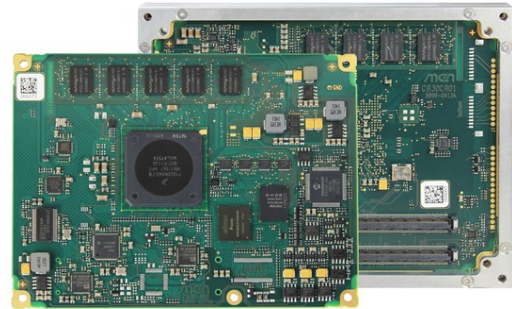


# CB30

## Vital Rugged COM Express Module with QorIQ P1022 COM Express Basic, Type 6

- » NXP QorIQ P1022 CPU
- » Up to 2 GB DDR3 SDRAM with ECC, soldered
- » Safe supervisor
- » Fail-safe board architecture
- » Event logging
- » SIL 2 with report from TÜV SÜD (EN 50128, EN 50129)
- » EN 50155, class TX compliance
- » -40 °C to +85 °C Tcase
- » Conduction cooling
- » Conformal coating
- » Compliant with COM Express Basic, type 6
- » PICMG COM.0 and Ultra-Rugged COM versions



### Safe CPU System up to SIL 2

The CB30 safe CPU board is a rugged COM Express module for use in safety-related applications, e.g., for rolling-stock train control systems or industrial applications. It is based on a NXP QorIQ single-core P1013 or dual-core P1022 processor, running at up to 1 GHz and providing excellent performance per watt. It is hardware-supervised by a dedicated safe supervisor to meet EN 50129 or IEC 61508 SIL 2 level requirements. An assessment report from TÜV SÜD greatly simplifies certification for railway applications.

### Functional Safety Architecture: Fail-Safe

The CB30 is a single-processor board with a fail-silent design. The functional safety architecture is based on monitoring all safe CPU subsystem environmental conditions, e.g., voltages and temperature. If safe operation of the CPU subsystem cannot be guaranteed, the safe supervisor (SUPV) removes the power of the subsystem, ensuring all external communications are stopped.

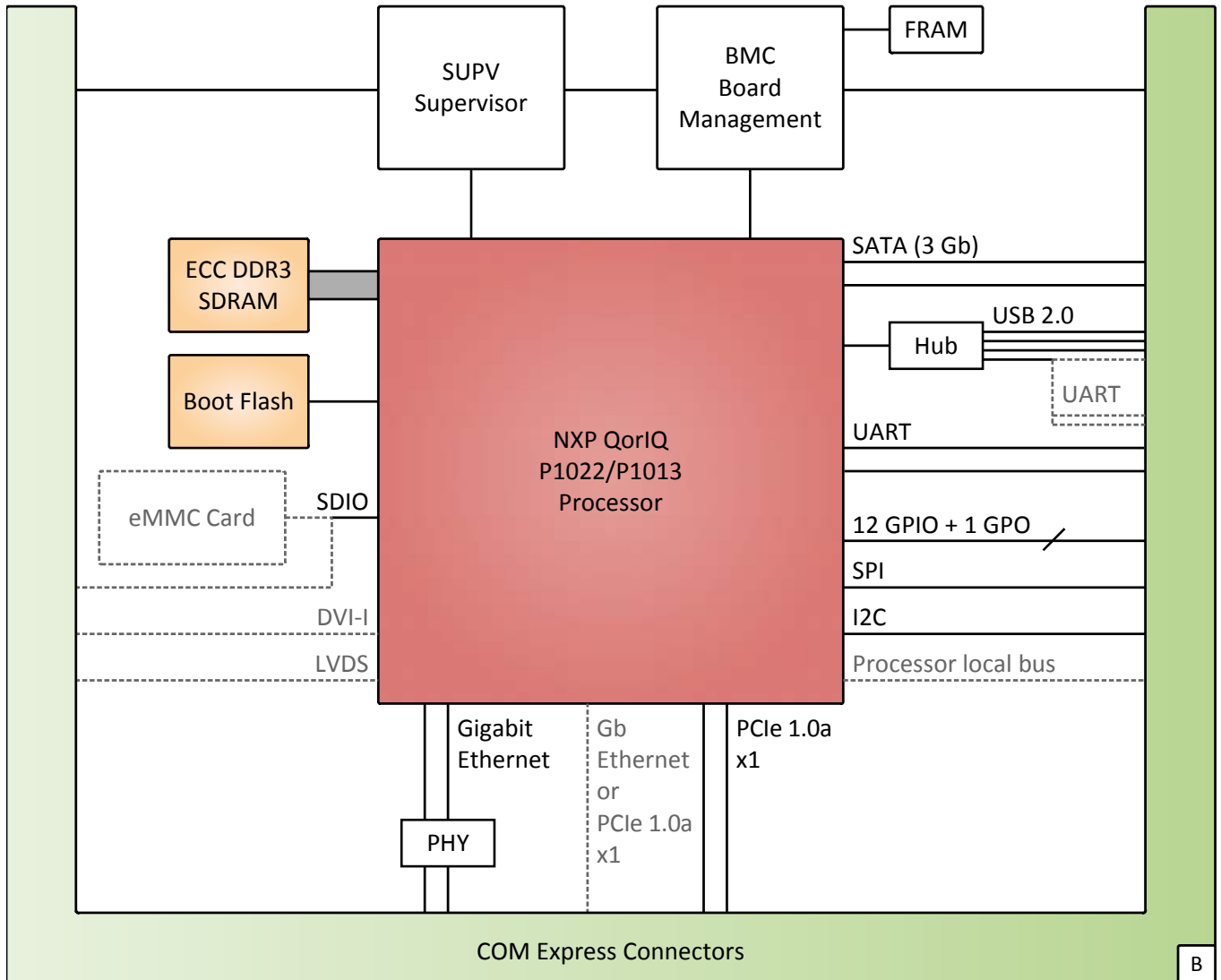
The SUPV also ensures it is only possible to exit the safe state in a controlled manner. If an overvoltage is detected the CB30 is placed in a non-recoverable disabled state and needs to be shipped to MEN for inspection before possibly returning to the field. An onboard event logger helps to analyze errors while reducing software overhead.

