

EMBEDDED SINGLE BOARD COMPUTER WITH 13TH GEN INTEL CORE – M12 CONNECTORS

- 13th Gen Intel Core Processor (Raptor Lake)
- Up to 96 GB soldered DDR5-5200 IB ECC RAM
- 120 GB NVMe on-board storage
- Dual 10G Ethernet (optional)
- Board Management Controller, TPM 2.0
- Front I/O: 2× 2.5G Ethernet M12 (AMT, TCC, TSN), 10 Gbps USB-A & USB-C with DP Alt Mode
- Rear I/O: 2× 2.5G Ethernet, PCIe, USB 10 Gbps, SATA
- -40 °C to +70 °C operating temp. (system amb.)
- Long-term availability



HIGH-PERFORMANCE EMBEDDED COMPUTING

The G029M is a 3U CompactPCI Serial CPU board featuring 13th Gen Intel Core processors with up to 14 cores (6P+8E) and up to 96 GB of soldered dual-channel DDR5-5200 IB ECC RAM. Introducing Intel's new hybrid architecture with a combination of Performance and Efficiency cores, the G029M raises the bar for embedded solutions with a flat 20-25% performance-per-watt increase over the existing G28. It is perfect for on-board railway applications as virtualization and central maintenance platform, but can also be utilized as a foundation for next-gen AI technologies or Wi-Fi and passenger internet access.

SCALABLE AND RUGGED

duagon further extends CPU scalability with options ranging from 15 W to 45 W TDP and a multitude of P/E core configurations to perfectly suit operational needs even in harsh ambient temperatures of up to +70 °C (+85 °C for 10 min.) A custom solid block heat sink provides optimal heat dissipation without the use of moving parts. All components are soldered for protection against shock and vibration according to applicable DIN, EN or IEC industry standards. To make it even more enduring, all models come with coating and underfilling as standard. All models come with fast 120 GB NVMe storage (more as an option).

GATEWAY TO EMBEDDED AI

The integrated Intel Iris Xe GPU with up to 96 Execution Units is AI-ready for a wide range of applications like intelligent CCTV with object and anomaly detection for improved passenger security.

Intel OpenVINO toolkit, combined with the accessibility of pre-trained models such as YOLO, serves as a robust foundation for seamless deployment of AI inference applications in real-world scenarios.

COMPREHENSIVE MANAGEMENT

A versatile board management controller provides intelligent monitoring and supervision of all vital signals including supply and on-board voltages, temperatures and a watchdog for the OS. Additionally, the G029M supports Intel AMT remote out-of-band management and holds a discrete TPM module for hardware-based system security.

FUTURE-SAFE WITH CERTIFIED RELIABILITY

The G029M supports Linux and is also certified for Red Hat Enterprise Linux 9.4-9.x, adding even more benefits in terms of performance, reliability and updates.

