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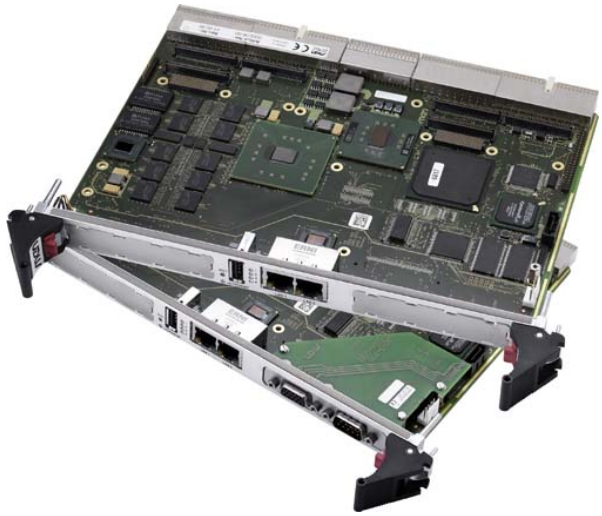
D6 - 6U CompactPCI® Pentium® M Blade Server



- **Pentium® M up to 2 GHz**
- **ULV Celeron® M 1 GHz**
- **PCI Express® 4 x4 links, plus 2 x4 (or 1 x8)**
- **4 HP CompactPCI® system slot, 64-bit/66-MHz**
- **Hot-swap, PICMG 2.16 support**
- **Up to 1 GB DDR2 ECC SDRAM**
- **Non-volatile SRAM, FRAM**
- **Up to 1 GB Flash-on-disk (NAND), hard disk**
- **2 SATA, 2 PATA interfaces**
- **4 Gigabit Ethernet (PCIe®)**
- **3 USB 2.0, 2 COM**
- **Individual I/O in FPGA**
- **2 XMC/PMC slots (PCIe®)**
- **Board Management Control**

Equipped with the high-performance Intel® 2-GHz Pentium® M down to the 1-GHz ultra-low voltage Celeron® M processor, the D6 single-board computer is a versatile 4HP/6U (single-slot, double-size Eurocard) CompactPCI® Single-Board Computer, designed especially for embedded systems which require high computing performance. The SBC comes with a tailored passive heat sink within 4HP height - forced air cooling is required inside the CompactPCI® system.
The D6 is suited for a wide range of industrial applications, for example networked appliances (base stations, gateways, routers etc.), instrumentation and test or railway signalling equipment. Main target markets comprise telecoms, medical engineering and transportation.
The D6 offers a 64-bit/66-MHz up to PCI-X interface to the CompactPCI® bus. PCI Express® for high-speed communication is supported on board to connect the two Gigabit Ethernet controllers (four x4 links) as well as two XMC modules (2 x4 links or 1 x8 link).
A wide range of different memory is available on the D6, such as a maximum of 1 GB DDR2 SDRAM with ECC as main memory (2 GB when components available). The non-volatile memory comprises up to 8 MB buffered SRAM, 16 KB FRAM and 1 GB NAND Flash as mass storage for program memory. All memory components are soldered to guarantee reliable shock and vibration resistance. A hard disk slot is also implemented within 4HP height. Aside from parallel ATA support, two serial ATA lines are available in addition.
The standard I/O available at the front panel of the D6 includes two XMC or PMC modules, two Gigabit Ethernet and one USB 2.0. If only one XMC module is used, one VGA and one COM are available at the front panel. A frame-buffer interface is provided in the FPGA which can also be used to implement further application-specific I/O functions. An additional 32 MB SDRAM is connected to the FPGA, e.g. for use as graphics memory.

The D6 is also prepared for rear I/O where for example two USB ports, two COMs, IDE, audio AC'97 or the rear I/O signals from the PMC modules can be connected.

A board management controller is implemented to supervise the CPU, all voltages, processor and board temperature, and reset. The controller is completely independent of the CPU and monitors all states of the CPU.
The D6 operates in Windows® and Linux environments as well as under major real-time operating systems such as VxWorks® or QNX®. The Award BIOS was especially designed for embedded system applications.
Equipped with Intel® components that come exclusively from the Intel® Embedded Line, the D6 has a guaranteed minimum standard availability of 5 years.

