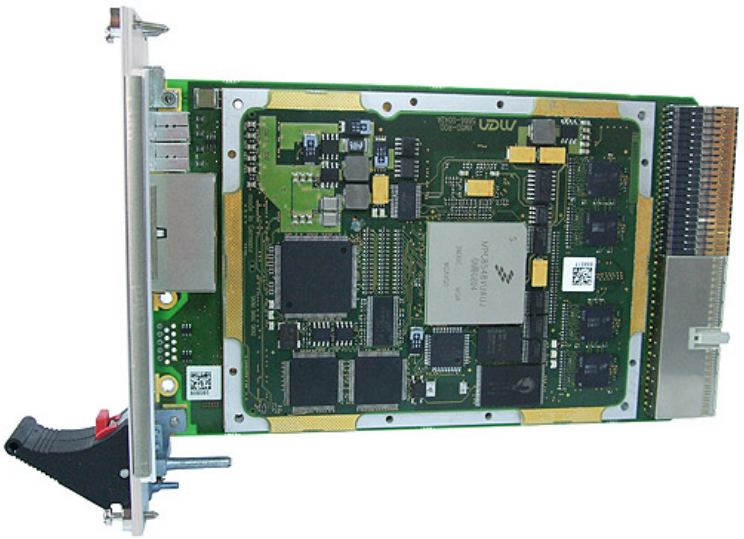
F50P – 3U CompactPCI® PlusIO PowerPC® MPC8548 CPU Board

- **32-bit CompactPCI® and PICMG 2.30 PlusIO**
- **8 HP or 12 HP with front 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**
- **Standard front I/O: 2 Gb Ethernet, 2 USB**
- **Standard rear I/O: 4 USB, 2 SATA**
- **FPGA for user-defined I/O functions (option)**
- **MENMON BIOS for PowerPC® cards**
- **-40 to +70°C (8 HP) (screened)**



The F50P is a versatile, rugged PowerPC® based single-board computer for embedded applications. 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 CPU card provides up to three Gigabit Ethernet channels, six USB ports, up to two SATA interfaces and up to 64 user-definable I/O lines controlled by an optional onboard FPGA. These interfaces can be combined in many variations and are available at the front or at the rear using the board's J2 connector. The J2 pin assignment and connector type are in compliance with the PICMG 2.30 CompactPCI® PlusIO standard - the migration path towards CompactPCI® Serial. Two USB and two RJ45 Ethernet connectors are already provided at the front panel, and space is left for an optional VGA connector.

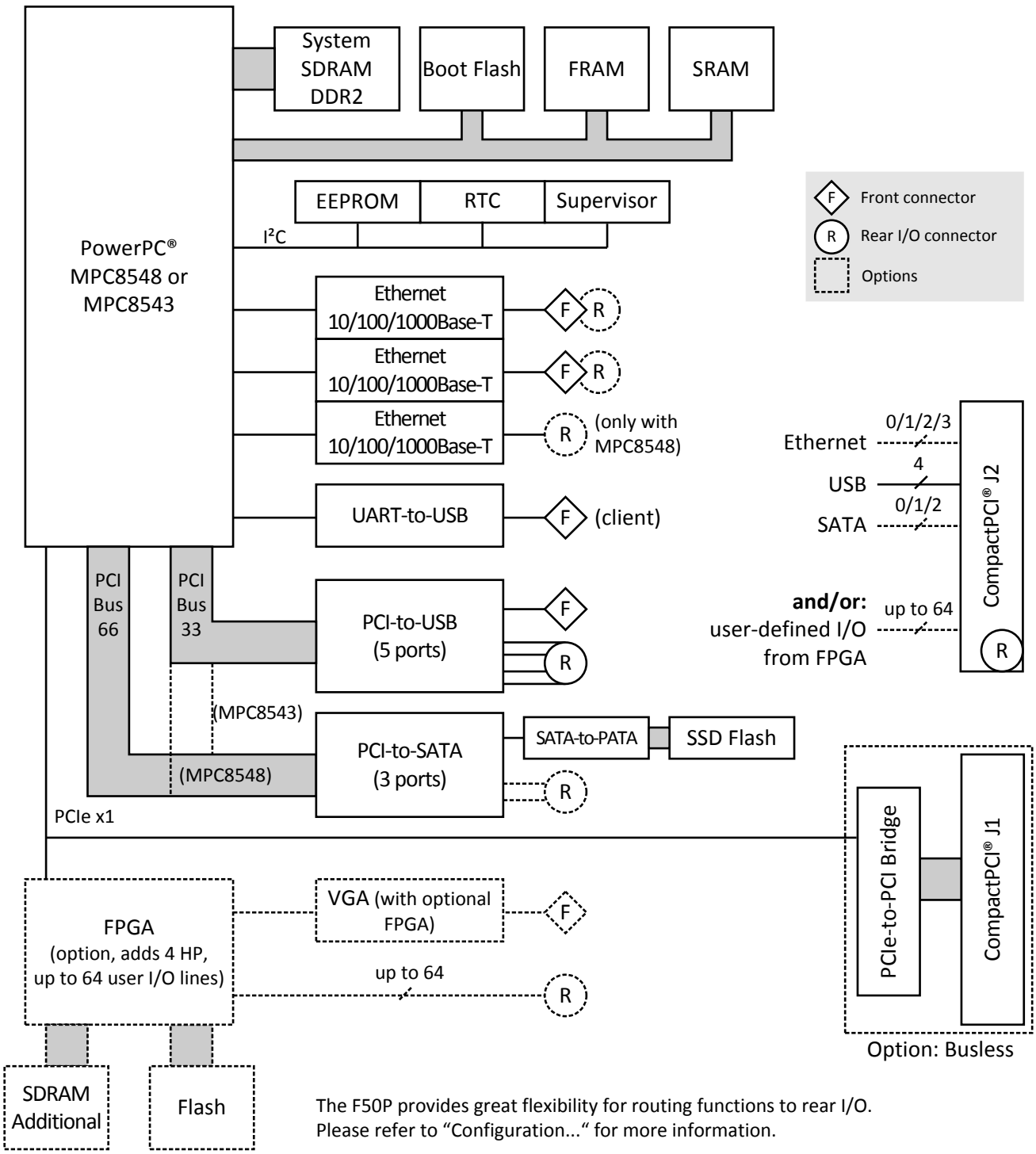
The large FPGA on the F50P allows to add additional user-defined functions such as graphics, touch, serial interfaces, fieldbus controllers, binary I/O etc. for the needs of the individual application in an extremely flexible way. Before boot-up of the system, the FPGA is loaded from boot Flash. Updates of the FPGA contents can be made inside the boot Flash during operation. If the FPGA is assembled, the card needs an extra 4 HP in front panel space.