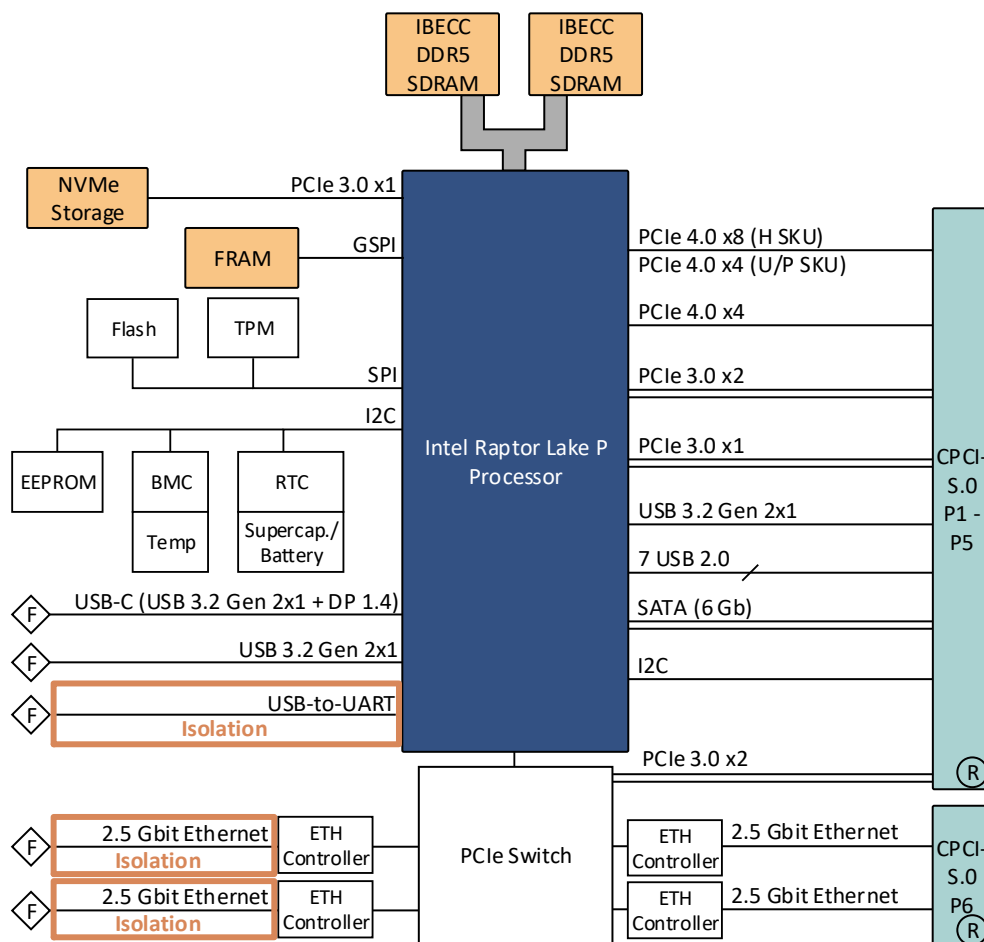
Long-term availability ensures an extended product life and future-safety, and an optional rechargeable battery contributes further to a reduction in maintenance required. The G029M is backwards compatible to duagon products G28, G25A (G029M with 10G Ethernet) and G23.



www.duagon.com/products/g029m/

DATA SHEET

G029M | DIAGRAM



F Front
 R Rear
 B Onboard
 O Options



G029M | TECHNICAL DATA

CPU

- The following CPU types are supported:
 - Intel Core i3-1315URE, 6 cores (2P+4E), 8 threads, 1.2 GHz, 64 EU, 15 W, -40 °C to +100 °C
 - Intel Core i3-1320PRE, 8 cores (4P+4E), 12 threads, 1.7 GHz, 48 EU, 28 W, -40 °C to +100 °C
 - Intel Core i3-13300HRE, 8 cores (4P+4E), 12 threads, 2.1 GHz, 48 EU, 45 W, -40 °C to +100 °C
 - Intel Core i5-1345URE, 10 cores (2P+8E), 12 threads, 1.4 GHz, 80 EU, 15 W, -40 °C to +100 °C
 - Intel Core i5-1350PRE, 12 cores (4P+8E), 16 threads, 1.8 GHz, 80 EU, 28 W, -40 °C to +100 °C
 - Intel Core i5-13600HRE, 12 cores (4P+8E), 16 threads, 2.7 GHz, 80 EU, 45 W, -40 °C to +100 °C
 - Intel Core i7-1365URE, 10 cores (2P+8E), 12 threads, 1.7 GHz, 96 EU, 15 W, -40 °C to +100 °C
 - Intel Core i7-1370PRE, 14 cores (6P+8E), 20 threads, 1.9 GHz, 96 EU, 28 W, -40 °C to +100 °C
 - Intel Core i7-13800HRE, 14 cores (6P+8E), 20 threads, 2.5 GHz, 96 EU, 45 W, -40 °C to +100 °C

MEMORY

- System RAM: 96 GB max., soldered DDR5-5200, IB ECC
- Non-volatile RAM (NVRAM): 64 kB FRAM

MASS STORAGE

- NVMe (soldered); 120 GB (standard)