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Technical Data

CPU
- Celeron® M ULV 373 up to Pentium® M 760
  - 1.0 GHz or 1.4 GHz or 2.0 GHz processor core frequency
  - 400MHz or 533MHz front-side bus frequency
- Chipset
  - Northbridge: Intel® MCH E7520 server chip set
  - Southbridge: Intel® ICH 6300ESB
  - High-end memory controller
- Passive heat sink

Memory
- 512KB L2 cache integrated in Celeron® M or 2MB L2 cache integrated in Pentium® M
- Up to 1GB SDRAM system memory (2GB when components available)
  - Soldered
  - DDR2 with ECC support
  - 400MHz memory bus frequency
  - Dual-channel, 2x64 bits
- Up to 1GB soldered NAND Flash (and more), FPGA-controlled
- Up to 32MB additional SDRAM, FPGA-controlled, e.g. for video data and NAND Flash firmware
- Up to 8MB boot Flash
- Up to 8MB non-volatile SRAM
  - Backed by GoldCap or external battery
- Up to 16KB non-volatile serial FRAM
- Serial EEPROM 3x2kbit for factory settings
- CompactFlash® card interface, optional, instead of XMC/PMC 0

Mass Storage
- Parallel IDE (PATA)
  - One port for local hard-disk/CD-ROM, or: one port for local CompactFlash®
  - One port for rear I/O
- Serial ATA (SATA)
  - One port via onboard connector
  - One port for rear I/O
  - Transfer rates up to 150MB/s
- Up to 1GB soldered ATA NAND Flash (and more), FPGA-controlled

Graphics
- FPGA-controlled
  - 2D graphics, frame-buffered
  - Resolution: VGA up to SXGA (max. 1280 x 1024 pixels)
  - Supports BIOS for set-up and control
  - Operating system support by means of dedicated drivers
- VGA connector at front panel, instead of XMC/PMC 0
- Standard VGA graphics with integrated operating system support can be added as needed through an XMC/PMC

I/O
- USB
  - One USB 2.0 port at front via Series A connector
  - Two USB 2.0 ports via rear I/O
  - UHCI implementation
  - Data rates up to 480Mbits/s
- Ethernet
  - Two 10/100/1000Base-T Ethernet channels at front panel
  - Two 10/100/1000Base-T Ethernet channels at rear (2.16)
  - RJ45 connectors at front panel
  - Ethernet controllers are connected by four x4 PCIe® links
  - Two onboard LEDs per channel (front) to signal LAN Link, Activity status and connection speed
- Two UARTs (COM1..COM2)
  - Via onboard adapter or rear I/O
  - COM1: Physical RS232 interface at front panel using adapter PCB, instead of XMC/PMC 0, or: via rear I/O
  - COM2: Via rear I/O, or: Physical interface at front panel using SA-Adapter™ via 10-pin ribbon cable on I/O connector, optional, instead of XMC/PMC 0, RS232..RS485, isolated or not
  - Data rates up to 115.2kbits/s
  - 16-byte transmit/receive buffer
  - Handshake lines: full support (rear I/O); CTS, DCD, DSR, DTR, RTS (COM1 at front); CTS, DTR, RTS (COM2 at front)
- 25 GPIO lines
  - Via rear I/O
- Further I/O depending on FPGA configuration

Front Connections
- One USB 2.0 (Series A)
- Two Ethernet (RJ45)
- COM1/VGA (instead of XMC/PMC 0)
- COM2 (D-Sub, optional, instead of XMC/PMC 0 and COM1/VGA)
- XMC/PMC 0 and 1
- CompactFlash® (optional, instead of XMC/PMC 0)

Rear I/O
- IDE (PATA), one port
- SATA, one port
- USB 2.0, two ports
- Ethernet 1000Base-T according to PICMG 2.16, two ports
- COM1/COM2
- 25 GPIO lines
- Mezzanine rear I/O: PMC 0 and 1

FPGA
- Standard factory FPGA configuration:
  - 16Z052_GIRQ - Interrupt controller
  - 16Z070_IDEDISK - IDE controller for NAND Flash

Technical Data

- 16Z024_SRAM - SRAM controller
- 16Z043_SDRAM - Additional SDRAM controller (up to 32MB)
- 16Z044_DISP - Display controller (60Hz/75Hz, 6-bit RGB)
- 16Z034_GPIO - GPIO controller (25 lines)

- The FPGA offers the possibility to add customized I/O functionality. See FPGA.

