

## Next-Generation Computing Building Blocks for Edge Computing Performance



## Micro-ATX Motherboard with Intel® 13<sup>th</sup> Gen Processor

In an era where AI and machine vision are revolutionizing industries, the need for robust computing solutions is imperative. Industrial applications are moving beyond mere data processing to require intelligent analysis and real-time decision-making.

Introducing the CT-MRL01 Micro-ATX Industrial Motherboard designed to harness the capabilities of the Intel® 13<sup>th</sup> Gen Raptor Lake processors. The CT-MRL01 is the backbone of high-performance systems, facilitating advanced technologies, including PCIe Gen 5, Four Independent Displays, and USB Type-C. With scalable PCIe and M.2 options, this motherboard offers resilience and endurance for industrial environments and the agility to drive performance in AI, Machine Learning, and deep learning operations. Built to withstand the demands of rugged applications, the CT-MRL01 sets new standards for reliability, balance, and performance in complex AI Edge environments. Explore the edge of technological potential with the Micro-ATX Industrial Motherboard solutions.

### CT-MRL01 Features

- Intel® 13<sup>th</sup>/12<sup>th</sup> Gen & R680E Processor
- Four 4K Displays (up to 8K)
- 20 Gbps USB Type-C Port
- 4x DDR4 up to 128GB
- PCIe Gen 5 & Gen 4 Expansion Slots
- Support Dual GPU Expansions

### Key Markets and Applications



Industrial  
Automation



Security and  
Surveillance



Intelligent  
Healthcare



Edge AI  
Solutions



Smart Retail  
Solutions



Collaborative  
Robots



## Leveraging Intel's Hybrid-Architecture

Deliver the optimal edge AI performance with the CT-MRL01 Series, featuring the advanced LGA 1700 socket. This zero-insertion force, flip-chip land grid array (FCLGA/LGA) socket with 1700 contact points takes center stage, enabling seamless compatibility for Intel Raptor Lake (13<sup>th</sup> Gen) and Intel<sup>®</sup> Alder Lake (12<sup>th</sup> Gen) processors. Intel's 13<sup>th</sup> Gen. and 12<sup>th</sup> Gen CPUs leverage the new Performance Cores (P-core) and Efficient Cores (E-core), delivering unprecedented performance with the new hybrid architecture.

## Intel<sup>®</sup> P&E Cores Technology

### Meeting Edge Processing Performance & Power Efficiency Needs

At the heart of these processors lies the groundbreaking P&E cores technology. This innovative hybrid design adopts a two-core strategy. The larger, performance-driven cores (P-core) handle compute-intensive and AI workloads, while the smaller, energy-efficient cores take care of high-density and scale-out workloads in the background. Designed to strike the perfect balance between high performance and energy efficiency, the CT-MRL01 excels across various industrial applications.

### Key Advantages :

- Intel Thread Director: Optimizes OS workload to cores distribution
- Up to 24 Cores: 8 Performance-cores, 16 Efficient-cores
- Up to 32 Threads: P-cores up to 5.8 GHz
- Increased L2 & L3 Cache: compared to the previous generation

## Harnessing the Full Power of P&E Cores with Windows 11

Intel's 13<sup>th</sup> Gen Core features a unique dual-core design, featuring P-cores, E-cores, and hyper-threads on P-cores, which introduces a new dimension in multi-core optimization. In response, Intel collaborated with Microsoft to introduce a hybrid-aware scheduler in Windows 11. This allows the operating system (OS) to prioritize fresh cores before tapping into hyper-threads. At the heart of this breakthrough is Intel's Thread Director, a microcontroller within the CPU. It uses machine learning to optimally schedule tasks on the right core at the right time. This allows us to ensure that P-core and E-core are working in synergy. With Windows 11, users can further enhance the performance and efficiency of the CT-MRL01 computer.



Intel<sup>®</sup> 12<sup>th</sup> and 13<sup>th</sup> Gen Processors





## Enhanced Capacity and Reliability with DDR4 Integration

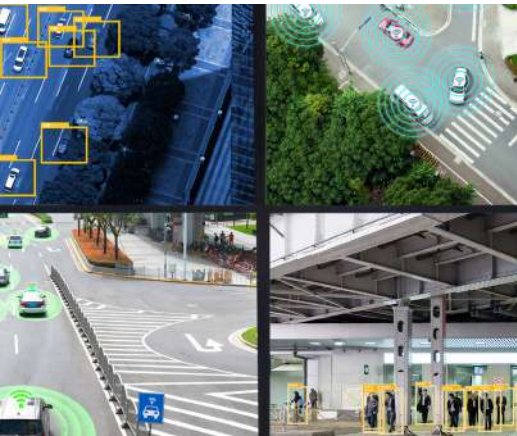
Embracing the proven reliability of DDR4 technology, the CT-MRL01 is equipped to handle the demands of edge AI applications. This motherboard supports up to 4x DDR4 DIMMs with speeds of 2133/2400/2666MHz, allowing a maximum capacity of 128GB. DDR4's stable and efficient architecture ensures consistent performance, crucial for intensive AI tasks at the edge.



- Substantial Throughput: DDR4's architecture allows for high data transfer rates, essential for edge computing.
- Optimized Speeds: Compatible with Intel 13<sup>th</sup> Gen CPUs, the CT-MRL01 fully utilizes DDR4's capabilities up to 2666 MT/s.
- Enhanced Capacity: With support for up to 128GB, the system can handle larger datasets and more complex AI models.



