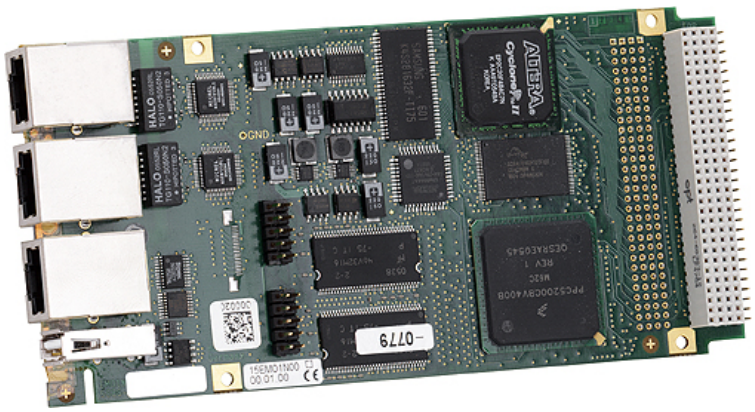
EM1N – Embedded System Module COM with MPC5200B

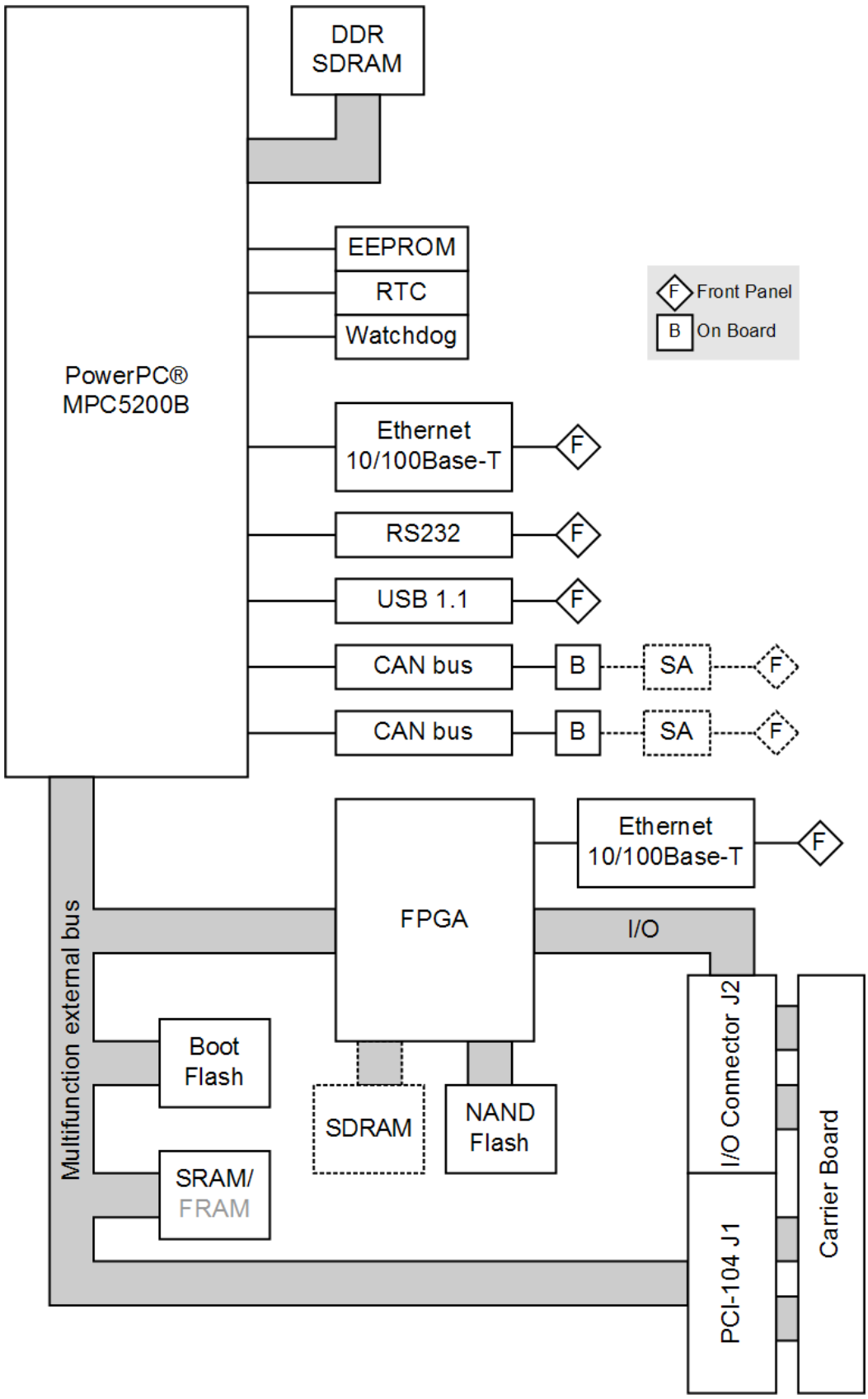
- **MPC5200B / 384 MHz**
- **FPGA 18,752 LEs (225,000 gates)**
- **Up to 256 MB onboard DDR SDRAM**
- **Up to 8 MB boot Flash, NAND Flash**
- **2 MB SRAM, 16 MB additional SDRAM**
- **Dual Ethernet, COM, USB 1.1 (front)**
- **Dual CAN controller on carrier**
- **User defined I/O functions (COMs, graphics, IDE etc.) optional via FPGA on carrier**
- **Stackable with PCI-104**
- **MENMON™ BIOS for PowerPC® cards**
- **-40 to +85°C with qualified components**



