Penguin Edge™ MVME7100

NXP® MPC864xD VME SBC

- ▸ Up to 1.3GHz system-on-chip NXP MPC864xD with dual PowerPC® e600 processor cores, dual integrated memory controllers, DMA engine, PCI Express interface, Ethernet, and local I/O
- ▸ Extended temperature (-40°C to +71°C) and rugged board variants available
- ▸ Four Gigabit Ethernet ports
- ▸ Up to 2GB of DDR2 ECC memory, 128MB NOR flash and 2GB NAND flash
- ▸ USB 2.0 controller for integrating cost-effective peripherals (commercial temperature only)
- ▸ 2eSST VMEbus protocol with 20MB/s transfer rate across the VMEbus
- ▸ Dual 33/66/100MHz PMC-X sites for expansion via industry standard modules with support for processor PMCs
- ▸ 8x PCI Express expansion connector for PMC-X and XMC expansion using XMCspan
- ▸ MVME7216E direct-connect rear transition module (RTM) for I/O routing through rear of a VMEbus chassis

The Penguin Edge™ MVME7100, featuring the system-on-chip MPC864xD processor, offers a growth path for VMEbus customers with applications on the previous generation of VME, specifically the MPC74xx processors. The system-on-chip implementation offers power/thermal, reliability, and lifecycle advantages not typically found in alternative architectures.
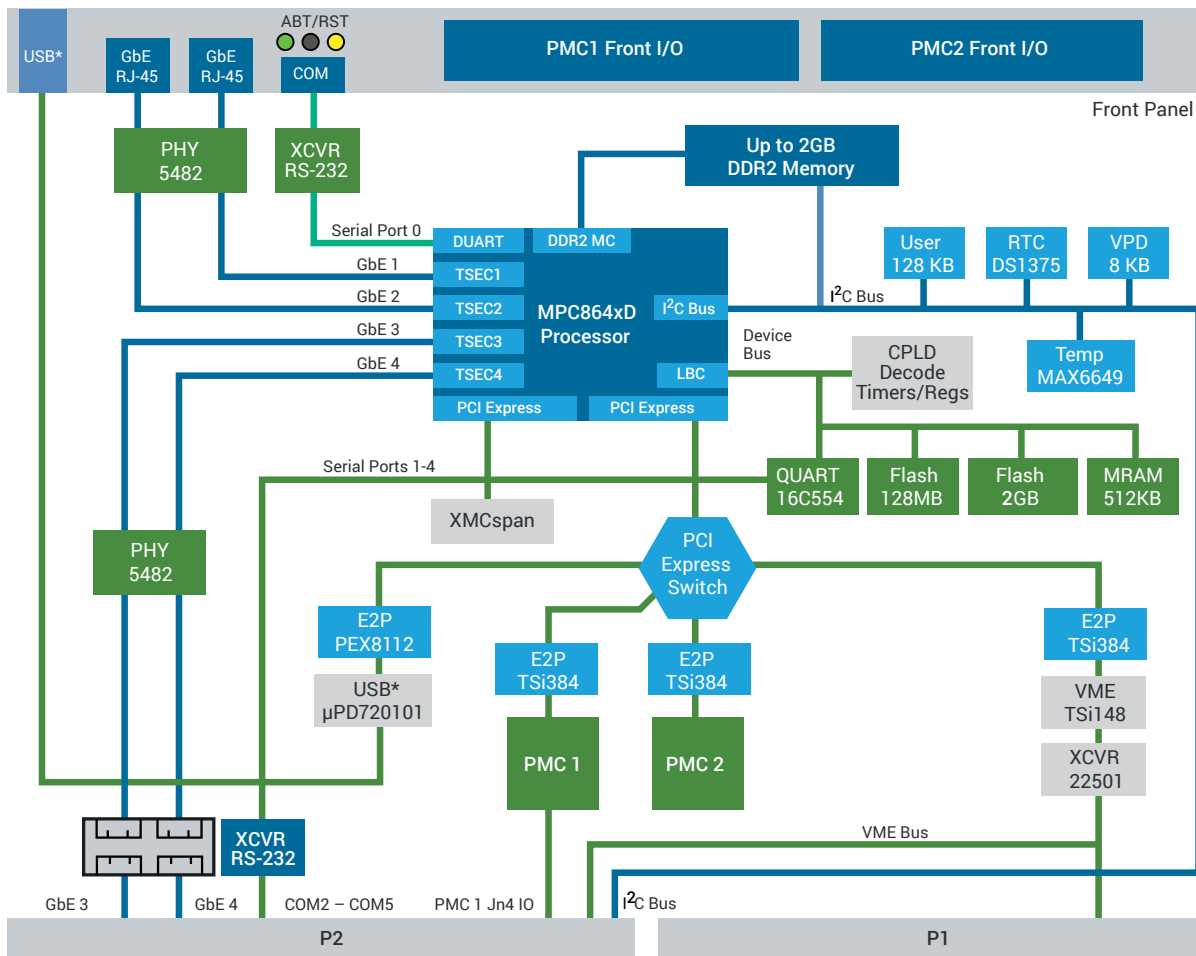
The MVME7100 single-board computer (SBC) helps OEMs of industrial, medical, and defense/aerospace equipment add performance and features for competitive advantage while still protecting the fundamental investment in VMEbus and related technologies. Customers can keep their VMEbus infrastructure (chassis, backplanes, and other VMEbus and PMC boards) while improving performance and extending the lifecycle. Also, the extended lifecycle of Penguin Edge computing products helps reduce churns in development and support efforts resulting from frequent product changes.