Board Management

- Board Management Controller (BMC)
- CPU alarm and status monitoring
- Voltage and current supervision
- Reset control
- CPU and board temperature monitoring
- Prepared for BIOS update via BMC

Mezzanine Slots

- Two slots usable for PMC or XMC
- Two XMC slots
  - Compliant with XMC standard VITA 42.3-200x
  - PCI Express® links: one x4 or two x4 or one x8
- Two PMC slots
  - Compliant with PMC standard IEEE 1386.1
  - 32-bit/33-MHz, 3.3V V(I/O)
  - PMC I/O module (PIM) support

Miscellaneous

- Real-time clock with GoldCap backup
- Reset button
- Four status LEDs, one hot-swap LED (blue)

PCI Express®

- Four x4 links to connect local 1000Base-T Ethernet controllers (1GB/s in each direction)
- Two x4 links or one x8 link for XMC extension (1GB/s or 2GB/s in each direction)

CompactPCI® Bus

- Compliance with CompactPCI® Core Specification PICMG 2.0 R3.0
- System slot
- Up to 64-bit/66-MHz PCI-to-PCI bridge / PCI-X
- V(I/O): +3.3V
- CompactPCI® hot-swap support compliant with CompactPCI® Hot Swap Specification PICMG 2.1 R2.0
- Compliance with CompactPCI® Packet Switching Backplane PICMG 2.16 R1.0
- Prepared for compliance with CompactPCI® System Management PICMG 2.9 R1.0

Electrical Specifications

- Supply voltage/power consumption:
  - +5V (-3%/+5%), 6A typ. (Pentium® M 1.4GHz, 1GB memory)
  - +3.3V (-3%/+5%), 3A typ. (Pentium® M 1.4GHz, 1GB memory)
  - ±12V (-5%/+5%), only used for XMCs/PMCs and hard-disk connector
- MTBF: 119,041h @ 40°C according to IEC/TR 62380 (RDF 2000)

Mechanical Specifications

- Dimensions: conforming to CompactPCI® specification for 6U boards
- Weight: 596g

Environmental Specifications

- Temperature range (operation):
  - 0..+40°C (Pentium® M 2GHz, with P601 mezzanines)
  - 0..+45°C (Pentium® M 2GHz, w/o mezzanines)
  - 0..+60°C (Celeron® M 1GHz, with P601 mezzanines)
  - Airflow: min. 10m³/h (Celeron® M 373); min. 15m³/h (all other processors)
- 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

- Award BIOS

Software Support

- Windows®
- Linux
- VxWorks®
- For more information on supported operating system versions and drivers see Software.