GRAPHICS

- Processor graphics

INTERFACES

- This product includes interface options
 - Different front connectors
 - I/O expansion via add-on board
 - Additional user-configurable LEDs
 - Available interfaces depend on the processor type
- SATA
 - 2 × SATA Revision 3.x, backplane
- Video
 - 1 × DisplayPort 1.4a, USB Type-C, for service

USB

- 1 × USB 3.2 Gen 2x1, Type-A, for service
- 1 × USB 3.2 Gen 2x1, Type-C, for service
- 1 × USB 3.2 Gen 2x1, backplane
- 7 × USB 2.0, backplane

Ethernet

- 2 × 100/1000BASE-TX / 2.5GBASE-TX, M12, X-coded, receptacle
- 2 × 100/1000BASE-TX / 2.5/5/10GBASE-TX, M12, X-coded, receptacle
- 2 × 100/1000BASE-TX / 2.5GBASE-TX, backplane

PCI Express

- 1 × PCIe 4.0, x8 (H SKU)/x4 (P/U SKU), backplane
- 1 × PCIe 4.0, x4, backplane
- 4 × PCIe 3.0, x2, backplane
- 2 × PCIe 3.0, x1, backplane

Serial

- 1 × RS232/RS422/RS485, isolated, D-Sub, 9-pin, plug
- 1 × USB-to-UART, isolated, USB Type-A

I2C

- 1 × backplane

LED

- Status: board status (BMC)
- Ethernet: link, activity
- Hot-swap
- User configurable: 4 ×

SUPERVISION AND MANAGEMENT

- Board management controller
- Temperature measurement
- System watchdog (BMC)
- Real-time clock, buffered by supercapacitor or battery or rechargeable battery
- Trusted Platform Module 2.0

PRODUCT STANDARD

- CompactPCI Serial: CompactPCI Serial PICMG CPCI-S.0 Specification R3.0



ELECTRICAL SPECIFICATIONS

- Supply voltage: +12 V (9.5 V to 15.5 V)
- Power consumption: 57 W (02G029M00)/65 W (02G029M01) max.

MECHANICAL SPECIFICATIONS

- Dimensions: 3U, 8 HP
- Weight: 610 g (02G029M00)/570 g (02G029M01)
- Cooling: Air cooling, forced convection, airflow 2.5 m/s

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 +70 °C, +85 °C for 10 min (EN 50155:2021, class OT4, ST1)
- Equipment location
 - EN 50155:2021, location 1, closed electrical operating area
 - 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), +4000 m max. (electrical isolation only)
- Pollution degree: EN 50124-1:2017, class PD2
- 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 B)
- 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 50153:2014 + A1:2017 + A2:2020
 - EN 50124-1:2017
 - EN ISO 13732-1:2008
- Fire protection: EN 45545-2:2020, 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
 - Regelwerk 50.02.01 :2021-12-01, 12.3.2. EMV - Funk, prequalified according to electronic equipment tests defined by Deutsche Bahn EMV 06 standard, class S1, for risk minimization in finished vehicle test
- 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: MEDICAL ELECTRICAL EQUIPMENT

- EMC: EN 60601-1-2:2015 + A1:2021

RELIABILITY

- MTBF: 206 542 h (02G029M00)/166 161 h (02G029M01) predicted @ 40 °C according to IEC/TR 62380 (RDF 2000)

BIOS/BOOT LOADER

- AMI Aptio UEFI Firmware

SOFTWARE SUPPORT

- Linux
 - Certified for Red Hat Enterprise Linux 9.4 - 9.x (02G029M00)
 - Tested with: Ubuntu 24.04 LTS
- Further Resources
 - See the product User Manual for details on software support: www.duagon.com/products/g029m/#doc
 - See section Software on the product web page for available packages: www.duagon.com/products/g029m/#downl
 - See also Application Note *Recommendations for a Robust Software Setup*



