

EM05 - ESM with Transmeta TM5900



- **Embedded System Module with:**
- **TM5900 / 800 MHz**
- **Up to 512 MB DDR RAM (SO-DIMM), CompactFlash**
- **Dual Fast Ethernet, dual COM (front)**
- **Graphics optional via FPGA (plus 8 MB SDRAM)**
- **Further COMs, CAN, IDE etc. optional via FPGA (USB, keyboard/mouse, floppy etc. optional on carrier board)**
- **Stackable with PCI-104**

The EM05 is a complete embedded single-board computer for use on any carrier board in different industrial environments. The final application consists either of a stand-alone EM05, the EM05 with an application-specific carrier card and/or with additionally plugged PCI-104 modules.

The EM05 is controlled by the TM5900 microprocessor from Transmeta, a Pentium®-like x86 with an integrated Northbridge that operates at 800MHz. What makes this CPU especially attractive is its extremely low power consumption of typically 5W at 800MHz and a long-term availability of five years.

The EM05 is equipped with an onboard 133MHz fast DDR RAM SO-DIMM socket for data and a CompactFlash slot for scalable program storage. At its front panel the EM05 provides max. two RS232 interfaces and two Fast Ethernet channels via RJ45 connectors or 9-pin D-Sub connectors. Further I/O deriving from the onboard Super I/O controller such as USB, IDE, PS/2 etc. can be routed to the I/O connector of the ESM by means of an FPGA -- with the corresponding connectors available on a carrier board. In the same flexible way, additional functionality such as serial interfaces, CAN bus controllers, protocol converters, touch

controller etc. can also be realized in the FPGA to the needs of the individual application. The functionality of the FPGA is dynamically loaded by the application software.

The EM05 is a powerful yet low-cost industrial PC which is designed to operate in harsh environments -- an ideal solution also for infotainment applications. For a first evaluation of the functions of the EM05 it is strongly recommended to use the EK03 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 on a plug-on module. They 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, which provides I/O that is also still independent of a specific application. 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.

Technical Data

CPU

- CPU
- Transmeta Crusoe TM5900 Microprocessor with integrated Northbridge
- 800MHz

Memory

- 64KB L1 and 512KB L2 Cache integrated in Crusoe CPU
- SO-DIMM slot for up to 512MB DDR RAM (1GB on request)
- 133MHz memory bus operation
- 64-bit data bus, 2.5V
- Flash 4MB
- 8-bit data bus, 3.3V
- Hardware data protection
- Serial EEPROM 4kbit for factory settings
- CompactFlash (TM) card interface for Flash ATA (true IDE) via on-board IDE
- Up to 8MB SDRAM, connected to FPGA, e.g. for video data

Interfaces

- Two 10/100Mbps/s Ethernet channels
- GD82551ER controllers
- Two RJ45 connectors or one 9-pin D-Sub connector at front panel
- Two UART RS232 serial interfaces (COM1/COM2)
- Two RJ45 connectors or one 9-pin D-Sub connector at front panel
- Up to 230 kbaud
- COM1/COM2 also available for rear I/O
- One UART RS232 serial interface (COM3), via rear I/O
- IDE port for hard-disk drives via rear I/O
- Ultra DMA100 support

Additional I/O through FPGA and Super I/O

- Available at I/O connector
- Super I/O
- USB 1.1
- Keyboard
- Mouse
- Floppy disk interface
- AC'97
- FPGA I/O
- Depending on FPGA composition
- TFT
- VGA
- SRAM
- Other/further I/O options on request

PCI Interface

- 32-bit PCI interface at PCI-104 connector J1
- Support of 4 external masters

Miscellaneous

- Real-time clock

- Power supervision and watchdog

Electrical Specifications

- Supply voltage/power consumption:
 - +5V (4.85V..5.25V), 2A max.
 - +3.3V (3.0V..3.6V), 2A max.
- MTBF: 84,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to ESM specification (PCB: 149mm x 71mm)
- Weight: 110g (w/o heat sink, w/o CompactFlash card); heat sink: 155g

Environmental Specifications

- Temperature range (operation):
 - 0..+60°C
 - Industrial temperature range on request
 - Airflow: min. 10m³/h
- 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

Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

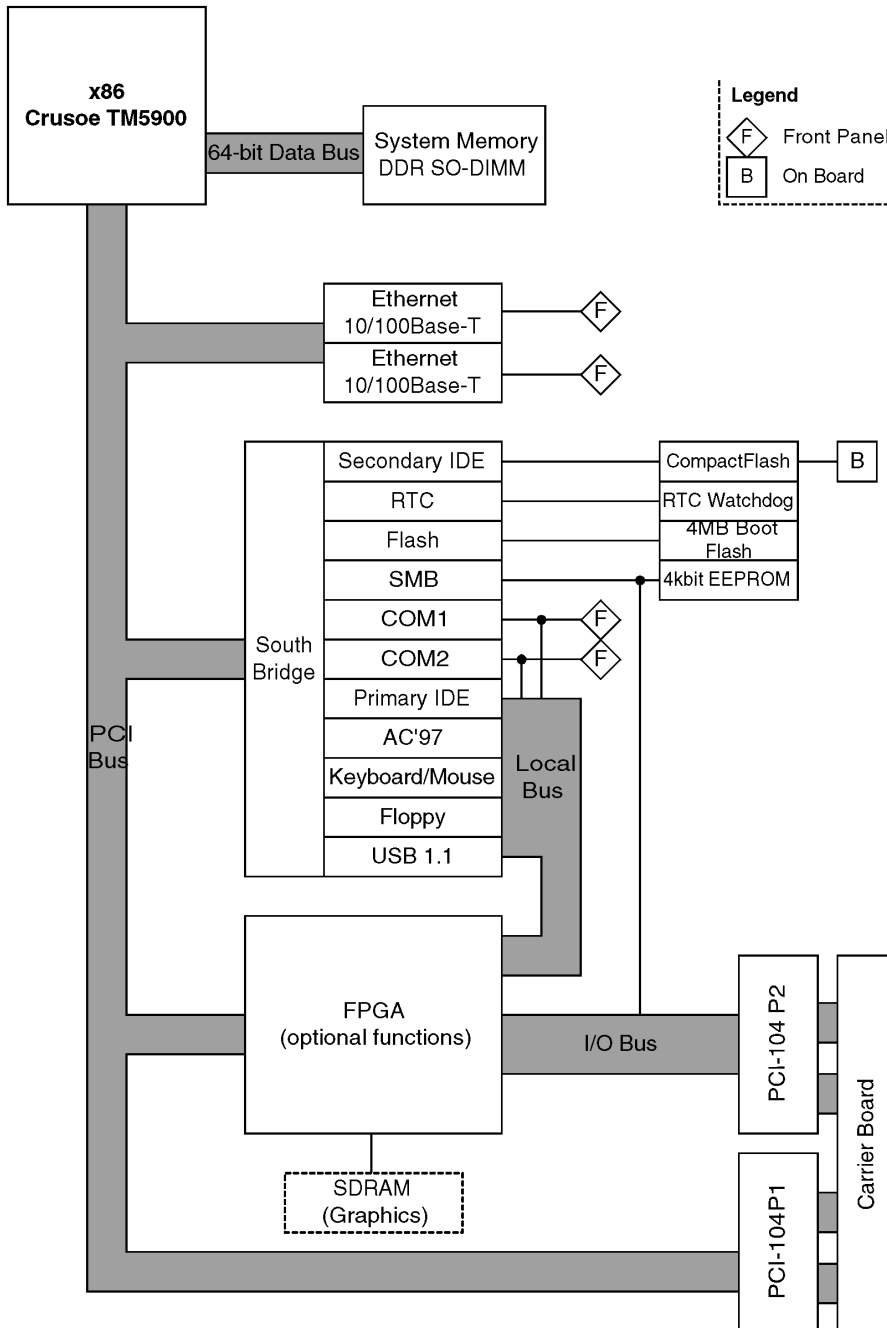
EMC

- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

Software Support

- Award BIOS
- Linux
- Windows
- VxWorks
- MSCAN/Layer2 support: MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)
- CANopen support: Windows driver