### Solid Connectivity and I/O

With its focus on safe design, the CB30 still offers ample I/O functionality, including two or three Gigabit Ethernet and PCI Express interfaces, two SATA channels, up to four USB 2.0 ports, UARTs and general-purpose I/O. DVI or LVDS can be implemented for graphics functions. Up to 2 GB DDR3 SDRAM with ECC support and a soldered eMMC storage device round out the CPU.

### Rugged COM Design for Harsh Environments

The CB30 complies with the COM Express Basic form factor and type 6 pin-out. For applications that need reliable operation even under the harshest environmental conditions, a specially hardened version is available - the CB30C. CB30C modules are embedded in a closed aluminum frame that ensures optimum EMC protection and efficient conduction cooling. Direct air cooling is possible by placing a heat sink on the cover. The innovative mechanical design around the COM.0 electronics makes it an ultra-rugged module. With all components soldered, its small form factor and low power consumption, the board is ideal for embedded applications in severe environments. Its full EN 50155 compliance up to class TX gives it a focus on rolling-stock applications. For evaluation and development purposes a microATX carrier board, the XC15, is available.



**B** Onboard    Options

## CPU

- The following CPU types are supported:
  - NXP QorIQ P1022, dual core, 800 MHz
  - NXP QorIQ P1022, dual core, 1 GHz
  - NXP QorIQ P1022, dual core, 1.2 GHz, with reduced temperature range
  - NXP QorIQ P1013, single core, 800 MHz
  - NXP QorIQ P1013, single core, 1 GHz
  - NXP QorIQ P1013, single core, 1.2 GHz, with reduced temperature range

## Memory

- System RAM
  - Soldered DDR3, ECC support
  - 1 GB, or 2 GB
- Boot Flash
  - 32 MB, 64 MB, or 128 MB
- 8 KB non-volatile FRAM for event logging

## Mass Storage

- The following mass storage devices can be assembled:
  - eMMC device, soldered; different sizes available

## Graphics

- Optional
- Integrated in QorIQ processor
- Maximum resolution: 1280 x 1024 pixels
- 60 Hz refresh rate
- 24 bpp color depth