G029M | ORDERING INFORMATION

STANDARD MODELS

- 02G029M00** 3U CPCI Serial, 8HP, Intel Core i7-13800HRE, 14 cores (6P + 8E), 2.5 GHz, 35 W TDP, 64 GB DDR5 (IB ECC) RAM, 120 GB NVMe, 2x 2.5G Ethernet M12, 1x USB 3.2 Gen 2x1, 1x USB 3.2 Gen 2x1 and DisplayPort over USB-C, 1x console redirection via USB, -40 °C to +70 °C, conformal coating
- 02G029M01** 3U CPCI Serial, 8HP, Intel Core i7-1370PRE, 14 cores (6P + 8E), 1.9 GHz, 28 W TDP, 64 GB DDR5 (IB ECC) RAM, 120 GB NVMe, 2x 2.5G Ethernet M12, 2x 10G Ethernet M12, 1x USB 3.2 Gen 2x1, 1x USB 3.2 Gen 2x1 and DisplayPort over USB-C, 1x console redirection via USB, 1x RS422/485 isolated on shared 9-pin D-Sub, -40 °C to +70 °C, conformal coating

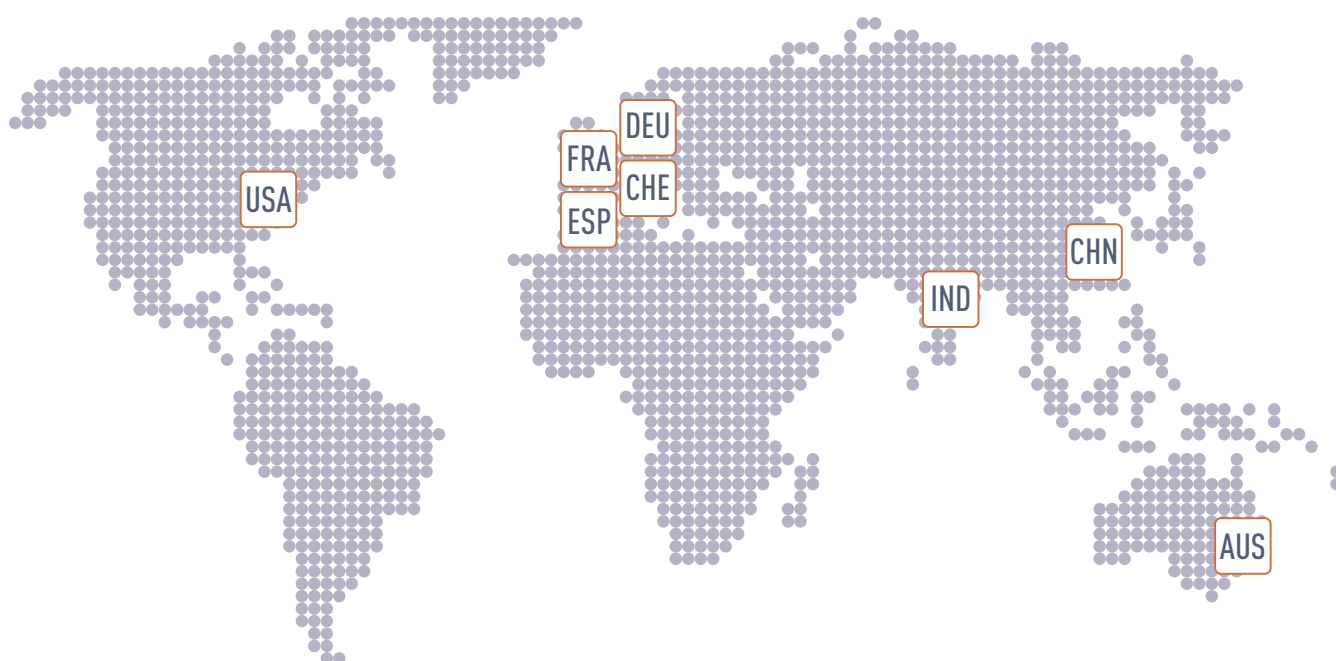
- **Contact duagon** for availability and lead times for product models not listed above.



LEADING THE EMBEDDED FUTURE

duagon WORLDWIDE

duagon has a global presence with support and sales representatives across eight countries. With three decentralized engineering and production sites, our customers take advantage of the added competence and flexibility.



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