Diagram



Related Products

Standard Hardware

08EK03-00	ESM evaluation kit: Mini ATX carrier board EC01 with 1 ESM slot, 3 PCI slots, COM2 switchable, TFT/VGA, PS/2, IDE, floppy interfaces; ESM EM05 with Crusoe TM5900 / 800MHz, 2 Fast Ethernet (RJ45), COM 1 (DSUB), FPGA functions (graphics 800x600, TFT, floppy); temperature range: 0..+60°C; incl. VGA cable, RJ45 to D-Sub cable, keyboard/mouse y-cable, external PSU and adapter for mounting of one PCI-104 module - 512MB DRAM installed, CompactFlash not installed (08EK03-00 = EC01-06 + EM05-00 + SA13-01)
15EM05-00	EM05, ESM - Embedded System Module, Transmeta TM5800 / 800MHz, CompactFlash slot, SO-DIMM DRAM slot, dual Fast Ethernet (RJ45), COM 1 (DSUB); standard FPGA contents graphics 800x600, SRAM controller, RTS-controlled UART; temperature range: 0..+60°C

Please refer to our ESM - Embedded System Modules compare chart for a selection of further single-board computers with different processors and on-board functionality.

FPGA IP Cores

This MEN board offers the possibility to add customized I/O functionality in FPGA. Every standard board comes with a preconfigured FPGA configuration. For additional functions already developed by MEN please refer to our FPGA IP Core overview. More IP cores that can be used in combination with MEN IP cores are available for example from www.altera.com or www.opencores.org. MEN also offers integration of existing and development of new (customized) IP cores. Depending on the hardware platform, SA adapters can be used to realize the physical lines - see below.

Altera offers free download of its FPGA development software: The Quartus II Web Edition software includes a complete environment for FPGA and CPLD design, including schematic- and text-based design entry, integrated VHDL and Verilog HDL synthesis and support for third-party synthesis software, SOPC Builder system generation software, place-and-route, verification, and programming. For more information and free download of the software please refer to www.altera.com/products. The Altera Tools Selector guide describes the Altera tool offerings and requirements. The online version of the document is available at www.altera.com/literature.

Accessories

0751-0006	CompactFlash card, 512MB, Type I, 0..+60°C
0751-0008	CompactFlash card, 64MB, Type I, 0..+60°C
0751-0009	CompactFlash card, 128MB, Type I, 0..+60°C
0751-0012	CompactFlash card, 256MB, Type I, 0..+60°C
0751-0018	CompactFlash card, 256MB, Type I, -40..+85°C

Related Products

0752-0105	512MB DDRAM 0..+60°C for 15EM05-00
08SA13-00	Serial interface adapter, PS/2 for keyboard/mouse, -40..+85°C

For more functions realized with SA adapters, see the listing on MEN's website. You can also view our SA adapter compare chart for a quick overview of different functions. Please contact sales to make sure that these SA adapters can be used in the board configuration you are looking for.

Software

13EM05-70	MEN Windows® drivers for EM05
13EM05-71	Windows® 2000/XP network driver for F8 and EM05 (ESM kit EK03)
13Z016-70	MDIS4/2004 Windows® NT4/W2K driver for CANopen
13Z018-06	MDIS4/2004 low-level driver sources for EM05 watchdog

Documentation

20EM05-00	EM05 user manual
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For the most up-to-date ordering information and direct links to other data sheets and downloads, see the EM05 online data sheet under www.men.de. --> [Click here!](#)

Germany

MEN Mikro Elektronik GmbH
Neuwieder Straße 5-7
90411 Nuremberg
Phone +49-911-99 33 5-0
Fax +49-911-99 33 5-901
E-mail info@men.de
www.men.de

France

MEN Mikro Elektronik SA
18, rue René Cassin
ZA de la Châtelaine
74240 Gaillard
Phone +33 (0) 450-955-312
Fax +33 (0) 450-955-211
E-mail info@men-france.fr
www.men-france.fr

UK

MEN Micro Ltd
Whitehall, 75 School Lane
Hartford, Northwich
Cheshire UK, CW8 1PF
Phone +44 (0) 1477-549-185
Fax +44 (0) 1477-549-178
E-mail info@menmicro.co.uk
www.menmicro.co.uk

USA

MEN Micro, Inc.
PO Box 4160
Lago Vista, TX 78645-4160
Phone (512) 267-8883
Fax (512) 267-8803
E-mail sales@menmicro.com
www.menmicro.com

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