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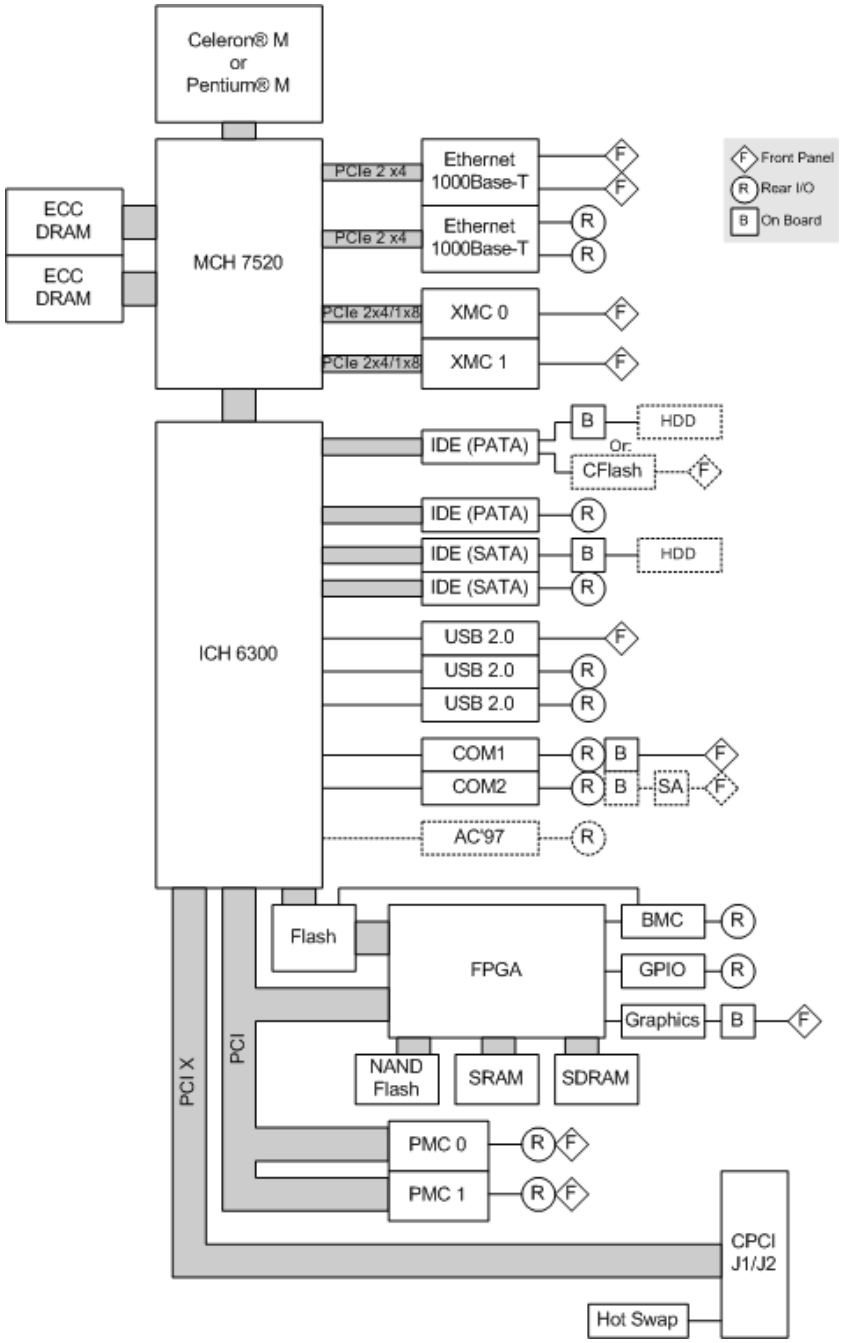
Diagram



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Configuration & Options

Standard Configurations

Article No.	CPU Type	System RAM	Additional SDRAM	SRAM / FRAM	NAND Flash	Boot Flash	XMC/PMC	Operation Temp.
02D006-00	Pentium® M 760, 2GHz	1GB DDR2 ECC	32 MB	8MB / 16KB	128 MB	2 MB	2 slots (if VGA adapter is not mounted)	0..+45°C

Options

CPU

- Celeron® M ULV 373, 1GHz
- Celeron® M 370, 1.5GHz
- Pentium® M LV 738, 1.4GHz
- Pentium® M LV 745, 1.8GHz
- Pentium® M 760, 2GHz

Memory

- System RAM
  - 256 MB, 512 MB, 1 GB or 2 GB (2GB when components available)
  - With or without ECC
- Additional SDRAM
  - 0 MB, 16 MB or 32 MB
- SRAM
  - 0 MB, 2 MB, 4 MB or 8 MB
- FRAM
  - 0 KB, 8 KB or 16 KB
- NAND Flash
  - 0 MB up to maximum available
- CompactFlash®
  - 0 MB up to maximum available
- Boot Flash
  - 2 MB, 4 MB or 8 MB