The EM1N Computer-On-Module can be supplied as a stand-alone module, with an application-specific carrier card and/or with additionally plugged PCI-104 modules. The EM1N is controlled by the MPC5200B PowerPC® processor which was specially developed for automotive applications and which operates at up to 400 MHz and 700 MIPS. The complete ESM™ module in standard form has an operational temperature of -40 to +85°C. The CPU consumes less than 1 W at 384 MHz. The EM1N is equipped with up to 256 MB soldered SDRAM and up to 1 GB NAND Flash as well as with 16 MB additional SDRAM, up to 8 MB boot Flash and 2 MB battery-backed SRAM.
The EM1N provides two Fast Ethernet interfaces, one serial line and USB 1.1 at its front panel. As an alternative to RJ45, D-Sub connectors guarantee reliable functions also in harsh environments. Two CAN controllers with V2.0A/B CAN protocol are included in the MPC5200B. The physical CAN interfaces are accessible via SA-Adapters™. Further UARTs and other additional I/O functions can be realized in the on-board FPGA and accessed via a carrier board. The functionality of the FPGA is dynamically loaded by the application software.

The EM1N comes with MENMON™ support. This firmware/BIOS can be used for bootstrapping operating systems (from disk, Flash or network), for hardware testing, or for debugging applications without running any operating system.The EM1N is designed to operate under harsh environmental conditions including -40 to +85°C operation temperature, shock, vibration, humidity. It focuses on applications in transportation (railways), automotive and avionics.
For a first evaluation of the functions of the EM1N it is strongly recommended to use the EK6N ESM™ starter kit. The kit consists of the standard CPU module, an FPGA loaded with additional I/O functions, the carrier card with I/O connectors, an external PSU, VGA and RJ45 to D-Sub cables, and an adapter for mounting a PCI-104 module.
ESM™ modules are complete computers which consist of the hardware (CPU, chip set, memory, I/O) which is not fixed to any application-specific function, and an FPGA programmed in VHDL code for user-defined I/O. ESM™ modules are based on PCI. They have two system connectors: J1 has a fixed signal assignment, while J2 is variable depending on the final application-specific configuration of the ESM™ and the carrier board. J2 also feeds the I/O signals of the functions programmed in the FPGA to the carrier card.

Diagram


DDR SDRAM
EEPROM
RTC
Watchdog
PowerPC®
MPC5200B
F Front Panel
B On Board
Ethernet 10/100Base-T
F
RS232
F
USB 1.1
F
CAN bus
B
SA
F
CAN bus
B
SA
F
Ethernet 10/100Base-T
F
FPGA
I/O
Multifunction external bus
Boot Flash
SDRAM
NAND Flash
SRAM/ FRAM
I/O Connector J2
PCI-104 J1
Carrier Board

