MC50M

Modular Gateway Computer with Intel Atom Processor for Rolling Stock

LEADING THE EMBEDDED FUTURE

- Intel Atom E3900 series
- Up to 8 GB DDR3 RAM with ECC
- Trusted Platform Module
- M.2 NVMe slot for storage
- Gb Ethernet, USB 5 Gbps, RS232, RS485/422, DisplayPort
- DIN rail, wall or 19" rack mounting
- Input voltage 24 V DC nom. or 48 V DC nom. with ignition
- Full range power supply 16 V DC to 60 V DC
- EN 50155 compliant (railways)
- -40 °C to +70 °C (+85 °C), fanless

Technical Data

CPU	■ The following CPU types are supported: ■ Intel Atom x5-E3930, 2 cores, 2 threads, 1.3 GHz, 1.8 GHz Turbo Boost, 6.5 W, 2 MB cache ■ Intel Atom x7-E3950, 4 cores, 4 threads, 1.6 GHz, 2.0 GHz Turbo Boost, 12 W, 2 MB cache
Memory	■ System RAM: 8 GB max., soldered DDR3, ECC ■ Non-volatile RAM (NVRAM): 64 Kbit (8 K × 8) FRAM
Mass Storage	■ eMMC (soldered); 64 GB max. ■ The following mass storage devices can be assembled: SSD M.2 (NVMe)
Graphics	■ Processor graphics ■ Maximum resolution: 4096 x 2160 pixels @ 60 Hz, 24 bpp
Interfaces	■ SSD/HDD slot: 1 × M.2 2242/2260/2280 socket 3 Key M; NVMe (PCIe 2.0 x1); internally accessible ■ Video: 1 × DisplayPort 1.2, DisplayPort, for service ■ USB: 2 × USB 3.2 Gen 1x1, Type-A, for service

Data Sheet

- Ethernet: 3 × 10/100/1000BASE-T, M12, X-coded, receptacle
- Serial
  - 1 × RS232, isolated, D-Sub, 9-pin, plug
  - 1 × RS422/RS485, isolated, D-Sub, 9-pin, plug
- LED
  - Status: board status (BMC), power status
  - Ethernet: activity, link
  - User configurable: 2 ×
- Power
  - 1 × power in, M12, A-coded, plug
  - Ignition input
- Earthing connection: M4 screw

Supervision and Management

- Board management controller
- Temperature measurement
- System watchdog (BMC)
- Ignition watchdog
- Real-time clock, buffered by supercapacitor (5 days max.)
- Trusted Platform Module 2.0

Electrical Specifications

- Supply voltage
  - 24 V DC nom.
  - 48 V DC nom.
- Power consumption: 10 to 15 W typ. (depending on CPU type and CPU load), 40 W max. (including ME modules)

Mechanical Specifications

- Dimensions: (W) 42 mm, (D) 144 mm, (H) 132 mm
- Weight: 760 g
- Mounting
  - DIN rail
  - Wall/flat surface
  - Rack in 19" cabinet
- Cooling: Air cooling, natural convection, airflow 0.4 m/s
- Protection rating: IP20

Product Compliance: Rail - Rolling Stock

- Compliance level: This product is prepared for use in EN 50155 systems. Some parameters are system-dependent and are specified on system level.
- Operating temperature: -40 °C to +85 °C (EN 50155:2021, Tmax/PCB = +85 °C; designed for use in OT4+ST1 systems)
- Equipment location: EN 50155:2021, location 2, cabin and interiors
- Rapid temperature variations: EN 50155:2021, class H1, no requirements
- Storage temperature: -40 °C (EN 50155:2021) to +85 °C (EN 60068-2-2, Bb)
- Altitude: +3000 m max. (EN 50125-1:2014, class AX)
- Pollution degree: EN 50124-1:2017, class PD3
- Humidity: +55 °C and +25 °C, 100 % RH max. (EN 50155:2021)
- Shock: 30 ms @ 50 m/s² (EN 61373:2010/AC:2017-09, vehicle body, cat. 1, class A)
- Vibration: 10 min @ 2.02 m/s² (functional) and 5 h @ 11.44 m/s² (long-life) (EN 61373:2010/AC:2017-09, vehicle body, cat. 1, class B, double acceleration)

- Electrical safety
  - EN 50155:2021
  - EN 62368-1:2020 + A11:2020
  - EN 50153:2014 + A1:2017 + A2:2020
  - EN 50124-1:2017
  - EN ISO 13732-1:2008
- Fire protection: EN 45545-2:2023, EL9, HL3
- EMC emission
  - EN 50121-3-2:2016 + A1:2019
  - Regelung Nr. EMV 06 :2019-05-09 (2.0), Anhang E: Messung an Geräten, Schutzklasse S1
- EMC immunity: EN 50121-3-2:2016 + A1:2019
- Protective coatings: EN 50155:2021, class PC2 (Any PCB protected on both sides)
- Useful life: 20 years (EN 50155:2021, class L4)

Product Compliance: Rail - Wayside Non-Safety Related

- Operating temperature: -40 °C to +70 °C (EN 50125-3:2003, class T2, cubicle, with class T2 maximum extended by 5 °C)
- Storage temperature: -40 °C (EN 60068-2-1:2007, Ab) to +85 °C (EN 60068-2-2:2007, Bb)
- Altitude: +3000 m max. (EN 50125-3:2003, class AX)
- Humidity: 100 % RH max. (EN 50125-2:2002, control cabinet, class T1/T2/TX)
- Shock: 11 ms @ 20 m/s² (EN 50125-3:2003, in a switch cabinet 1 m to 3 m from the track)
- Vibration: 2.3 m/s² (EN 50125-3:2003, in a switch cabinet 1 m to 3 m from the track)
- Electrical safety
  - EN 50124-1:2017
  - EN 62368-1:2014 + AC:2015
- EMC emission
  - EN 50121-4:2016
  - EN 61000-6-4:2007 + A1:2011
- EMC immunity
  - EN 50121-4:2016
  - EN 61000-6-2:2005
- Restrictions: Service interfaces may only be used with a maximum cable length of 3 m for installations 10 m or less away from the track.

