

F50C - Conduction Cooled 3U CompactPCI® MPC8548 SBC



- 32-bit/33-MHz cPCI system slot
- 1 slot, 9 HP front, rear I/O
- MPC8548 (or MPC8543), up to 1.5 GHz
- Up to 2 GB (ECC) DDR2 SDRAM
- Up to 128 KB FRAM, 2 MB SRAM
- Up to 16 GB SSD Flash
- FPGA for user-defined I/O functions
- MENMON™ BIOS for PowerPC® cards
- -40 to +85°C screened

The F50C is a versatile, rugged PowerPC® based single-board computer for embedded applications with conduction cooling. It is controlled by an MPC8548, or optionally an MPC8543 PowerPC® processor (alternatively with encryption unit) with clock frequencies between 800 MHz and 1.5 GHz. The SBC is equipped with ECC-controlled, soldered-on DDR2 RAM for data storage, with up to 16 GB of solid-state Flash disk for program storage as well as industrial FRAM and SRAM.

The board provides up to three Gigabit Ethernet channels, four USB ports, up to two SATA interfaces and up to 64 user-definable I/O lines controlled by its onboard FPGA. These interfaces can be combined in many variations and are all available at the rear using the board's J2 connector. For first operation and service purposes, the board also includes a UART-to-USB port accessible at the front panel.

The F50C is based on a standard 3U CompactPCI® card that is embedded into a dedicated CCA frame for conduction cooling (CCA = conduction cooled assembly). The 9-HP assembly can be used with MEN's conduction-cooled subrack. It is designed for

operation in a -40°C to +85°C environment. For convection cooling, the F50P model is also available, which comes with a tailor-made heat sink for extended temperatures.

The large FPGA on the F50C allows to add additional user-defined functions such as graphics, touch, serial interfaces, fieldbus controllers, binary I/O etc. for the needs of the individual application in an extremely flexible way. Before boot-up of the system, the FPGA is loaded from boot Flash. Updates of the FPGA contents can be made inside the boot Flash during operation.

Equipped with a PCI-bridge chip, the F50C offers a full CompactPCI® interface (system slot functionality) for reliable system expansion. Apart from that, the F50C can also be used as a busless, stand-alone board, with power supply from the backplane.

The soldered components on the F50C withstand shock and vibration, and the board design is optimized for conformal coating.

The F50C 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.

Technical Data

CPU

- PowerPC® PowerQUICC™ III MPC8548, MPC8548E, MPC8543 or MPC8543E
 - 800MHz up to 1.5GHz
 - Please see Configuration & Options for available standard versions.
 - e500 PowerPC® core with MMU and double-precision embedded scalar and vector floating-point APU
 - Integrated Northbridge and Southbridge

Memory

- 2x32KB L1 data and instruction cache, 512KB/256KB L2 cache integrated in MPC8548/MPC8543
- Up to 2GB SDRAM system memory
 - Soldered
 - DDR2 with or without ECC
 - Up to 300 MHz memory bus frequency, depending on CPU
- Up to 16GB soldered Flash disk (SSD solid state disk)
- Up to 32MB additional DDR2 SDRAM, FPGA-controlled, e.g. for video data
- 16MB boot Flash
- 2MB non-volatile SRAM
 - With GoldCap backup
- 128KB non-volatile FRAM
- Serial EEPROM 4kbits for factory settings

Mass Storage

- Parallel IDE (PATA)
 - Up to 16GB soldered ATA Flash disk (SSD solid state disk)
- Serial ATA (SATA)
 - Up to two ports via rear I/O J2
 - Transfer rates up to 150MB/s (1.5 Gbits/s)
 - Via PCI-to-SATA bridge
 - [See interface configuration matrix showing possible I/O combinations \(PDF\)](#)

I/O

- USB (host)
 - Four USB 2.0 host ports
 - Via rear I/O J2
 - OHCI and EHCI implementation
 - Data rates up to 480Mbits/s
- USB (client)
 - One USB client port on series A connector at front panel
 - Via UART-to-USB converter
 - For first operation and service
 - Data rates up to 115.2kbits/s
 - 16-byte transmit/receive buffer
 - Handshake lines: none
- Ethernet
 - Up to three 10/100/1000Base-T Ethernet channels with MPC8548/E (two channels with MPC8543/E)

- Via rear I/O J2
- [See interface configuration matrix showing possible I/O combinations \(PDF\)](#)
- User-defined I/O
 - FPGA-controlled
 - Up to 64 I/O lines
 - Connection via rear I/O J2
 - Standard version provides 4 UARTs and 16 GPIO lines
 - [See interface configuration matrix showing possible I/O combinations \(PDF\)](#)

Rear I/O

- Four USB 2.0
- Up to three 1000Base-T Ethernet
- Up to two SATA
- Up to 64 I/O lines, FPGA-controlled
 - Reduces Ethernet/SATA interfaces
 - [See interface configuration matrix showing possible I/O combinations \(PDF\)](#)

FPGA

- Standard factory FPGA configuration:
 - Main bus interface
 - 16Z043_SDRAM - Additional SDRAM controller (32 MB)
 - 16Z034_GPIO - GPIO controller (rear I/O 16 lines, 2 IP cores)
 - 16Z125_UART - UART controller (controls rear I/O COM1..4)
- The FPGA offers the possibility to add customized I/O functionality. See FPGA.