Technical Data

CPU	■ PowerPC® □ MPC5200B □ Up to 400MHz
Memory	■ 2x16KB L1 data and instruction cache integrated in MPC5200 ■ Up to 256MB SDRAM system memory □ Soldered □ DDR □ 64MHz memory bus frequency ■ Up to 1GB soldered NAND Flash (and more), FPGA-controlled ■ 16MB additional SDRAM, FPGA-controlled, e.g. for video data and NAND Flash firmware ■ Up to 8MB boot Flash ■ 2MB battery-backed SRAM, or: 128KB non-volatile FRAM ■ Serial EEPROM 8kbits for factory settings
Mass Storage	■ Parallel IDE (PATA) □ One port for hard-disk drives □ Available via I/O connector □ FPGA-controlled ■ Up to 1GB soldered ATA NAND Flash (and more), FPGA-controlled
Graphics	■ Available via I/O connector ■ FPGA-controlled
I/O	■ USB □ One USB 1.1 port □ Series A connector at front panel □ OHCI implementation □ Data rates up to 12Mbit/s ■ Ethernet □ Two 10/100Base-T Ethernet channels □ One channel FPGA-controlled □ Two RJ45 or one D-Sub connector at front panel ■ One RS232 UART (COM1) □ RJ45 or D-Sub connector at front panel □ Data rates up to 115.2kbit/s □ 512-byte transmit/receive buffer □ Handshake lines: CTS, RTS ■ CAN bus □ Two CAN bus channels □ 2.0 A/B CAN protocol □ Data rates up to 1 Mbit/s □ Connection via onboard connectors □ External transceivers using SA-Adapters™ ■ Further I/O depending on FPGA configuration
FPGA	■ Standard factory FPGA configuration: □ Main bus interface □ 16Z070_IDEDISK - IDE controller for NAND Flash □ 16Z043_SDRAM - Additional SDRAM controller (16MB) □ 16Z023_IDENHS - IDE controller (PIO mode 0; non-hot-swap) □ 16Z044_DISP - Display controller (800 x 600, 60Hz/70Hz, 6-bit RGB) □ 16Z031_SPI - SPI touch panel controller □ 16Z087_ETH - Ethernet controller (10/100Base-T) □ 16Z025_UART - UART controller (controls COM10..COM13) □ 16Z034_GPIO - GPIO controller (7 lines) ■ The FPGA offers the possibility to add customized I/O functionality. See FPGA.

Technical Data

PCI Interface	■ 32-bit, 32-MHz PCI interface at PCI-104 connector J1 ■ Compliant with PCI Specification 2.2 ■ Support of 4 external masters
Miscellaneous	■ Real-time clock ■ Power supervision and watchdog
Electrical Specifications	■ Supply voltage/power consumption: □ +5V (-2%/+5%), 10mA max., only for USB □ +3.3V (-2%/+5%), 1A typ. ■ MTBF: 232,000h @ 40°C (derived from MIL-HDBK-217F)
Mechanical Specifications	■ Dimensions: conforming to ESM™ specification (PCB: 149mm x 71mm), Type I-S ■ Weight: 90g (w/o heat sink)
Environmental Specifications	■ Temperature range (operation): □ -40..+85°C □ Airspeed: min. 2 m/s ■ Temperature range (storage): -40..+85°C ■ Relative humidity (operation): max. 95% non-condensing ■ Relative humidity (storage): max. 95% non-condensing ■ Altitude: -300m to + 3,000m ■ Shock: 15g/11ms ■ Bump: 10g/16ms ■ Vibration (sinusoidal): 2g/10..150Hz ■ Conformal coating on request
Safety	■ PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers
EMC	■ Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst)
BIOS	■ MENMON™
Software Support	■ VxWorks® ■ Linux (ELinOS) ■ QNX® ■ PikeOS (partitionable RTOS) certified platform ■ MSCAN/Layer2 support: MEN Driver Interface System (MDIS™ for all supported operating systems) ■ For more information on supported operating system versions and drivers see Downloads.

FPGA

This product offers the possibility to add customized I/O functionality in FPGA.

Flexible Configuration	■ Customized I/O functions can be added to the FPGA. ■ It depends on the board type, pin counts and number of logic elements which IP cores make sense and/or can be implemented. Please contact MEN for information on feasibility. ■ You can find more information on our web page "User I/O in FPGA"
FPGA Capabilities	■ FPGA Altera® Cyclone® II EP2C20 □ 18,752 logic elements □ 239,616 total RAM bits ■ Connection □ Available pin count: 77 pins □ Functions available via I/O connector J2 ■ MEN offers a starter kit for this computer-on-module. The kit includes a suitable carrier board with different I/O connectors for FPGA signals. An FPGA development package for this hardware kit is also available for download.

Configuration & Options

Standard Configurations

Article No.	CPU Type	FPGA	System RAM	NAND Flash	Boot Flash	Additional SDRAM	SRAM	Misc.
15EM01-00	MPC5200, 384MHz	12,000 LE	128 MB	128 MB	2 MB	16 MB	2 MB	Front I/O
15EM01N00	MPC5200B, 384MHz	18,752 LE	256 MB	1 GB	2 MB	16 MB	2 MB	Front I/O
15EM01A00	MPC5200B, 384MHz	18,752 LE	256 MB	128 MB	2 MB	16 MB	2 MB	Rear I/O
15EM01A01	MPC5200B, 384MHz	18,752 LE	256 MB	128 MB	2 MB	16 MB	2 MB	Rear I/O, 5V only

Options

CPU	■ MPC5200B, 384 MHz
Memory	■ System RAM □ 128 MB or 256 MB ■ NAND Flash □ 0 MB up to maximum available ■ Boot Flash □ 2 MB, 4 MB or 8 MB ■ Additional SDRAM □ 0 MB or 16 MB ■ SRAM □ 0 MB or 2 MB ■ 128KB non-volatile FRAM instead of SRAM
I/O	■ Front connections □ D-Sub connectors for Ethernet and COM/USB
Mechanical	■ PCI and I/O connectors can also be placed for face-to-face assembly (ESM™ Type N)

Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.

