

COTS Embedded Solutions and Custom Design Expertise

**Rugged Computer Boards and Systems for
Harsh, Mobile and Mission-Critical Environments**

Commercial vehicles

Construction machines

Agricultural machines

Shipbuilding

Transportation

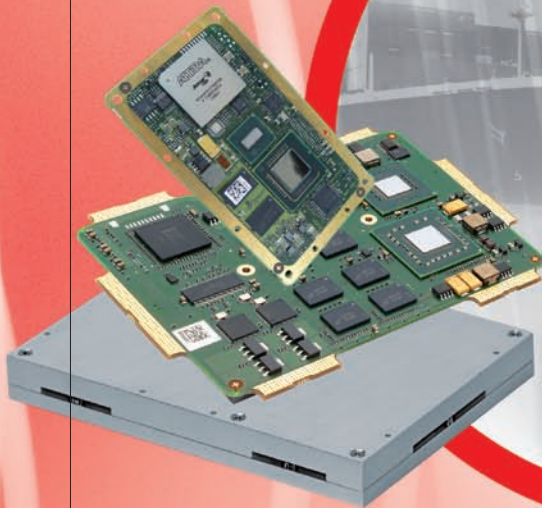
Avionics

Railways



*Safety
Reliability
Availability*

*Ruggedness
Temperature
Shock
Vibration
Humidity
Dust*



*Vehicle onboard control
Supervision
Communication
Infotainment
Security
Test*



**mikro elektronik
gmbh • nürnberg**

Modular Computer Systems

With board-to-board communication being based on serial interconnects and/or a parallel bus system, 19" IEEE 1101.10/11 compliant systems offer a maximum of configuration flexibility and maintainability. MEN partners with Schroff® to provide system solutions which are often modified with customized backplanes and PSUs. Dedicated PSUs, e.g., with wide-range inputs for transport applications are developed by MEN.

CompactPCI® Serial 3U system and peripheral slot cards for communication-intensive high-performance applications based on modern serial interfaces and proven 19" mechanics according to the proposed PICMG CPCI-S.0 specification currently under development.

- SBCs up to Intel® Core™ i7, 2.53 GHz
- Memory soldered
- Standard front I/O
e.g., Ethernet, USB, UARTs, VGA, DVI, DisplayPorts
- Standard rear I/O up to 8 PCIe, 8 Ethernet, 8 USB, 8 SATA
- Ethernet mesh with 1 to 8 channels on mezzanine card
- Peripheral cards for SATA HDD/SDD, XMC/PMC modules, PCIe® MiniCards, Ethernet, USB
- Standard 19" chassis with 9-slot backplane

CompactPCI® PlusIO 3U CPU boards based on Intel® or PowerPC® processors in accordance with PICMG 2.30 offer fast serial communication, can be combined with CompactPCI® Serial peripheral cards and are 100% downward-compatible to parallel CompactPCI® (PICMG 2.0).

- SBCs with Intel® multi-core and Freescale™ processors
- Usable in CompactPCI® PlusIO and CompactPCI® 2.0 systems
- Memory soldered
- Standard front I/O, e.g., Ethernet, USB, VGA
- Standard rear I/O up to 4 PCIe, 4 Ethernet, 4 USB, 4 SATA
- Additional functions in combination with side cards (DVI, audio, FireWire etc.)
- Peripheral card functions with CompactPCI® Serial and CompactPCI® 2.0
- Standard 19" chassis with 8-slot hybrid backplane

CompactPCI® 3U 3U CPU boards for convection and conduction cooled systems according to PICMG 2.0 based on Intel® or PowerPC® processors, completed by a wide range of I/O and controller cards.

