F50C – 3U CompactPCI® PowerPC® MPC8548 Conduction Cooled 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 Tcase screened**
- **Conduction cooling**

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® CPU (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 CPU card 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.

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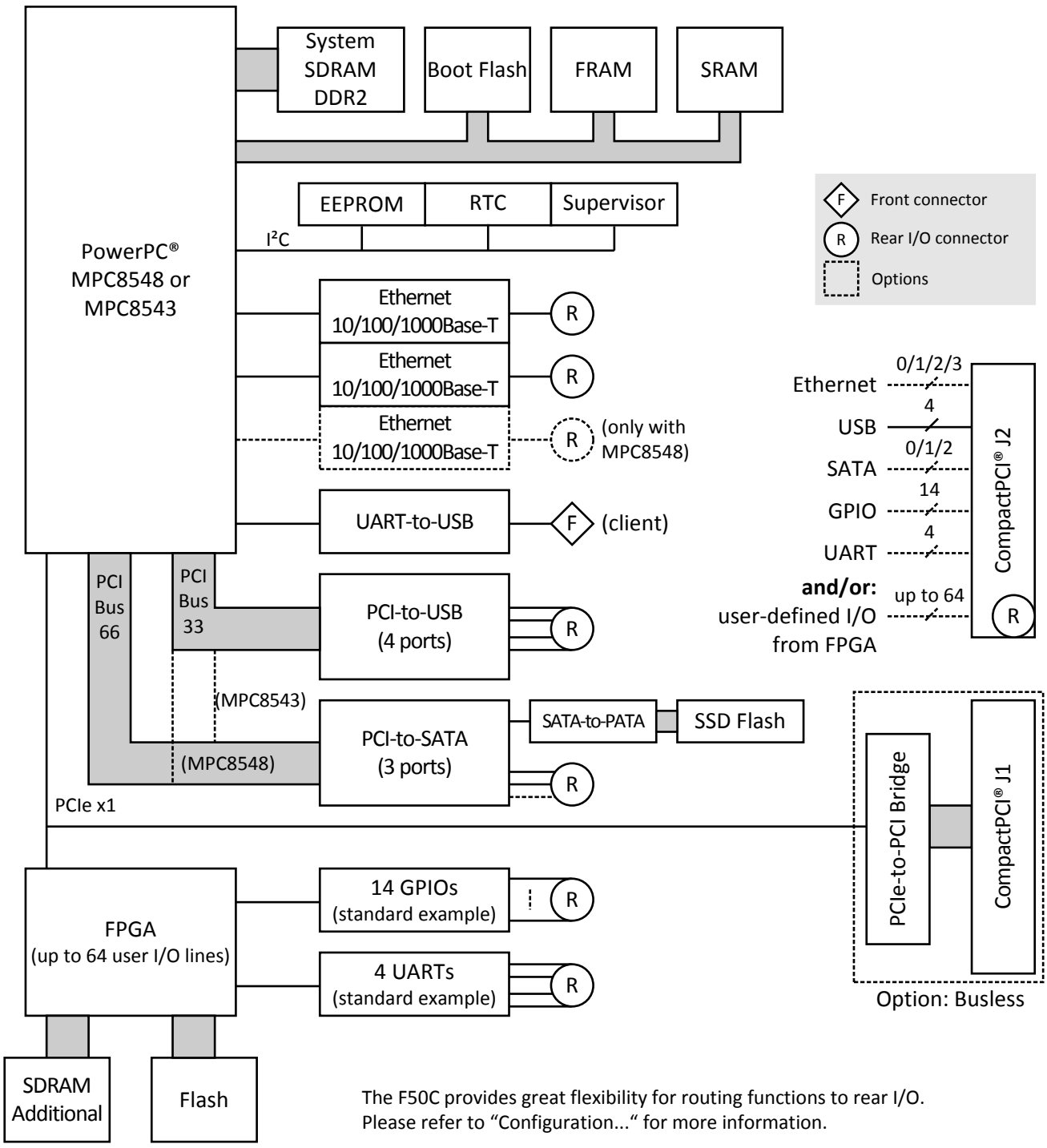
Diagram



The F50C provides great flexibility for routing functions to rear I/O.
Please refer to “Configuration...“ for more information.

Technical Data

CPU	■ PowerPC® PowerQUICC™ III MPC8548, MPC8548E, MPC8543 or MPC8543E □ 800MHz up to 1.5GHz □ Please see Standard Configurations 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 Gbit/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 480Mbit/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 115.2kbit/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)

Technical Data

FPGA	■ Standard factory FPGA configuration: □ Main bus interface □ 16Z043_SDRAM - Additional SDRAM controller (32 MB) □ 16Z034_GPIO - GPIO controller (rear I/O 14 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.
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 (CCA frame) (screened) □ 0..+60°C Tcase (CCA frame) (screened, with 16 GB SSD Flash disk) □ 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) support available. Please contact Green Hills® for further information. ■ OS-9® (on request) ■ 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® 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

Configuration & Options

Standard Configurations

Article No.	CPU Type	System RAM / FRAM	SSD	Front I/O	Rear I/O	FPGA	Front Panel	Op. Temp.	Cooling
02F050C00	MPC8548, 1.33 GHz	512 MB ECC / 128 KB	2GB	1 USB client	4 USB / 2 ETH / 2 SATA / 14 GPIO / 4 UARTs	Yes	9 HP	-40..+85°C	Conduction
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

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, 8 GB or 16 GB
  - Please note that the 16 GB Flash disk component only supports a temperature range of 0..+60°C!
- 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.

Ordering Information

Standard F50C Models	**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, 2 SATA, 14 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
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: Linux	This product is designed to work under Linux. See below for potentially available separate software packages from MEN.	
	10EM09-91	General Linux BSP for A17, EM9, EM9A, EK9, F50C, F50P and XM50
	13Z017-06	MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO and 16Z037_GPIO
	13Z025-90	Linux native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART
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.	
	10EM09-60	VxWorks® BSP (MEN) for A17, EK9, EM9, EM9A, F50C, F50P and XM50
	13Z017-06	MDIS5™ low-level driver sources (MEN) for 16Z034_GPIO and 16Z037_GPIO
	13Z025-60	VxWorks® native driver (MEN) for 16Z025_UART, 16Z057_UART and 16Z125_UART
Software: INTEGRITY®	This product is designed to work under the INTEGRITY® RTOS from Green Hills® Software. An INTEGRITY® Board Support Package for this board is provided by Green Hills® Software. For more information and product support please contact Green Hills® Software (www.ghs.com).	
Software: Firmware/BIOS	MENMON™ is MEN's firmware/BIOS for PowerPC® platforms.	
	14XM50-00	MENMON™ (Firmware) for XM50, F50C and F50P (object code)
Software: Miscellaneous	A Windows® USB2UART driver from FTDI is available for XM50, XM51 and F50P/F50C Windows® hosts.	
	More info & downloads	

For operating systems not mentioned here contact MEN sales.

Documentation	Compare Chart 3U CompactPCI® / PlusIO CPU cards » Download	
	Compare Chart 3U CompactPCI® / PlusIO peripheral cards » Download	
	20F050C00	F50C User Manual
	20SYST016	3U CompactPCI® CCA Rack User Manual
	22Z125-ER	16Z125_UART Errata

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