# Datasheet

## MVME162PA4

### VME Embedded Controller with Four IndustryPack Slots

**MOTOROLA**
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**Four-slot IndustryPack logic interface for embedded monitoring and control applications**

The MVME162PA4 provides OEMs and solutions developers an ideal platform for embedded monitoring and control applications. It allows an OEM to minimize engineering expenses while integrating value-added hardware and software applications onto an off-the-shelf product.

The inclusion of the Petra application-specific integrated circuit (ASIC), which replaces functions formerly implemented in the IP2 chip, MC2 chip and MCECC chip, improves the performance of the memory subsystem. Memory configuration switches enable the customer to tailor memory size for applications requiring smaller memory configurations.

■ 33 MHz MC68040 microprocessor with 8KB of cache, and MMU and FPU

■ A32/D64 VMEbus master/slave interface with system controller function

■ High-performance DMA support for VMEbus D64 and local bus memory burst cycles

■ 16MB of configurable SDRAM

■ 512KB SRAM with battery backup

■ 1MB Flash memory for on-board monitor/debugger or user-installed firmware

■ 8K x 8 NVRAM and time-of-day clock with battery backup

■ Two serial communication ports, console port as EIA-232-D DCE and second port user configurable for EIA-232-D/EIA-422 (V.36) DTE/DCE

■ Four 16- or two 32-bit IndustryPack ports with one DMA channel per port

■ One SCSI interface

■ One Ethernet interface

■ Six 32-bit timers, one watchdog timer
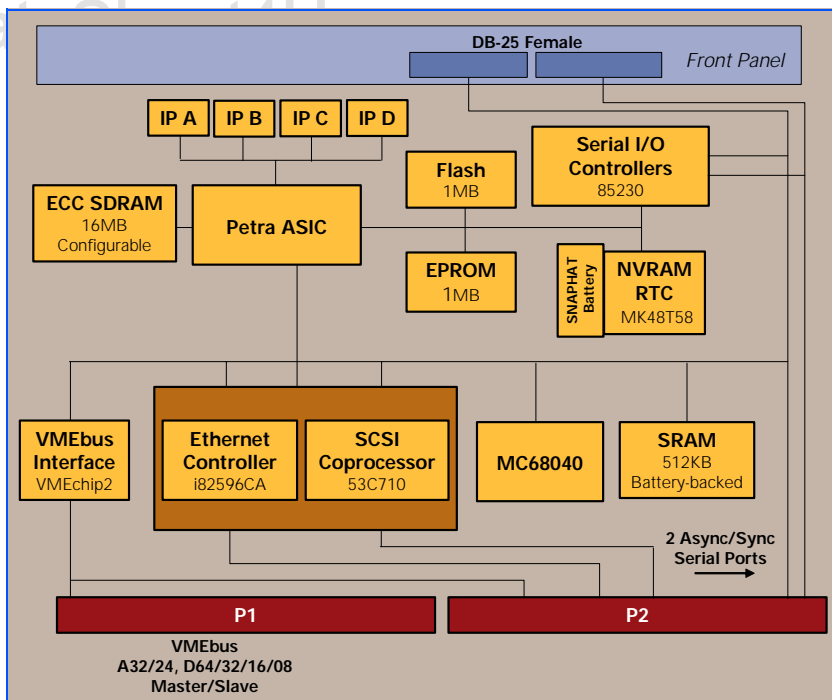
### Microprocessor Options

The MVME162PA4 provides scalability by allowing several types of MPU options. Features such as clock speed and floating point capability can be selected.

### Memory Expansion

The MVME162PA4 is offered with a configurable SDRAM. The size of the memory is determined by switch settings and the memory devices.

### VMEbus Interface

The VMEbus interface ASIC includes a local bus to/from the VMEbus DMA controller, VME board support features, as well as a global control and status register (GCSR) for microprocessor communications. The device also supports the VME D64 specification, further enhancing system performance.

### Transition Module

An optional MVME712M transition module is available to support the use of standard I/O connections for the MVME162PA4. This module takes the I/O connections for the peripherals on board the MVME162PA4 from the P2 connection of the module to a transition module that has industry-standard connections.