Equipped with a PCI-bridge chip, the F50P offers a full CompactPCI® interface (system slot functionality) for reliable system expansion. Apart from that, the F50P can also be used as a busless, stand-alone board, with power supply from the backplane.

Being designed for operation in a conduction or convection cooled environment, the F50P provides flexibility also in its cooling concept. Its firmly plugged-on CPU module is embedded in a covered frame. This ensures EMC protection and allows efficient conductive cooling for the F50C model, which is also available by standard. For air cooling, the F50P version comes with a tailor-made heat sink on top of the cover, requiring an 8-HP front panel, for an extended temperature range of -40 to +70°C. The soldered components on the F50P withstand shock and vibration, and the board design is optimized for conformal coating.

The F50P 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.

Diagram



The F50P 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 □ 800 MHz up to 1.5 GHz □ 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	■ 2 x 32 KB L1 data and instruction cache, 512 KB / 256 KB L2 cache integrated in MPC8548/MPC8543 ■ Up to 2 GB SDRAM system memory □ Soldered □ DDR2 with or without ECC □ Up to 300 MHz memory bus frequency, depending on CPU ■ Up to 16 GB soldered Flash disk (SSD solid state disk) ■ Up to 32 MB additional DDR2 SDRAM, FPGA-controlled, e.g. for video data ■ 16 MB boot Flash ■ 2 MB non-volatile SRAM □ With GoldCap backup ■ 128 KB non-volatile FRAM ■ Serial EEPROM 4 kbits for factory settings
Mass Storage	■ Parallel IDE (PATA) □ Up to 16 GB soldered ATA Flash disk (SSD solid state disk) ■ Serial ATA (SATA) □ Up to two ports via rear I/O J2 □ Transfer rates up to 150 MB/s (1.5 Gbit/s) □ Via PCI-to-SATA bridge □ See interface configuration matrix showing possible I/O combinations (PDF)
Graphics	■ FPGA-controlled (optional) ■ VGA connector prepared at front panel
I/O	■ USB (host) □ Five USB 2.0 host ports □ One series A connector at front panel □ Four ports via rear I/O J2 □ OHCI and EHCI implementation □ Data rates up to 480 Mbit/s ■ USB (client) □ One USB client port on series A connector at front panel □ Via UART-to-USB converter □ Data rates up to 115.2 kbit/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) □ Two RJ45 connectors at front panel □ Two front-panel LEDs for channels for LAN link, activity status and connection speed □ All three possible also via rear I/O J2 (Note: requires additional Ethernet transformers on rear I/O board or backplane.) □ See interface configuration matrix showing possible I/O combinations (PDF) ■ User-defined I/O □ FPGA-controlled (optional) □ Up to 64 I/O lines □ Connection via rear I/O J2 □ See interface configuration matrix showing possible I/O combinations (PDF)
Front Connections (Standard)	■ One USB 2.0 host (Series A) ■ One USB client (Series A) ■ Two Ethernet (RJ45)