The faster processor and 2eSST VMEbus interface combine to offer significant performance improvement. New cost-effective peripherals can be integrated easily using USB interfaces.

Extended temperature (-40°C to +71°C) variants support a wide range of operating and storage temperatures in addition to increased tolerances for shock. This enables the boards to operate in harsh environments while maintaining structural and operational integrity.

MVME7100 Block Diagram

MVME7100 Block Diagram showing Front Panel interfaces (USB*, GbE RJ-45, GbE RJ-45, ABT/RST COM, PMC1 Front I/O, PMC2 Front I/O), PHY 5482, XCVR RS-232, Up to 2GB DDR2 Memory, MPC864xD Processor (DUART, DDR2 MC, TSEC1, TSEC2, TSEC3, TSEC4, I²C Bus, LBC, PCI Express, PCI Express), User 128 KB, RTC DS1375, VPD 8 KB, CPLD Decode Timers/Regs, Temp MAX6649, QUART 16C554, Flash 128MB, Flash 2GB, MRAM 512KB, XMCspan, PCI Express Switch, E2P PEX8112, USB* µPD720101, E2P TSi384, E2P TSi384, PMC 1, PMC 2, E2P TSi384, VME TSi148, XCVR 22501, PHY 5482, XCVR RS-232, P2 and P1 connectors.

Overview

VMEbus 2eSST Performance

The 2eSST protocol offers an available VME bus bandwidth of up to 320MB/s, an increase of up to 8x over VME64, while maintaining backward compatibility with VME64 and VME32. The combination of the latest Texas Instruments VMEbus transceivers and the Tundra Tsi148 VMEbus bridge's legacy protocol support allows customers to integrate the MVME7100 series into their existing infrastructure providing backward compatibility and thereby preserving their investment in existing VMEbus boards, backplanes, chassis and software.

Balanced Performance

The MVME7100 series provides more than just faster VMEbus transfer rates; it provides balanced performance from the processor, memory subsystem, local busses and I/O subsystems. This coupled with a wealth of I/O interfaces make the MVME7100 series ideal for use as an application-specific compute blade, or an intelligent I/O blade/carrier.

The NXP MPC864xD system-on-chip (SoC) processor, running at speeds up to 1.3GHz, is well-suited for I/O and data-intensive applications. The integrated SoC design creates an I/O intensive state-of-the-art package that combines dual low power processing cores with on-chip L2 cache and dual integrated DDR2 memory controllers, PCI Express, DMA, Ethernet and local device I/O. The on-chip PCI Express interface and dual DDR2 memory busses are well matched to the processor. To ensure optimal I/O performance, the 8x PCI Express port is connected to a five-port PCI Express switch. Three 4x PCI Express ports are connected to PCI Express-to-PCI-X bridges which provide independent PCI-X busses for the two PMC-X sites and VME bus interface. A 1x PCI Express port is connected to a PCI Express-to-PCI bridge which is connected to the USB chip (commercial temperature only). The MVME7100 also offers quad Gigabit Ethernet interfaces, USB 2.0, and five (5) RS-232 serial connections. All of this adds up to a set of well-balanced, high-performance subsystems offering unparalleled performance.

Backward Compatibility

The MVME7100 series continues the direction of providing a migration path from embedded controllers such as the MVME16x, MVME17x, MVME2300/MVME2400, and from SBCs such as the MVME2600/2700 to a single platform. The MVME7100 series, like the MVME3100, MVME5100, MVME5500, and MVME6100 series, merged the best features of the Penguin Edge embedded controllers and SBCs enabling OEMs to support varying I/O requirements with the same base platform, simplifying part number maintenance, technical expertise requirements and sparing.

The MVME7100 series offers customers an alternate migration path from the MVME2100, MVME2300, MVME2400, MVME2600, MVME2700, MVME3100, MVME5100, MVME5500 and MVME6100 boards to allow them to take advantage of features such as the integrated MPC864xD SoC processor, DDR2 memory, Gigabit Ethernet, PCI-X, PCI Express, USB, and 2eSST.