Ordering Information

Standard EM1N Models	**15EM01N00**	MPC5200B/384MHz, FPGA 18,752 logic elements, 256 MB SDRAM, 1 GB NAND Flash, 2 MB SRAM, 16 MB graphics memory, 2 MB boot Flash, front: 2 Fast Ethernet (RJ45), 1 UART (RJ45), 1 USB, -40..+85°C with qualified components (also for ESM™ evaluation kit EK6N)
Related Hardware	**08EK06N00**	ESM™ evaluation kit for EM1N: Mini ATX carrier board, EM1N with PowerPC® MPC5200B / 384 MHz, 256 MB DDR SDRAM, 1 GB NAND Flash, 2 MB SRAM, 16 MB graphics memory, 2 MB boot Flash, 2 Fast Ethernet, 1 UART, 1 USB 1.1, graphics, IDE, RJ45 to D-Sub cable, VGA cable, external PSU and adapter for mounting of one PCI-104 module, 0..+60°C
	15EM01A00	MPC5200B/384MHz, FPGA 18,752 logic elements, 256MB SDRAM, 128MB NAND Flash, 2MB SRAM, 16MB graphics memory, 2MB boot Flash, -40..+85°C with qualified components
Miscellaneous Accessories	**05F006-00**	RS232 interface cable RJ45 to 9-pin D-Sub (1 COM to 1 COM), 2m
Software: Linux	This product is designed to work under Linux. See below for potentially available separate software packages from MEN.	
	10EM01-90	Linux BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12, F12N and PP1 under ELinOS 5.0 (rpm for direct installation in ELinOS)
	This product is designed to work under ELinOS Embedded Linux by SYSGO. For more information and product support please contact www.sysgo.com.	
	13Z015-06	MDIS5™ low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)
	13Z016-06	MDIS5™ driver (MEN) for 16Z029_CAN (CANopen master)
	13Z017-06	MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO
	13Z025-90	Linux native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART
	13Z077-90	Linux native driver (MEN) for 16Z077_ETH and 16Z087_ETH
Software: VxWorks®	This product is designed to work under VxWorks®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets.	
	10EM01-60	VxWorks® BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12N and F12
	10EM01-61	VxWorks® 6.8 BSP for EM1A and EM1N
	13Z015-06	MDIS5™ low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)
	13Z016-06	MDIS5™ driver (MEN) for 16Z029_CAN (CANopen master)
	13Z017-06	MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO
	13Z025-60	VxWorks® native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART

Ordering Information

Software: QNX®

This product is designed to work under QNX®. For details regarding supported/unsupported board functions please refer to the corresponding software data sheets.

10EM01-40	QNX® 6.3 SP3 BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12 and F12N
10EM01-41	QNX® 6.4.1 BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12 and F12N
10EM01-42	QNX® 6.5.0 BSP (MEN) for EM1, EM1A, EM1N, EK6, EK6N, F12 and F12N
13Z015-06	MDIS5™ low-level driver sources (MEN) for 16Z029_CAN (MSCAN/Layer2)
13Z016-06	MDIS5™ driver (MEN) for 16Z029_CAN (CANopen master)
13Z017-06	MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO, 16Z037_GPIO and 16Z127_GPIO
13Z025-40	QNX® 6.3 native driver (MEN) for 16Z025_UART and 16Z125_UART
13Z025-41	QNX® 6.4 native driver (MEN) for 16Z025_UART and 16Z125_UART
13Z025-42	QNX® 6.5 native driver (MEN) for 16Z025_UART and 16Z125_UART
13Z044-40	QNX® native driver (MEN) for 16Z044_DISP (frame buffer)
13Z087-40	QNX® native driver (MEN) for 16Z087_ETH

Software: PikeOS

This product is designed to work under PikeOS by SYSGO. PikeOS is a real-time operating system for use in safety and mission-critical systems which can be certified according to DO-178B DAL-B and EN 50128 SIL 4. For more information and product support please contact www.sysgo.com.

Software: Firmware/BIOS

MENMON™ is MEN's firmware/BIOS for PowerPC® platforms.

14EM01-00	MENMON™ (Firmware) for EM1, EM1A, EM1N, F12 and F12N (object code)

For operating systems not mentioned here contact MEN sales.

Documentation

Compare Chart ESM™ Embedded System Modules » Download

20EM00-00	ESM™ Specification
20EM01NER	EM1N/EM1A Errata
20EM01N00	EM1N/EM1A User Manual
21Z025-90	16Z025_UART and 16Z125_UART under Linux User Manual
22Z025-ER	16Z025_UART Errata
22Z087-ER	16Z087_ETH Errata

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