# CM50

## Rugged COM Express Module with Intel Atom Processor E3900 *Series*
### COM Express Mini, Type 10

» *Intel Atom E3900 series*
» *Up to 8 GB DDR3 RAM with ECC*
» *Intel VT-x virtualization support*
» *Very small form factor*
» *Trusted Platform Module*
» *Board Management Controller (SIL 2 certifiable)*
» *Conduction cooling*
» *-40 °C to +85 °C Tcase*
» *Compliant with COM Express Mini, type 10*
» *PICMG COM.0 and Ultra-Rugged COM versions*



### Truly Rugged COM Express Module

The CM50 is an ultra-rugged COM Express module with Type 10 Pin-Out for rolling stock, public transportation and industry applications. It is operable in an extended temperature range of -40 °C up to +85 °C (Tcase). The use of soldered components makes the board resistant to shock and vibration.

### Versions for Extremely Harsh Environments

For applications that need reliable operation even under the harshest environmental conditions, a specially hardened version is available - the CM50C. CM50C modules are embedded in a closed aluminum frame that ensures optimum EMC protection, efficient conduction cooling and extended resistance to vibration and shock. 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.

### Scalable Low Power Processor

The Intel E3900 CPU series provides a scalable performance up to 4 cores and integrated quality graphics. Intel VT-x virtualization support allows to run multiple applications on a single hardware platform, saving costs. Due to the low power dissipation (depending on the CPU), no active cooling is necessary and very small designs are feasible.

### Safety, Security and Connectivity

The board management controller provides enhanced reliability, reduced downtime and is prepared for SIL certification. The Trusted Platform Module supports features like secure/measured booting and fast cryptographic execution. The CM50C comes with a large variety of interfaces, including, e.g., Digital Display Interfaces, HD Audio, PCI Express and Gigabit Ethernet. This enables implementing many functions on a very small form factor.

### Long-term Available

Long-term availability until 2031 ensures an extended product life and future-safety for a wide range of applications.

## Data Sheet

| | |
|---|---|
| B | Onboard |

## Diagram
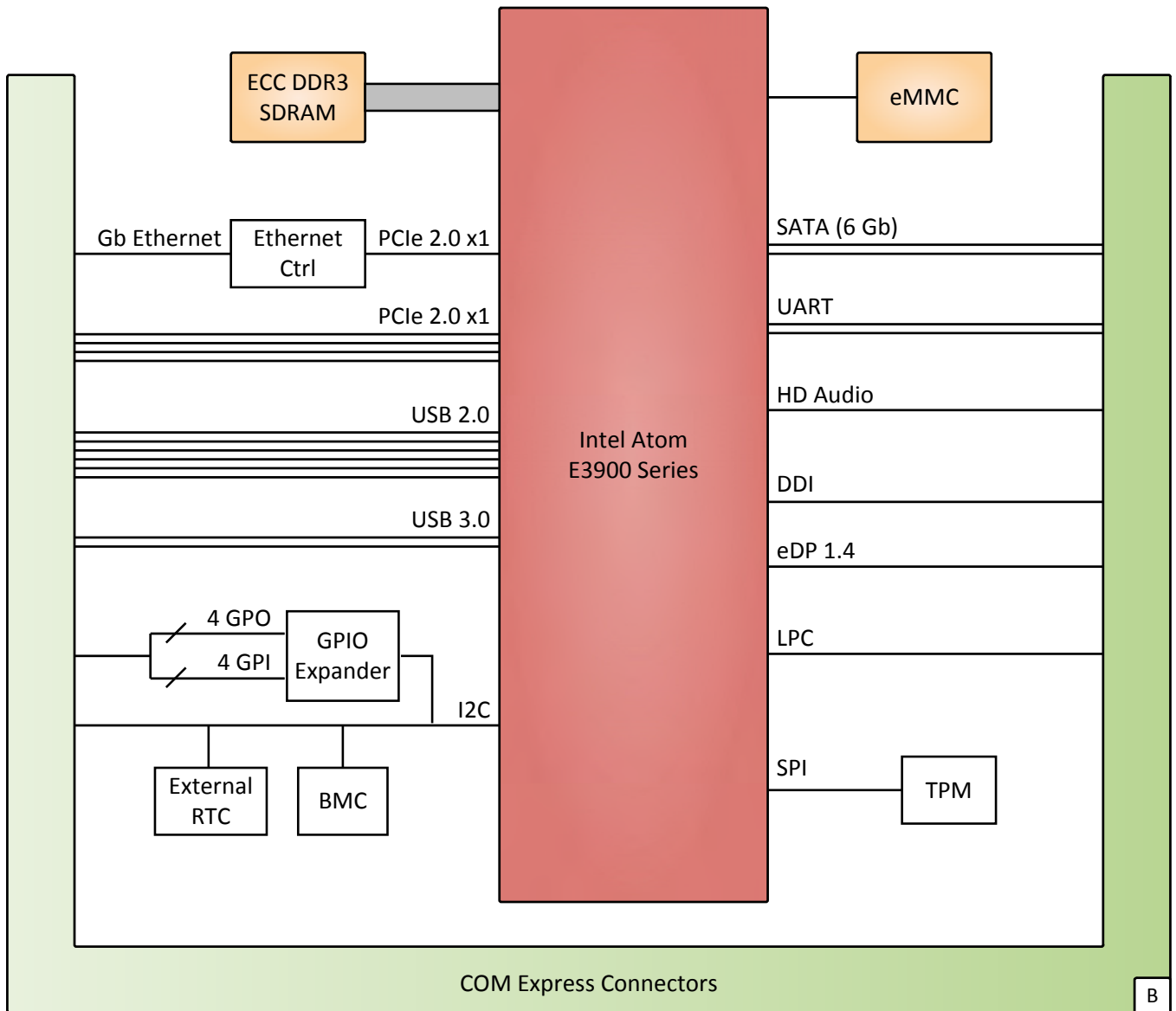
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|---|---|
| **CPU** | ■ The following CPU types are supported:<br>    □ Intel Atom x7-E3950, 4 cores, 4 threads, 1.6 GHz, 2.0 GHz Turbo Boost, 12 W, 2 MB cache<br>    □ Intel Atom x5-E3930, 2 cores, 2 threads, 1.3 GHz, 1.8 GHz Turbo Boost, 6.5 W, 2 MB cache |
| **Memory** | ■ System RAM<br>    □ Soldered DDR3, ECC<br>    □ 8 GB max. |
| **Security** | ■ TPM (Trusted Platform Module 2.0) |
| **Mass Storage** | ■ The following mass storage devices are assembled:<br>    □ eMMC (soldered); 64 GB max. |
| **Graphics** | ■ Processor graphics<br>■ Maximum resolution: 4096x2160 pixels @ 60 Hz, 24 bpp |
| **Interfaces** | ■ SATA<br>    □ 2x SATA Revision 3.x, board to board<br>■ SDHC (on request)<br>    □ 1x, board to board<br>■ Video<br>    □ 1x DDI, board to board<br>    □ 1x eDP 1.4, board to board<br>■ Audio<br>    □ 1x, HD Audio, board to board<br>■ USB<br>    □ 6x USB 2.0, board to board<br>    □ 2x USB 3.0, board to board<br>■ PCI Express<br>    □ 4x PCIe 2.0, x1, board to board<br>■ Ethernet<br>    □ 1x 10/100/1000BASE-T, board to board<br>■ Serial<br>    □ 2x UART, board to board<br>■ GPIO<br>    □ 4x GPI, board to board<br>    □ 4x GPO, board to board<br>■ I2C<br>    □ 1x, board to board<br>■ LPC<br>    □ 1x, board to board |
| **Supervision and Control** | ■ Board management controller<br>■ Watchdog timer<br>■ Temperature measurement<br>■ Real-time clock |
| **Product Standard** | ■ Mini, Type 10, PICMG COM.0 COM Express Module Base Specification<br>■ Mini, Type 10, Ultra-Rugged COM |
| **Electrical Specifications** | ■ Supply voltage<br>    □ +6 V to +17 V<br>    □ +3 V RTC (2 V to 3.3 V)<br>■ Power consumption<br>    □ 14.4 W typ. (quad core processor, full load) |