### IndustryPack Interface

A key feature of the MVME162PA4 is the IndustryPack logic interface. This interface provides a 32-bit data path from the IndustryPack modules to the local MC68040 bus. IndustryPack modules provide a wide variety of connections to "real-world" applications such as I/O, control, interface, analog and digital functions. Up to four single-wide or two double-wide IndustryPack modules can be installed on the MVME162PA4 and still occupy only one VME slot. As I/O needs change, a new IndustryPack module can be installed thus preserving the customer's overall investment.

### Software Support

The MVME162PA4 is supported by a wide range of real-time kernels and embedded operating systems.

| | |
|---|---|
| **Lynx Real-Time Systems, Inc.:** | LynxOS |
| **Integrated Systems, Inc.:** | pSOS+ |
| **Microware Systems Corporation:** | OS-9 |
| **Microtec:** | VRTX32 |
| **Wind River Systems, Inc.:** | VxWorks |

### IndustryPack Performance

| Bus Frequency | | Period and Bandwidth to 32-Bit IP Space | | |
|---|---|---|---|---|
| MC68040 | IP | Back-to-Back Examine (Note 1) | Four-Cycle DMA Burst (Note 2) | Single-Cycle DMA (Note 3) |
| 25 MHz | 8 MHz | 4 IP clocks 8MB/s | 10 IP clocks 12.8MB/s | 4 IP clocks 8MB/s |
| 32 MHz | 8 MHz | 3 IP clocks 10.6MB/s | 10 IP clocks 12.8MB/s | 4 IP clocks 8MB/s |
| 32 MHz | 32 MHz (Note 5) | 6 IP clocks 21MB/s | 12 IP clocks 42MB/s (Note 4) | 6 IP clocks 21MB/s |

Notes:
1. Back-to-back cycles for a local bus master, which is accessing a memory or I/O space location on an IndustryPack; assumes a zero-wait-state-acknowledge reply from the IndustryPack.
2. DMA burst cycles between a local bus slave and a memory or I/O space location on an IndustryPack; assumes a zero-wait-state-acknowledge reply from the IndustryPack.
3. DMA single cycles between a local bus slave and a memory or I/O space location on an IndustryPack; assumes a zero-wait-state-acknowledge reply from the IndustryPack.
4. Burst modes DMA is not supported when both bus frequencies are 32 MHz.
5. Because the specified bandwidth assumes a zero-wait-state IndustryPack cycle, it would be difficult to achieve the stated bandwidths for an IP bus frequency of 32 MHz.

## Processor

| | |
|---|---|
| **Microprocessor:** | MC68040 |
| **Clock Frequency:** | 33 MHz |

## Memory

### Synchronous Dynamic RAM

| | |
|---|---|
| **Capacity:** | 16MB |
| **Read/Write Burst Mode:** | 4-1-1-1/2-1-1-1 |
| **Shared:** | VMEbus and local bus |

### Static RAM

| | |
|---|---|
| **Capacity:** | 512KB |
| **Read/Write Burst Mode:** | 5-3-3-3/5-3-3-3 |
| **Shared:** | VMEbus and local bus |
| **Battery Type:** | Lithium |
| **Battery Life (approximate):** | 406 days continuous backup at 25° C, 81 days at 70° C |

### Flash

| | |
|---|---|
| **Capacity:** | 1MB |
| **Shared:** | No |

### EPROM (32-pin PLCC)

| | |
|---|---|
| **Capacity:** | One 1M x 8 in socket |

## VMEbus ANSI/VITA 1-1994 VME64 (IEEE STD 1014)

| | |
|---|---|
| **DTB Master:** | A16–A32; D08–D64, BLT, UAT + MBLT |
| **DTB Slave:** | A24–A32; D08–D64, BLT, UAT + MBLT |
| **Arbiter:** | RR/PRI |
| **Interrupt Handler:** | IRQ 1–7 |
| **Interrupt Generator:** | Any 1 of 7 |
| **System Controller:** | Yes, jumperable |
| **Location Monitor:** | Four, LMA32 |