Miscellaneous

- Real-time clock with GoldCap backup
- Temperature sensor, power supervision and watchdog

CompactPCI® Bus

- Compliance with CompactPCI® Core Specification PICMG 2.0 R3.0
- System slot
- 32-bit/32-MHz PCIe®-to-PCI bridge
- V(I/O): +3.3V (+5V tolerant)

Busless Operation

- Board can be supplied with +5V, +3.3V and +12V from backplane, all other voltages are generated on the board
- Backplane J1 connector used only for power supply

Electrical Specifications

- Supply voltage/power consumption:
 - +5V (-3%/+5%), 800mA approx.
 - +3.3V (-3%/+5%), 350mA approx.
 - ±12V (-5%/+5%), 1A approx.

Technical Data

Mechanical Specifications

- Dimensions:
 - CompactPCI® 3U board embedded in MEN-standard 3U-CCA frame
 - For use with MEN's conduction cooled subrack, 0701-0054
- Front panel: 9HP with cut-out for USB
- Weight: 620g

Environmental Specifications

- Temperature range (operation):
 - -40..+85°C Tcase (screened)
 - Convection cooled variety F50P also available
- 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): 1g/10..150Hz
- Conformal coating on request

MTBF

- 150,290h @ 40°C according to IEC/TR 62380 (RDF 2000)

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)