## Onboard Interfaces

- Available via COM Express connectors
- SATA
  - Two channels, SATA Revision 2.x
- SDIO/SDHC
  - One channel for MMC/SD/SDIO cards; optional
- Video
  - One DVI interface; optional
  - One LVDS interface, single-channel; optional
- USB
  - Four host channels, USB 2.0, or
  - Three host channels, USB 2.0
- Ethernet
  - Two channels, 1000BASE-T, or
  - Three channels, 1000BASE-T
  - Link and activity LED signals for each channel
- PCI Express
  - Three x1 links, PCIe 1.0a, or
  - Two x1 links, PCIe 1.0a
- ExpressCard
  - One interface
- UART
  - Two interfaces, or
  - Four interfaces
  - Physical interfaces RS232 or RS422/RS485 depending on implementation on carrier board
- I2C
  - One I2C interface
- SPI
  - One SPI interface
- GPIO
  - 12 GPIO lines
  - 1 GPO line
- Processor local bus; optional

## Supervision and Control

- Safe supervisor
  - Check for overvoltage, undervoltage, excess temperature, CPU clock
  - Watchdog, configurable as a window or timeout watchdog
- Event logging
  - Event history logged in non-volatile FRAM, e.g., reset, overvoltage, undervoltage, excess temperature
  - 256 entries possible
  - Events are generated by board hardware or user application
- Real-time clock, with supercapacitor or battery backup on the carrier board
  - Up to year 2199

## Product Standard

- Basic, Type 6, PICMG COM.0 COM Express Module Base Specification
- Basic, Type 6, Ultra-Rugged COM

## Electrical Specifications

- Supply voltage
  - +12 V (9 to 14 V)
- Power consumption
  - 15 W typ.

## Mechanical Specifications

- Dimensions
  - COM Express Basic: (W) 125 mm, (D) 95 mm
  - Ultra-Rugged COM Basic with cover and frame: (W) 135 mm, (D) 105 mm, (H) 18 mm
- Weight
  - 470 g (model 15CB30C00)

## Environmental Specifications

- Temperature range (operation)
  - -40°C to +85°C Tcase (conduction cooling cover/frame), compliant with EN 50155, class TX (model 15CB30C00)
  - -40°C to +85°C, compliant with EN 50155, class TX (model 15CB30-00)
- Temperature range (storage): -40°C to +85°C
- Cooling concept
  - Conduction cooling
  - Air cooling
- Relative humidity (operation): max. 95% with condensation (EN 50155 / EN 60068-2-30)
- Relative humidity (storage): max. 95% with condensation (EN 50155 / EN 60068-2-30)
- Altitude: -300 m to +3000 m
- Shock: EN 50155 (12.2.11) / EN 61373 category 1 class B body mounted
- Vibration: EN 50155 (12.2.11) / EN 61373 category 1 class B body mounted

## Reliability

- MTBF
  - 724 561 h @ 40°C according to IEC/TR 62380 (RDF 2000) (model 15CB30C00, 15CB30-00)

## Safety

- Functional Safety
  - Certifiable up to SIL 2 according to EN 50128 / EN 50129 ("safety case" document and certificate from TÜV SÜD)
  - Tolerable hazard rate (THR) for safety functions <math>0.5 \cdot 10^{-7}</math> / h
  - Diagnostic coverage: 90% min.
  - Board maintains safe state after a failure
- Electrical Safety
  - EN 60950-1, class III equipment
- Flammability (PCBs)
  - UL 94 V-0
- Fire Protection
  - EN 45545, hazard level 3
  - NFPA 130, category "other vehicle components"

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## **EMC**

- EMC behavior generally depends on the system and housing surrounding the COM module.
- The Rugged COM Express module in its cover and frame supports the system to meet the requirements of
  - EN 50121-3-2, class B
  - EN 50121-4
  - EN 55022

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## **BIOS/Boot Loader**

- U-Boot Universal Boot Loader

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## **Software Support**

- Linux
- VxWorks (on request)
- See also [Application Note Recommendations for a Robust Software Setup](#)
- For more information on supported operating system versions and drivers see [Software](#).

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[www.men.de/products/cb30/](http://www.men.de/products/cb30/)

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