Product Compliance: Road Vehicle

- EMC emission: ECE R10 Rev.5
- EMC immunity: ECE R10 Rev.5

Reliability

- MTBF: 421 000 h predicted @ 40 °C according to IEC/TR 62380 (RDF 2000)

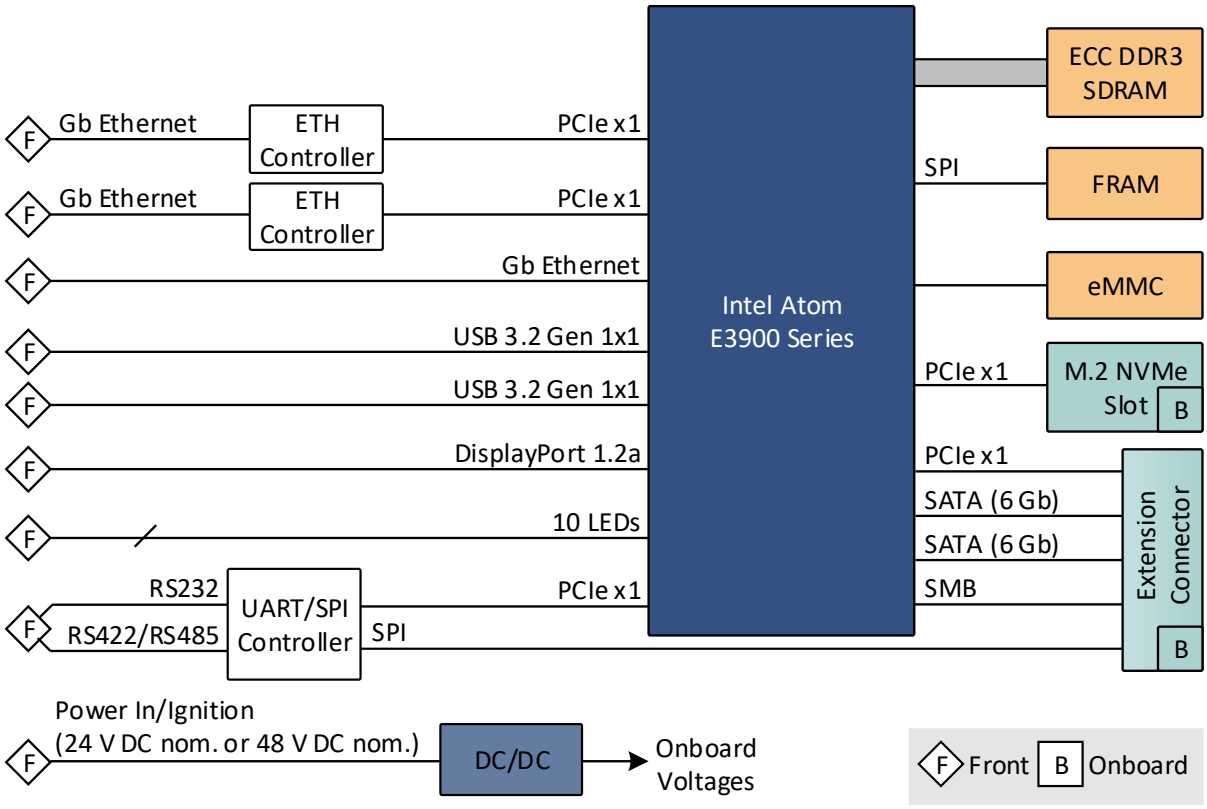
BIOS/Boot Loader

- AMI Aptio UEFI Firmware

Software Support

- Linux
  - duagon Yocto BSP
  - Tested with: duagon Yocto BSP (Kirkstone 4.0, Linux kernel 5.15); Lubuntu 18.04 X LTS
- Windows: Windows 10 IoT Enterprise 64-bit
- See the product User Manual for details on software support: **www.duagon.com/products/mc50m/#doc**
- See section Software on the product web page for available packages: **www.duagon.com/products/mc50m/#downl**
- See also Application Note ***Recommendations for a Robust Software Setup***

Diagram



Ordering Information

Standard Models

06MC50M10	Modular Computer, Intel Atom x5-E3930, 1.3 GHz, 2 GB DDR3 DRAM, 8 GB eMMC, M12 X-coded connectors, 24 V DC nom. or 48 V DC nom., -40 °C to +70 °C (+85 °C)
06MC50M11	Modular Computer, Intel Atom x5-E3930, 1.3 GHz, 4 GB DDR3 DRAM, 16 GB eMMC, M12 X-coded connectors, 24 V DC nom. or 48 V DC nom., -40 °C to +70 °C (+85 °C)
06MC50M12	Modular Computer, Intel Atom x7-E3950, 1.6 GHz, 8 GB DDR3 DRAM, 16 GB eMMC, M12 X-coded connectors, 24 V DC nom. or 48 V DC nom., -40 °C to +70 °C (+85 °C)
06MC50M14	Modular Computer, Intel Atom x7-E3950, 1.6 GHz, 4 GB DDR3 DRAM, 16 GB eMMC, M12 X-coded connectors, 24 V DC nom. or 48 V DC nom., -40 °C to +70 °C (+85 °C)