PCI Expansion

The MVME7100 has an 8x PCI Express connection to support PCI Express expansion carriers such as the XMCspan.

Transition Modules

The MVME7216E transition module provides industry standard connector access to two 10/100/1000BaseTX ports, and four asynchronous serial ports configured as RS-232 DTE. All of these are via RJ-45 connectors. The MVME7216E RTM is designed to directly connect to the VME backplane in chassis' with an 80 mm deep rear-transition area.

Software Support

Firmware Monitor

The MVME7100 firmware (known as MOTLoad) is resident in the MVME7100 flash and provides power-on self-test, initialization and operating system booting capabilities. In addition, it provides a debugger interface similar to the time proven "bug" interface on previous Penguin Edge VMEbus boards.

Operating Systems and Kernels

▸ The MVME7100 series supports the Linux operating system
▸ VxWorks is available through Wind River

Specifications

Processor

▸ Microprocessor: NXP MPC864xD with dual PowerPC e600 cores
▸ Clock Frequency: 1.06 or 1.3GHz
▸ On-chip L1 Cache (I/D): 32K/32K per core
▸ On-chip L2 Cache: 1MB per core

System Controller

▸ Integrated within MPC864xD

Main Memory

▸ Type: Double data rate (DDR2) SDRAM
▸ Speed: DDR2-533
▸ Capacity: 1GB or 2GB
▸ Configuration: Dual memory controller

Flash Memory

▸ Type: NOR flash, on-board programmable
  – Capacity: 128MB
  – Write Protection: Hardware via switch, software via register or sector lock
▸ Type: NAND flash, on-board programmable
  – Capacity: 2GB
  – Write Protection: Software via register
  – Supported by YAFFS (Linux) or Datalight FlashFX® Pro (VxWorks) under separate license

Non-Volatile Memory

▸ Type: SEEPROM, on-board programmable
  – Capacity: 128KB (available for users), 8KB baseboard Vital Product Data (VPD), and two (2) 256B Serial Presence Detect (SPD)
▸ Type: MRAM
  – Capacity: 512KB

VMEbus Interface

‣ Compliance: ANSI/VITA 1-1994 VME64 (IEEE STD 1014), ANSI/VITA 1.1-1997 VME64 Extensions, VITA 1.5-199x 2eSST

‣ Controller: Tundra Tsi148 PCI-X to VMEbus bridge with support for VME64 and 2eSST protocols

‣ DTB Master: A16, A24, A32, A64; D08-D64, SCT, BLT, MBLT, 2eVME, 2eSST

‣ DTB Slave: A16, A24, A32, A64; D08-D64, SCT, BLT, MBLT, 2eVME, 2eSST, UAT

‣ Arbiter: RR/PRI

‣ Interrupt Handler/Generator: IRQ 1-7/Any one of seven IRQs

‣ System Controller: Yes, switchable or auto detect

‣ Location Monitor: Two, LMA32

Ethernet Interface

‣ Controller: MPC864xD Triple Speed (TSEC) Ethernet Controllers

‣ Interface Speed: Four @ 10/100/1000Mbps (TSEC)

‣ Connector: Two Gigabit Ethernet ports routed to front panel RJ-45, two Gigabit Ethernet ports to VMEbus P2 connector, pin out matching MVME7216E RTM

‣ Indicators: Link status/speed/activity

Asynchronous Serial Ports

‣ Port 1
  – Controller: MPC864xD Duart (second port N/C)
  – Number of Ports: One 16550 compatible
  – Configuration: RS-232 DTE (RxD, TxD, RTS, CTS)
  – Async Baud Rate, bps max.: 38.4K RS-232, 115Kbps raw
  – Connector: One front panel Mini DB-9
  – Mini DB-9 to DB-9 adapter cable: SERIAL-MINI-D2

‣ Ports 2-5
  – Controller: Exar ST16C544D Quart
  – Number of Ports: Four 16550 compatible
  – Configuration: RS-232 (RxD, TxD, RTS, CTS)
  – Async Baud Rate, b/s max: 38.4K RS-232, 115Kbps raw
  – Connector: Via VMEbus P2 connector, pinout matching MVME7216E RTM

‣ USB Interface (commercial temperature only)
  – Controller: NEC μ720101
  – Configuration: USB 2.0
  – Number of ports: One
  – Connector: One powered port routed to front panel

Dual IEEE P1386.1 PCI Mezzanine Card Slots

‣ Address/Data: A32/D32/D64, PMC PN1, PN2, PN3, PN4 connectors (PN4 for PMC1 only)

‣ PCI Bus Clock: 33MHz, 66MHz or 100MHz PCI/ PCI-X

‣ Signaling: 3.3V

‣ Power: +3.3V, +5V, ±12V

‣ Module Types: Two single-wide or one doublewide, front panel or P2 I/O, PMC and PrPMC support, PMC1 site Pn4 routed to VMEbus P2 connector rows A and C