- SBCs with Intel® multi-core, Intel® Atom™ and Freescale™ processors
- Memory soldered
- Standard front I/O, e.g., Ethernet, USB, UARTs, VGA
- Rear I/O, e.g., SATA, Ethernet
- FPGA for individual user I/O
- Peripheral cards for PMC and M-Modules™, PCIe® MiniCards, Ethernet, USB, WLAN, GSM, GPS etc.
- Standard 19" chassis with 3-, 5- or 8-slot backplane

CompactPCI® 6U 6U CPU boards according to PICMG 2.0 and PICMG 2.16 based on Intel® CPUs and a unique PowerPC® solution with triple redundancy on board level for safety-critical applications up to DAL-A or SIL 4.

- SBCs with Intel® multi-core and Freescale™ architecture
- PowerPC® CPU boards with triple redundancy (CPU, memory, PSU)
- Memory soldered
- Standard front I/O, e.g., Ethernet, USB, UARTs, VGA, PMC
- Rear I/O, e.g., PMC, SATA, UARTs, graphics
- 1 or 2 PMC slots
- Peripheral cards for binary I/O and M-Modules™
- Standard 19" chassis with 6-slot backplane

VMEbus 6U VME64 and 2eSST CPU boards based on Intel® or PowerPC® processors including a triple redundant SBC for safety-critical applications up to DAL-A or SIL 4.

- SBCs with Intel® multi-core and Freescale™ architecture
- PowerPC® CPU boards with triple redundancy (CPU, memory, PSU)
- Memory soldered
- PMC or M-Module™ slots
- Standard front I/O, e.g., Ethernet, USB, UARTs, VGA, PMC
- Rear I/O e.g. PMC, SATA, UARTs, graphics
- Peripheral cards for M-Modules™
- Standard 19" chassis with 6-slot backplane

Computer-On-Modules The COM concepts supported by MEN are highly robust and EMC-proof and solve the cooling requirements of the system behind. The fanless conductive cooling concept is prepared for a power dissipation of up to 35 W. The CPU PCB is mounted into a frame and is completely enclosed in an aluminum housing – also making it 100% EMC-proof. The module is fixed on the carrier card using eight screws and has a rugged board-to-board connector. While electrical signals on standard ESMexpress® COMs are exclusively serial, the ultra-small ESMini™ COMs support parallel and serial signals along with onboard FPGAs.

ESMexpress®

- ANSI-VITA 59 standard in process
- Intel® Atom™, Intel® multi-core and Freescale™ processors
- Memory soldered
- Unique size 95 x 125 mm
- Fixed pin-out for COM interchangeability
- Closed aluminum housing and/or heat sink
- ATX evaluation carrier XC1

ESMini™

- Intel® Atom and Freescale™ processors
- Memory soldered
- Unique size 95 x 55 mm
- Pin-out depending on onboard FPGA
- Closed aluminium housing and/or heat sink
- MicroATX evaluation carrier XC4



Mezzanine I/O MEN uses PMC and XMC modules to add modular computing I/O to any 19" system or on stand-alone SBCs while M-Modules™ allow to add any kind of real-world I/O to a system in a very flexible way. Typical M-Module™ functions comprise instrumentation, process I/O, motion, robotics and various general-purpose analog and binary I/O.

- Graphics accelerator and frame buffer interfaces
- Gigabit Ethernet
- CAN bus and UART interfaces
- Reflective memory
- Convection and conduction cooled versions
- USM concept with user-defined I/O in FPGA
- Up to 32 binary inputs and/or outputs
- Up to 16 analog inputs or outputs

- TTL I/O, relay outputs
- Data and temperature acquisition
- Oscilloscopes, digital multimeters, function & waveform generator
- Motor controllers and motion counters
- CAN bus and Profibus interfaces
- USM concept with user-defined I/O in FPGA



Box Computers MEN box computers are based on the MIPIOS® family of extremely rugged IP67-compliant products designed for Ethernet connectivity. They are prepared for wall mounting (DIN rail mounting optional). The design is always realized without fans, using conductive cooling to spread the dissipated heat to the outside of the housing. Standard versions comply with the EN 50155, class Tx railway standard and have E1 certification.