Mass Storage

- CompactFlash® card interface
  - Instead of XMC/PMC 0, instead of COM1/VGA
  - Via onboard IDE
  - Type I
  - True IDE
  - DMA support
- Hard disk on board
  - Instead of XMC/PMC 0, instead of COM1/VGA
  - Via PATA onboard connector
  - Still only one slot needed
  - Using adapter kit

I/O

- I/O alternative to XMC/PMC 0 or COM1/VGA
  - Onboard hard disk
  - CompactFlash® slot, or:
  - COM2 at front panel via SA-Adapter™
  - SA-Adapter™ for COM2 for RS232 or RS422/485, isolated or not
- XMC/PMC
  - 0, 1 or 2 slots

Rear I/O

- IDE (PATA), one port
- SATA, one port
- USB 2.0, two ports
- Ethernet 1000Base-T according to PICMG 2.16, two ports
- COM1/COM2
- 25 GPIO lines
  - Can be extended by 50 additional lines by reducing PMC rear I/O
- AC'97 audio
  - Reduces GPIO lines
- Mezzanine rear I/O: PMC 0 and 1

FPGA

- Pin count of rear I/O connectors:
  - 50 additional pins on J5
  - Usable for GPIO
  - Reduces PMC rear I/O

Operation Temperature

- 0..+40°C (Pentium® M 2GHz, with P601 mezzanines)
- 0..+45°C (Pentium® M 2GHz, w/o mezzanines)
- 0..+60°C (Celeron® M 1GHz, with P601 mezzanines)
- Depends on board configuration (CPU, mezzanines, hard disk...)

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® Cyclone® EP2C20
  - 18,752 logic elements
  - 239,616 total RAM bits
- Connection
  - Available pin count of rear I/O connectors: 25 pins (J4, for free configuration)+ 50 pins (J5, limited to GPIO, optional)
  - Functions available through rear I/O

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Ordering Information

Standard Hardware

02D006-00 Pentium M 760, 2GHz, 1GB DDR2 RAM (ECC), 128MB NAND Flash, 2MB Boot Flash, 8MB SRAM, 32MB SDRAM, 16KB FRAM, 2 XMC/PMC slots, VGA&COM on front (removable), 0..+45°C

Related Hardware

08CT07-00 CompactPCI rear I/O transition module 6U/80mm, 2 Gb Ethernet, 2 USB 2.0, 2 COMs, 1 PIM slot, 1 CompactFlash slot, connecting to D6, D7, D9, 0..+60°C

15P517-00 Graphics accelerator, 16MB integrated SGRAM, 4 Mbit Flash BIOS, S-Video In/Out and Composite Video Output, 0..+60°C, no RoHS

15P601-00 4-port 1000Base-T Ethernet, 4x RJ45, 2 x4 PCIe links, 5V supply, 0..+55°C

Systems & Card Cages

0701-0030 CompactPCI 19" 3U/84HP rack-mount enclosure for 6U cards (horizontal), 6-slot backplane, system slot left, 250W ATX wide-range PSU, 2 fans, prepared for rear I/O

Miscellaneous

0710-0028 Industrial PATA hard disk, 2.5", 80GB, 24hours/7days, for on-board mounting (hard disk mounting kit may be required additionally), -30..+85°C qualified

08AD71-00 AD71, 2.5" hard disk adapter for A13, A14, A15, D6, D7

Software: OS independent

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

Software: Linux

13Z044-90 Linux native driver (MEN) for 16Z044_DISP (frame buffer)

Software: Windows

13T001-70 Windows network driver (Intel) for F14, F15, F17, F18, D9, D6, D7, D601, A19, A20 and P601, P602

13T003-70 Windows chipset driver (Intel) for F14, F15, F17, F18, F18E, F19P, D9, D6, D7, D601, A19 and A20

13Z044-70 Windows native driver (MEN) for 16Z044_DISP (frame buffer)

Software: VxWorks

10D006-60 VxWorks BSP (MEN) for D6

Documentation

20APPN004 Application Note: How to make a USB stick bootable

20D006-00 D6 User Manual

20D006-ER D6 Errata

For the most up-to-date ordering information and direct links to other data sheets and downloads, see the D6 online data sheet under » www.men.de.

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