# Technical Data

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**Mechanical Specifications**
- Dimensions
  - COM Express Mini: (W) 84 mm, (D) 55 mm
  - Ultra-Rugged COM Mini: (W) 94 mm, (D) 65 mm, (H) 18 mm
- Cooling
  - Conduction cooling

**Product Compliance: Rail - Rolling Stock**
- Operating temperature: -40 °C to +85 °C (EN 50155:2017, class OT6)
- Storage temperature: -40 °C (EN 50155:2017) to +85 °C (EN 60068-2-2, Bb)
- Humidity: +55 °C and +25 °C, 100 % max. (EN 50155:2017)
- Shock: 30 ms @ 50 m/s² (EN 61373:2010/AC:2017-09, vehicle body, cat. 1, class B)
- Vibration: 10 min @ 2.02 m/s² and 5 h @ 11.44 m/s² (EN 61373:2010/AC:2017-09, vehicle body, cat. 1, class B x 2)
- Fire protection: EN 45545-2:2013 + A1:2015, HL3
- EMC emission: EN 50121-3-2:2016
- EMC immunity: EN 50121-3-2:2016

**Product Compliance: Information Technology Equipment**
- Operating temperature: -40 °C to +85 °C (EN 60068-2-1:2007, Ae; EN 60068-2-2:2007, Be)
- Storage temperature: -40 °C (EN 60068-2-1:2007, Ab) to +85 °C (EN 60068-2-2:2007, Bb)
- Humidity: +55 °C and +25 °C, 90 % to 100 % (EN 60068-2-30:2005, Db)
- Electrical safety
  - EN 62368-1:2014 + AC:2015
- EMC
  - Radiated emission: EN 55032:2015 (multimedia equipment), class A (industrial environments)
  - Immunity: EN 55024:2010 (information technology equipment)

**Reliability**
- MTBF: 822 869 h predicted @ 40 °C according to IEC/TR 62380 (RDF 2000)

**BIOS/Boot Loader**
- AMI Aptio UEFI Firmware

**Software Support**
- Linux
  - Supported kernel: 4.8 or higher. For older kernels (e.g., 4.4.x), patches for the Apollo Lake platform are also available.
  - Yocto BSP
  - Tested with: Yocto BSP (Sumo 2.5, Linux kernel 4.15)
- Windows
  - Windows 10 IoT Enterprise 64-bit
- See also Application Note Recommendations for a Robust Software Setup
- For more information and available packages see Software.

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