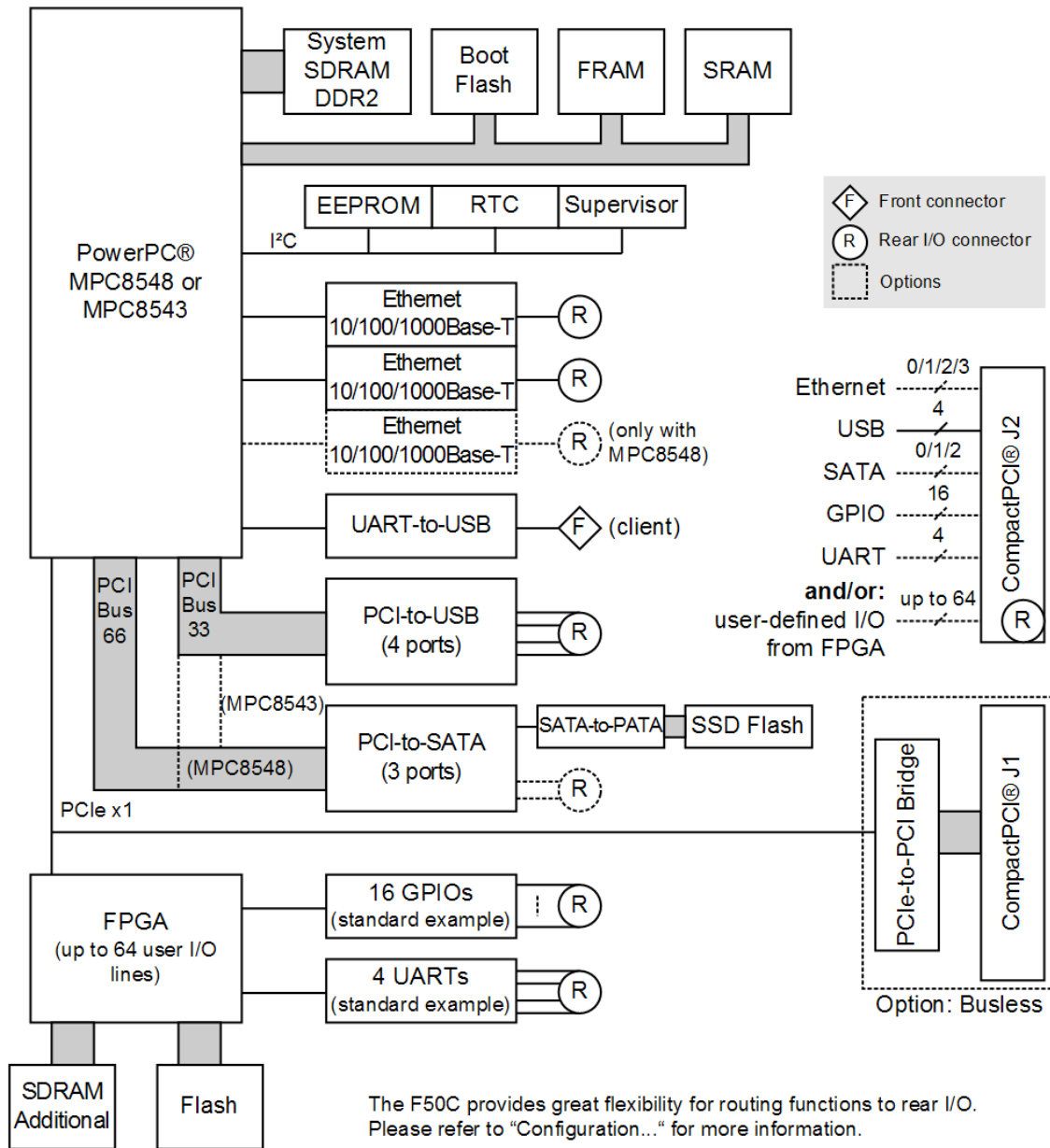
BIOS

- MENMON™

Software Support

- Linux
- VxWorks®
- QNX® (on request; support of the FPU is currently not provided by QNX®)
- INTEGRITY® (Green Hills® Software)
- OS-9® (on request)
- For more information on supported operating system versions and drivers see Software.

Diagram



Configuration & Options

Standard Configurations

Article No.	CPU Type	System RAM / FRAM	SSD	Front I/O	Rear I/O	FPGA	Front Panel	Op. Temp.	Cooling
02F050P00	MPC8548, 1.33 GHz	512 MB ECC / 128 KB	2GB	2 USB / 2 ETH	4 USB / 2 SATA	No	8 HP	-40..+70°C	Convection
02F050C00	MPC8548, 1.33 GHz	512 MB ECC / 128 KB	2GB	1 USB client	4 USB / 2 ETH / 16 GPIO / 4 UARTs	Yes	9 HP	-40..+85°C	Conduction

Options

CPU

- Several PowerQUICC™ III types with different clock frequencies
- MPC8548 or MPC8548E
 - 1 GHz, 1.2 GHz, 1.33 GHz or 1.5 GHz
- MPC8543 or MPC8543E
 - 800 MHz or 1 GHz

Memory

- System RAM
 - 512 MB, 1 GB or 2 GB
 - With or without ECC
- Flash Disk
 - 2 GB, 4 GB, 6 GB, 8 GB, 12 GB or 16 GB
- FRAM
 - 0 KB or 128 KB
- Additional SDRAM
 - 0 MB or 32 MB
 - With FPGA

I/O

- [See interface configuration matrix showing possible I/O combinations \(PDF\)](#)
- Ethernet
 - Up to three channels at rear
 - Only two channels total with MPC8543
- SATA
 - Up to two channels at rear
- Up to 64 user-defined I/O lines
 - With optional FPGA
 - Reduces number of Ethernet/SATA channels

Cooling concept

- [Convection cooled variety F50P also available, for up to -40..+85°C](#)

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

FPGA

Flexible Configuration

- This MEN board offers the possibility to add customized I/O functionality in 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® Arria® GX AGX35C
 - 33,520 logic elements
 - 1,348,416 total memory bits
 - Connected to CPU via PCI Express® x1 link
- Connection
 - Available pin count: 64 pins
 - Functions available via rear I/O J2 connector

Ordering Information

Standard Hardware

02F050C00 MPC8548, 1.33 GHz, 2 GB SSD Flash, 512 MB DDR2 RAM, 2 MB SRAM, 128 KB FRAM, FPGA, rear I/O (2 GbE, 4 USB, 16 GPIO, 4 UARTs), 9 HP, -40..+85°C Tcase screened - conduction cooled board within CCA frame

Related Hardware

02F050P00 MPC8548, 1.33 GHz, 2 GB SSD Flash, 512 MB DDR2 RAM, 2 MB SRAM, 128 KB FRAM, front I/O and PICMG 2.30 rear I/O (2 SATA, 4 USB), 8 HP, no FPGA, -40..+70°C screened

0701-0054 CompactPCI rack for 3U cards in CCA frames, 3 slots, incl. wide-range PSU 24VDC, -40..+70°C(+85°C) qualified (Tx), IP65

Systems & Card Cages

0701-0054 CompactPCI rack for 3U cards in CCA frames, 3 slots, incl. wide-range PSU 24VDC, -40..+70°C(+85°C) qualified (Tx), IP65

Software: OS independent

13Z017-06 MDIS5 low-level driver sources (MEN) for 16Z034_GPIO and 16Z037_GPIO

Software: Linux

10EM09-91 General Linux BSP for A17, EM9, EM9A, EK9, F50C, F50P and XM50

13Z025-90 Linux native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART

Software: VxWorks

10EM09-60 VxWorks BSP (MEN) for A17, EK9, EM9, EM9A, F50C, F50P and XM50

13Z025-60 VxWorks native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART

Software: Firmware/BIOS

14XM50-00 MENMON (Firmware) for XM50, F50C and F50P (object code)

Documentation

20F050C00 F50C User Manual

20SYST016 3U CompactPCI CCA Rack User Manual

22Z125-ER 16Z125_UART Errata

For the most up-to-date ordering information and direct links to other data sheets and downloads, see the **F50C online data sheet** under » www.men.de.

Contact Information

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

USA

MEN Micro, Inc.
 24 North Main Street
 Ambler, PA 19002
 Phone (215) 542-9575
 Fax (215) 542-9577
 E-mail sales@menmicro.com
 www.menmicro.com

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