Technical Data

Rear I/O	■ Four USB 2.0 ■ Up to three 1000Base-T Ethernet ■ Up to two SATA ■ Up to 64 I/O lines with optional FPGA □ Reduces Ethernet/SATA interfaces □ See interface configuration matrix showing possible I/O combinations (PDF) ■ Standard version compatible with PICMG 2.30 CompactPCI® PlusIO □ Two SATA □ Four USB 2.0 □ 1PCI33/0PCIE/2SATA1.5/4USB2/0ETH
FPGA	■ The FPGA offers the possibility to add customized I/O functionality. See Options ■ Standard: FPGA not assembled
Miscellaneous	■ Real-time clock with GoldCap backup ■ Temperature sensor, power supervision and watchdog ■ Status LED at the front ■ Reset button
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): +3.3 V (+5 V tolerant)
Busless Operation	■ Board can be supplied with +5 V, +3.3 V and +12 V from backplane, all other voltages are generated on the board ■ Backplane J1 connector used only for power supply
Electrical Specifications	■ Supply voltage/power consumption: □ +5 V (-3%/+5%), 800 mA approx. □ +3.3 V (-3%/+5%), 350 mA approx. □ ±12 V (-5%/+5%), 1 A approx.
Mechanical Specifications	■ Dimensions: conforming to CompactPCI® specification for 3U boards ■ Front panel: □ 8 HP without FPGA □ 12 HP with FPGA □ See also F50P front panel diagram ■ Weight: 626 g
Environmental Specifications	■ Temperature range (operation): □ -40..+70°C (screened) □ 0..+60°C (screened, with 16 GB SSD Flash disk) □ Airflow: min. 1.0 m/s □ Conduction cooled variety F50C also available ■ Temperature range (storage): -40..+85°C ■ Relative humidity (operation): max. 95% non-condensing ■ Relative humidity (storage): max. 95% non-condensing ■ Altitude: -300 m to + 3,000 m ■ Shock: 15 g, 11 ms ■ Bump: 10 g, 16 ms ■ Vibration (sinusoidal): 1 g, 10..150 Hz ■ Conformal coating on request
MTBF	■ 162,822 h @ 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

Technical Data

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.

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 / 2 SATA / 14 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, 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 optional FPGA
I/O	■ See interface configuration matrix showing possible I/O combinations (PDF) ■ VGA at front (with optional FPGA) ■ Ethernet □ Up to two channels at front □ 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, see below □ Reduces number of Ethernet/SATA channels

Configuration & Options

FPGA	■ The optional onboard FPGA offers the possibility to implement customized I/O functionality. ■ 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 ■ Please note that the FPGA expands the board's width by 4 HP, to 12 HP! □ See also F50P front panel diagram ■ You can find more information on our web page "User I/O in FPGA"
Cooling concept	■ -40..+70°C on 8 HP with heat sink (without FPGA) for convection cooling ■ Conduction cooled variety F50C also available, for -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 F50P Models	**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
Related 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, 2 SATA, 14 GPIO, 4 UARTs), 9 HP, -40..+85°C Tcase screened - conduction cooled board within CCA frame
	08CT12-00	CompactPCI® PlusIO rear transition module 3U/80mm, 2 Ethernet, 4 USB, 4 SATA, 4 PCIe® x1, -40°C..+85°C qualified
Systems & Card Cages	**0701-0046**	CompactPCI® 19" 4U/24HP desktop system for 3U cards, 3-slot 3U CompactPCI® backplane, system slot right, 1U fan tray with 1 fan, 8 HP space for 1 pluggable PSU
	0701-0056	CompactPCI® 19" 4U/84HP rack-mount enclosure for 3U cards (vertical), 4+4-slot 3U CompactPCI® / CompactPCI® Serial hybrid backplane, prepared for rear I/O, 250W power supply wide range 90..264VAC on rear, 1U fan tray with 2 fans included, 0..+60°C
	MEN delivers turn-key systems completely installed (hardware, operating system, accessories), wired and tested. Different rack sizes, power supplies and backplanes on request. For details please contact your local sales representative.	
Software: Linux	This product is designed to work under Linux. See below for all available separate software packages.	
	10EM09-91	General Linux BSP for A17, EM9, EM9A, EK9, F50C, F50P and XM50
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® 6.4/6.5 BSP (MEN) for A17, EK9, EM9, EM9A, F50C, F50P and XM50
	10EM09-61	VxWorks® 6.9 BSP (MEN) for A17, EK9, EM9, EM9A, F50C, F50P and XM50
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® Serial CPU and I/O cards » Download	
	Compare Chart 3U CompactPCI® / PlusIO CPU cards » Download	
	Compare Chart 3U CompactPCI® / PlusIO peripheral cards » Download	
	Compare Chart 3U CompactPCI® / PlusIO extension cards » Download	
	20F050P00	F50P User Manual

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