## SCSI Bus

| | |
|---|---|
| **Controller:** | NCR 53C710 |
| **Local Bus DMA:** | Yes, with local bus burst |
| **Asynchronous/ Synchronous:** | 5.0MB/s/10.0MB/s |
| **Connector:** | 50-pin, available on P2 |

## Ethernet

| | |
|---|---|
| **Controller:** | 82596CA |
| **Local Bus DMA:** | Yes |
| **Connector:** | DB-15, available on P2 |

## IndustryPack Logic Interface

| | |
|---|---|
| **Data Width:** | 16/32-bit |
| **Interrupts:** | Two levels |
| **DMA:** | Four channels |
| **Clock Speed:** | 8 or 32 MHz |
| **Module Types:** | Four single-high, two double-high |
| **Connectors:** | Access via four 50-pin planar connectors |

## Serial Ports

| | |
|---|---|
| **Controller:** | 85230 |
| **Console:** | EIA-232-D DCE |
| **Second Port:** | User configurable, EIA-232 or EIA-530 DTE/DCE, or EIA-485 |
| **Baud Rate, bps max.:** | 38.4K sync/async |
| **Connectors:** | Available on the front panel through two DB-25 female connectors and P2 |

## Hardware Support

| | |
|---|---|
| **Multiprocessing Support:** | Four mailbox interrupts, RMW, shared RAM |
| **Debug/Monitor:** | 162Bug, boot and diagnostics |
| **Transition Module (optional):** | MVME712M |

## Power Requirements (no IP Modules)

| | Typical | Maximum |
|---|---|---|
| **+5V ±5%** | 2.0 A | 2.5 A |
| **+12V ±5%** | — | 100 mA (max., with off-board LAN transceiver) |
| **−12V ±5%** | 100 mA | — |

## Board Size

| | |
|---|---|
| **Height:** | 233.4 mm (9.2 in.) |
| **Depth:** | 160.0 mm (6.3 in.) |
| **Front Panel Height:** | 261.8 mm (10.3 in.) |
| **Width:** | 19.8 mm (0.8 in.) |

## Demonstrated MTBF

(based on a sample of eight boards in accelerated stress environment)

| | |
|---|---|
| **Mean:** | 190,509 hours |
| **95% Confidence:** | 107,681 hours |

## Safety

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

## Environmental

| | **Operating** | **Nonoperating** |
|---|---|---|
| **Temperature:** | 0° C to 55° C, forced air cooling | –40° C to +85° C |
| **Humidity (NC):** | 5% to 90% | 5% to 90% |
| **Vibration:** | 2 Gs RMS, 20–2000 Hz random | 6 Gs RMS, 20–2000 Hz random |

## 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) |

This product was 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 |
|---|---|
| **MVME162PA-344SE** | 33 MHz MC68040, SCSI, Ethernet |
| **Related Products** | |
| **MVME712M** | Four DB-25 female serial port connectors, Centronics parallel port connector, DB-15 Ethernet connector, SCSI connector, P2 adapter |
| **MVME712P2** | P2 adaptor module from VME backplane to cabling for transition modules |
| **SIMM05** | EIA-232 DTE module (option) |
| **SIMM06** | EIA-232 DCE module (default configuration) |
| **SIMM07** | EIA-530 DTE module (option) |
| **SIMM08** | EIA-530 DCE module (option) |
| **SIMM09** | EIA-485 module (option) |
| **Documentation** | |
| **V162P4A/IH** | MVME162P4 Installation and Use manual |
| **V1X2P4A/PG** | MVME162P4/172P4 Programmer's Reference Guide |
| **VME712MA/IH2** | MVME712 Transition Module Installation and Use |
| **V162DIAA/UM** | 162Bug Diagnostics User's Manual |
| **68KBUG1/D** | 68K Debugging Package User's Manual Part 1 |
| **68KBUG2/D** | 68K Debugging Package User's Manual Part 2 |
| Documentation is available for online viewing and ordering at http://www.motorola.com/computer/literature | |

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