with configurable sampling rate up to 160 MSps per channel continuous capture : - Signal Bandwidth : 3 MHz - Signal Amplitude : 2,2 V peak-peak - Sampling Rate : up to 160 MSps - SINAD : 72 dB - SFDR : 86 dB - ADC Resolution : 14 bits - Coupling : DC - Line Termination : 50 Ohm Input via coaxial cables

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Specifications (continued)

Formfactor (Size)	6U VME64x (VITA 1.1-1997 R2003) with modified depth
Backplane Connectors	IEC 61076-4-113 160-pin connector x 2 IEC 61076-4-101 95-pin connector x 1
Software Resets	Software Reset for Processor Software Reset for User FPGA
MIL-STD-1553B	2 x dual-redundant channels, routed to backplane connector, Bus Controller and Remote Terminal
ARINC 429	3 x transmit channels, routed to backplane connector 6 x receive channels, routed to backplane connector
User FPGA	Xilinx Artix-7 100T Series with up to 100K logic cells
RS-422/485	8 x RS-422/485 channels, routed from User FPGA to backplane connector (Tx+/Tx- and Rx+/Rx-)
LVTTL I/O	32 x Low Voltage TTL interfaces routed to backplane connector from User FPGA for external user interface
PROM	Platform Flash Memory for configuration of User FPGA Programmable through JTAG
Clocks	2 MHz, 10 MHz, 20 MHz and 40 MHz routed to User FPGA
Test Signals	20 x Test Signals from User FPGA routed to Header on companion XMC adapter 8 x SMD LED Signals from User FPGA on companion XMC adapter
Test Interface	JTAG Header

Characteristics

	Dimensions	**Cooling**	**Weight**
Physical	233,35 mm high 160,0 mm deep including VME connectors ≈16 mm wide	Air	780 g +/- 50 g
	233,35 mm high less than 160,0 mm deep including VME connectors ≈16 mm wide	Conduction	770 g +/- 50 g
Maximum Power Consumption	MPC8640D Dual-Core 1,0 GHz	55 Watt	
Software	VxWorks Operating System and software drivers Support for Gentoo Linux		

6U VME64x Airborne Computer

Reliability

MTBF	Figures according to MIL-HDBK-217F, Parts Stress Method		
	Commercial Grade	Ground Benign, Controlled, 25 C	105 000 hours
	Industrial Grade	Ground, Mobile, 45 C	13 000 hours
		Naval, Sheltered, 40 C	22 000 hours
		Airborne, Inhabited Cargo, 55 C	11 000 hours
		Airborne, Uninhabited Cargo, 70 C	7 000 hours
		Airborne, Rotary Wing, 55 C	8 000 hours
		Airborne, Inhabited Fighter, 55 C	8 000 hours
		Airborne, Uninhabited Fighter, 70 C	4 000 hours
	Ruggedised Grade	Ground, Mobile, 45 C	14 000 hours
		Naval, Sheltered, 40 C	24 000 hours
		Airborne, Inhabited Cargo, 55 C	12 000 hours
		Airborne, Uninhabited Cargo, 70 C	7 000 hours
		Airborne, Rotary Wing, 55 C	9 000 hours
		Airborne, Inhabited Fighter, 55 C	10 000 hours
		Airborne, Uninhabited Fighter, 70 C	5 000 hours

Environmental Specifications

	Commercial Grade	Industrial Grade	Ruggedised Grade
Temperature **- Operating** **- Storage**	0 C to +55 C -40 C to +85 C	-40 C to +70 C -55 C to +85 C	-40 C to +85 C -55 C to +105 C
Humidity	0% to 90%	0% to 95%	0% to 95%
Shock	20 g peak for 11 ms	30 g peak for 11 ms	40 g peak for 11 ms
Vibration **- Sine** **- Random**	2 g (peak) 10 Hz to 100 Hz 0,002 g²/Hz 5 Hz to 2 kHz	5 g (peak) 5 Hz to 2 kHz 0,04 g²/Hz 5 Hz to 2 kHz	10 g (peak) 5 Hz to 2 kHz 0,1 g²/Hz 5 Hz to 2 kHz

Part Selector

Part Designation	Cooling	Grade
CCII/AC/6UVME64x/002/COM	Air	Commercial
CCII/AC/6UVME64x/002/IND	Air	Industrial
CCII/AC/6UVME64x/002/CC	Conduction	Ruggedised