- Intel® Atom™ inside
- Versions without or with display/touch
- Interfaces, e.g., Ethernet, USB, UARTs, CAN bus, IBIS
- PCIe® MiniCard slots for wireless connections

- 220 x 130 x 70 mm housing with M12 connectors
- Fanless and maintenance-free
- Redundant wide-range PSU (power class S2)
- -40 to +70 (+85)°C operating temperature



Display Computers MEN offers a wide range of display computer systems based on a flexible modular configuration concept in terms of processor performance, interface types and PSU types. The control electronics are available as a stand-alone product or as part of a complete system. Standard versions comply with the EN 50155, class Tx railway standard and have E1 certification.

- Intel® Atom™ or Intel multi-core inside
- Screen sizes from 10.4" to 21" and more
- PCIe® MiniCard and SIM card slots for wireless connections

- Complete devices or display electronics only
- Interfaces, e.g., Ethernet, USB, UARTs, CAN bus, IBIS
- Fanless and maintenance-free, vandal-proof
- -40 to +70 (+85)°C operating temperature



Ethernet Switches Whether as stand-alone units for insertion in 19" systems or based on the MIPIOS® family of extremely rugged IP67 products or in CompactPCI® format, MEN Ethernet switches are an easily customizable low-power platform for harsh environments. Standard versions comply with the EN 50155, class Tx railway standard and have E1 certification.

- Managed or unmanaged versions
- PoE (Power over Ethernet) versions
- Configuration via web interface, CLI (RS232, Telnet or SSH), SNMP ver. 3 or ext. dongle

- M12, RJ45 or DSUB connectors
- Fanless and maintenance-free
- Redundant wide-range PSU (power class S2) or 24V
- -40 to +70 (+85)°C operating temperature



Custom Design Expertise

Custom design of computer boards and systems

Often the most cost-effective solution results in a custom design – while using as many standard components as possible. Synergy effects emerge through the mutual development of standard and custom boards and systems.

Complete system solutions based on in-house mechanical design

Whether 19" system, wall-mount, stand-alone or DIN-rail, we guarantee overall operability of each system, minimizing the integration effort and the handling cost on the client's side. The quality of our systems is assured by applying traceability through the V-model.

Customer assistance in configuration of mission-critical systems

Computer architectures with safety-critical requirements are very complex. Considerations include safety-critical characteristics and levels (SIL, DAL), reliability questions, error behavior modes, and the major IEC and EN standards – backed by a professional safety and risk management.

MEN – The Rugged and Mission-Critical Embedded Experts

Development and production of rugged and reliable products

Our boards and systems are developed to meet requirements like temperature ranges between -40 and +85°C through convection or conduction cooling, shock, vibration, chemical influence, or the option of coating against humidity right from the start.

Development based on quality management systems of our markets

We are certified according to ISO 9001 and ISO 14001, plus EN/AS 9100 (aerospace), IRIS (railways) and E1 (automotive). We develop according to the GRESS requirements by Airbus and are preparing for EFQM (European Foundation for Quality Management).

Development based on relevant standards know-how for our markets

Preparing products for qualification according to vertical market standards is one of our key services, for example EN 50155 for railways, DO-254 and DO-178B for avionics, German Lloyd for shipbuilding or E1 for automotive.

Fully automated, high-quality in-house production

To achieve the highest product quality, our manufacturing and test process is fully automated. Vapor-phase soldering assures smooth processing of the components. Traceability is guaranteed by time stamps throughout the whole process.

All relevant environmental tests in-house

We carry out the preliminary qualifications in our own environmental test lab (temperature, shock, vibration, humidity), high-voltage and EMC chambers. Further calculations and analyses include MTBF, FMEA, Hazard Tree, BITE, HASS or HALT.

FPGA technology expertise

FPGAs allow us to customize our hardware without touching the board layout at an attractive price even in low quantities. FPGA-based solutions are flexible, offer long-term availability and support extended temperature operation.



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