AI RAIL COMPUTING PLATFORM

HIGH-PERFORMANCE COMPUTING PLATFORM FOR SAFETY-CRITICAL COMPUTER VISION APPLICATIONS

PRODUCT DESCRIPTION

The AI Railway Computing Platform from Mission Ebedded is specifically designed for advanced computer vision and intelligent video analysis in safety-critical railway applications. With the ability to be installed in network-based clusters, the compact NVIDIA-based platform provides ultra-fast high-performance computing to process massive multi-dimensional sensor data in real time.

The rugged platform offers a high level of customization in terms of performance, functionality, and services. It meets the safety requirements of SIL 2 and the standards, including EN 50155 and fire protection standard EN 45545.

Single Unit

Cluster

RAILWAY APPLICATIONS

- Obstacle detection and classification
- Collision avoidance
- Signal recognition
- Autonomous driving (shunting)
- High-definition railroad mapping
- Real-time infrastructure monitoring for predictive maintenance
- Driver vigilance
- Passenger compartment monitoring
- High-performance data recording

KEY FEATURES AND ADVANTAGES

HIGH PERFORMANCE

- NVIDIA ARM® CPU/GPU
- Clustering option for high-performance computing
- GigE Vision® standard for fast image transfer
- Hardware computer vision and AI accelerators
- High-performance storage options

RELIABLE AND SAFE OPERATION

- Safety controller for supervision
- High reliability for safety applications
- High availability for mission-critical applications (clustering option)
- Hot/cold stand-by or two-channel design
- Designed for SIL2 applications

RUGGED RAILWAY-CERTIFIED DESIGN

- Compliant with EN 50121/50155/45545 Railway Standards
- ECE R10 regulation compliance, e-marking
- Shock and vibration resistant
- Robust housing and small form factor
- Designed for high-density rack mounting

HIGH COST-EFFECTIVENESS

- Short time-to-market
- Long-term availability and lifecycle management
- Mean time between failure (MTBF): 300.000-400.000 h (depending on configuration)
- Mean time to repair (MTTR): less than 15 minutes

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SPECIFICATIONS

SYSTEM

CPU	Multiple CPUs available (ARM) Standard: NVIDIA® 8-core ARM® v8.2 64-bit CPU, 8MB L2+4MB L3, 2260 MHz
GPU	Multiple GPUs available Standard: NVIDIA® 512-core GPU
Flash Memory	Multiple options available Standard: 32 GB
Storage	Internal M.2 NVMe
Video Codecs	JPEG, H.264, H.265 / HEVC
Vision Accelerator	Dedicated co-processor & ISP
AI Inference Accelerator	Two accelerators, 10 TOPS (INT8) in total
Auxiliary Co-Processing	Two 32-bit ARM® Cortex-R5
Reliabilty	MTBF: 300.000-400.000h depending on configuration
Availabilty	▪ MTTR: less than 15 minutes ▪ Designed for cluster operation: load-balance, hot/cold standby
Safety Co-controller	▪ 32-bit ARM® Cortex-M7 CPU running at up to 216 MHz ▪ Pre-certified self-test library ▪ Mission Embedded System-on-Module application supervision framework for SIL2 applications ▪ EN 50159, category 1, black channel communication framework
Security	TPM 2.0 module

SOFTWARE

Mission Embedded Technologies	ME enhanced Linux Platform
User Applications	Support for user applications and scripts
Software Update	▪ Remote software and firmware update ▪ ME fail-safe over-the-air software update (on request)
Parameterization	Switchless via USB / remote via Management Web-GUI or SSH
Fleet Management (optional)	Web-based application
Video Applications	▪ GigE Vision® protocol stack ▪ Image pre-processing ▪ Video codec framework

CONNECTORS AND INTERFACES (STANDARD CONFIGURATION)

All connectors are protected against polarity reversal.	
Power Supply	M12 S-coded 4-pin male connector
Gigabit Ethernet Interface	▪ 1 x M12 X-coded 8-pin female connector (2500/1000/100/10 Mbit/s) ▪ 1 x M12 X-coded 8-pin female connector (1000/100/10 Mbit/s)
Input/Output Interface	▪ 2 x digital inputs ▪ 1 x CAN interface

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POWER SUPPLY

Input Voltage (nominal)	24 VDC (according to EN 50155 Standard)
Voltage Range	16.8 to 32 VDC Additional ranges on request (18 to 75 / 40 to 160 VDC)
Power Consumption	Maximum: 60 W (depending on configuration) Standby: 1.4 A under load - 0.4 in idle mode
Galvanic Isolation	Compliant with EN 50155, all external connectors
Interruptions of Voltage Supply	EN 50155, Class S1, no battery installed
Protective Earthing	Supported
Power Connector	M12 S-coded male
Reverse Polarity Protection	Supported

ENVIRONMENTAL CONDITIONS

Operating Temperature	-25 to 70°C (EN 50155 class T3)
Extended Operating Temperature	EN 50155 class ST0 (no extended temperature range)
Storage Temperature	-40 to 85°C
Shock and vibration	EN 50155, category 1, class B (testing according to EN 61373)
IP Level	IP20
Railway Fire Protection	EN 45545-2 HL3
Pollution Degree	EN 50124-1 PD2

STANDARDS AND CERTIFICATIONS

Shock and Vibration	EN 61373:2012
EMC	EN 61000-6-2 EN 61000-6-4 Compliant with ECE-R10 regulations
EMS	EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6
CE	2014/30/EU (Electromagnetic Compatibility Directive) 2014/35/EU (Low Voltage Directive) 2011/65/EU (RoHS)
Railway	EN 50155, EN 50121-3-2
Railway Fire Protection	EN 45545-1, EN 45545-2 HL3, EN 45545-5 EN 50124-1 PD2 EN 50159, category 1 EN 50165 class 1
Safety Integrity Level	Hardware applicable for SIL2 applications

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MECHANICAL DATA	
Dimensions (W/L/H)	295 × 96 × 129 mm (housing) 96 x 129 mm (front panel)
Housing	Sheet steel
Weight	2.8 kg (depending on configuration)
Installation	Mounted on 19“ 3HU sub-rack using 4 screws 5 units per 3HU Maximum installation depth: 305 mm (required), 325 – 345 mm (recommended)
Cooling	External fan required

THERE IS ALWAYS A **MISSION EMBEDDED**

Mission Embedded develops and supplies highly reliable embedded systems for professional applications in safety-critical areas such as railway and transportation, special vehicles, industry, medical technology as well as aerospace and defense. Our high-quality tailor-made solutions enable our customers to turn their innovation projects into reality within the shortest possible time.

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