PCI Expansion Connector for Interface to XMCspan boards

‣ 8x PCI Express interface

‣ One 76-pin connector located on MVME7100 planar

Counters/Timers

‣ TOD Clock Device: Maxim DS1375 I2C device with battery backup

‣ Cell Storage Life: 10 years at 25°C

‣ Cell Capacity Life: One year at 100% duty cycle, 25°C

‣ Removable Battery: Yes

‣ Real-Time Timers/Counters: Four, 32-bit programmable timers in PLD; four, 32-bit programmable/cascadable timers in MPC864xD

‣ Watchdog Timer: In PLD

Board Size

‣ Height: 233.4mm (9.2 in.)

‣ Depth: 160.0mm (6.3 in.)

‣ Front Panel Height: 261.8mm (10.3 in.)

‣ Width: 19.8mm (0.8 in.)

‣ Max. Component Height: 14.8mm (0.58 in.)

Power Requirements

Board Variant	Power (+5V ±5%)
MVME7100-0173-2GF	Typical: 45W Maximum: 60W

Estimated MTBF

Expected field MTBF estimate based on Telcordia SR-332, issue 1, ground fixed, controlled environment, unit ambient air temperature of 40°C is 1,066,000 hours at 60% confidence level. Contact Penguin Solutions for alternative environments

or temperatures.

Other Features

▸ RoHS compliant
▸ Jumper-less configuration
▸ On-board temperature sensor (Maxim MAX6649)
▸ JTAG header for connection of diagnostic tools

Front Panel

▸ IEEE or Scanbe handles
▸ Connectors for serial, Gigabit Ethernet and USB ports (commercial temperature only)
▸ Openings for PMC sites

Transition Modules

I/O Connectors

▸ MVME7216E
  – Asynchronous Serial Ports: Four, RJ-45, labeled as COM2-5
  – Ethernet: Two 10/100/1000BaseTX, RJ-45

Non-Volatile Storage

▸ 8KB VPD SEEPROM

Transition Module Size

▸ Height: 233.4mm (9.2 in.)
▸ Depth: 80.0mm (3.1 in.)
▸ Front Panel Height: 261.8mm (10.3 in.)
▸ Front Panel Width: 19.8mm (0.8 in.)

All Modules

Environmental

	Commercial	-ET
Cooling Method	Forced Air	Forced Air

Operating Temperature	0°C to +55°C	−40°C to +71°C
Storage Temperature	−40°C to +85°C	−50°C to +100°C
Vibration Sine	1G, 5 - 200Hz	1G, 15 - 2000Hz*
Vibration Random	N/A	.0007g2/Hz 15 - 2000Hz*
Shock	N/A	4 g/11mS*
Humidity	5% to 90% RH	to 100% RH
Conformal Coating	Optional	Optional

* Final ET shock and vibration capabilities TBD. Values shown are minimums.

Safety

All printed wiring boards (PWBs) are manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

Electromagnetic Compatibility (EMC)

▸ Intended for use in systems meeting the following regulations:
  – U.S.: FCC Part 15, Subpart B, Class A (non-residential)
  – Canada: ICES-003, Class A (non-residential)
▸ Penguin Edge board products are tested in a representative system to the following standards:
  – CE Mark per European EMC Directive 89/336/EEC with Amendments; Emissions: EN55022 Class B; Immunity: EN55024

Ordering Information

Part Number	Description	Weight
MVME7100-0173-2GF	1.3GHz MPC8641D, 2GB DDR2 memory, 2GB NAND flash, IEEE (ENP1)	0.62 kg

Related Products

XMCSPAN-001	XMC Expansion, IEEE handles
MVME7216E-101	Rear transition module
MVME721ET-101-CC-2	Extended temp RTM, new NEW I/O on 5 row P2, two GbE, four serial, PIM, 6E (for use with MVME3100/4100/7100)
SERIAL-MINI-D2	Serial cable - Micro D sub connector to standard DB-9
ACC/CABLE/SER/DTE/6E	Serial cable, RD 009, 2M, 2 DTE MD/D, RJ-45 to DB-9

Contact Us

+1 602-438-5720
info@penguinsolutions.com
www.penguinsolutions.com/edge/

About Penguin Solutions

Penguin Solutions accelerates customers' digital transformation with the power of emerging technologies in HPC, AI, and IoT with solutions and services that span the continuum of edge, core, and cloud. The company designs highly advanced infrastructure, machines and networked systems that enable the world's most innovative enterprises and government institutions to build the autonomous future, drive discovery and amplify human potential. The Penguin Edge portfolio covers system on modules, single board computers and application-ready platforms that extend insight, intelligence, and analytical capabilities closer to where the data is generated - optimizing a range of use cases across industries and rugged environments.