The CT-MRL01's memory architecture provides users with the ability to select the best memory configuration for their specific needs, balancing performance with stability in challenging AI applications.



4x Independent Displays

## Immersive 4K Resolution with Quad Display Support

The CT-MRL01 facilitates superior visual experiences, supporting four independent DisplayPort (DP++) outputs. Each port is capable of driving displays at stunning 4K HDR resolution, enabling a multi-monitor setup that delivers vibrant, high-quality visuals ideal for AI edge applications. With Intel<sup>®</sup> UHD Graphics powered by Xe Architecture, the CT-MRL01 can deliver up to 8K HDR video, making it adept at handling complex visual tasks seamlessly.

- 4x DisplayPort (DP++) with robust 4K HDR Resolution
- Intel<sup>®</sup> UHD Graphics for high-fidelity imagery

Embrace the power of visual computing with the CT-MRL01, offering unparalleled graphic capabilities and display configurations for an immersive visual experience in any AI-driven environment.



## Advanced PCIe Expansion for High-Speed Performance

The CT-MRL01 propels industrial computing to new heights with a comprehensive suite of PCIe slots, embracing Gen 3, Gen 4, and the latest Gen 5 standards, ensuring broad compatibility and future-proof scalability. This diverse PCIe support caters to a range of high-speed, high-performance requirements, paving the way for innovation in AI, machine learning, and data-intensive applications. With the inclusion of the latest PCIe Gen 5 technology, the CT-MRL01 is ready for the next evolution of industrial and computational advancements.



- 1x PCIe x16 Slot (Gen 5) for cutting-edge performance acceleration cards
- 1x PCIe x16 Slot (Gen 4) for additional expansion cards
- 2x PCIe x4 Slots (Gen 4 & Gen 3; open-end design) for versatile expansion cards

### Full-Length, Full-Height Dual GPU Expansion



## Dual-GPU Configuration for Intensive AI Workloads

The CT-MRL01's dual PCIe x16 slots are specially designed to support Dual-GPU configurations. With the ability to run two GPUs simultaneously, the CT-MRL01 allows for robust multi-monitor setups and delivers double the compute power for tasks that demand heavy graphical or AI processing, making it an ideal choice for industrial edge AI applications such as automated quality inspection, real-time analytics in manufacturing, and AI-driven process control in various industrial sectors.

- Enhanced graphics processing power for machine vision and AI-driven image analysis
- Parallel processing capabilities essential for complex simulations and modeling
- Optimal resource allocation for graphics-intensive applications without compromising performance

## Future-Proof Operations with M.2 Expansions

NVMe | SATA | Bluetooth 5.0 | Wi-Fi 6

The versatile M.2 slots empower the CT-MRL01 to support a wide array of applications, from advanced AI and machine learning to rapid data analysis and edge computing. Whether it's enhancing storage capabilities or integrating cutting-edge wireless technology, the CT-MRL01's M.2 M-Key expansion slots are engineered with PCIe Gen 4 speed to ensure it remains a robust and adaptable platform for any industrial demand.

- 1x M.2 M / NVMe PCIe x4 / 2242, 2260, 2280
- 1x M.2 M / NVMe/SATA / PCIe x4 / 2242, 2260, 2280
- 1x M.2 E / PCIe x2 / USB 2.0 / 2230



## Next-Level Connectivity with 20 Gbps USB Type C

The CT-MRL01 motherboard takes connectivity into the future with the inclusion of a USB 3.2 Gen 2x2 Type C port with 20 Gbps speed. With this USB Type C port, the CT-MRL01 is not only equipped for the present demands of high-speed data but also poised to accommodate the next wave of technological innovations.



- Rapid Data Transfers
- Rapid Data Transfers
- Reversible Connectivity
- Future-Proof Technology



## Enhanced Security with Discrete TPM 2.0 Support

The CT-MRL01 is a motherboard designed with security at its core. This robust platform now comes with dedicated TPM 2.0 (Trusted Platform Module) support, providing hardware-based security features that are critical in safeguarding against data breaches and cyber threats.



## Secure Remote Management with Intel® AMT 12.0

The CT-MRL01 industrial motherboard integrates Intel® AMT 12.0, delivering advanced remote management capabilities that enhance operational efficiency and security. Ideal for enterprise-level deployments, this feature allows for out-of-band system access, troubleshooting, and maintenance, ensuring uninterrupted productivity and robust protection for critical applications.

## Industrial-Grade Durability

The CT-MRL01 is built for industrial resilience, engineered with components specifically chosen for their long-term reliability. Built to withstand the rigors of demanding environments, this motherboard is rigorously tested and validated to ensure continuous performance where it matters most. With its commitment to industrial robustness, the CT-MRL01 is the cornerstone of any setup that requires durability and stability.

- Extended Operating Temperature: 0 °C to 60 °C
- Precision-Selected Industrial Components
- CE and FCC Certified



# We Create World-Class Edge Computers For Your Industry-Leading Solutions

NEW

## CT-MRL01 MicroATX Industrial Motherboard



Model	CT-MRL01
	Support 12 <sup>th</sup> /13 <sup>th</sup> Gen Intel® Core™ i9/i7/i5/i3 Alder lake-S, Raptor Lake-S Processor
Memory	4x DDR4 2133/2400/2666MHz DIMM. 128 GB Max
Display Interface	Quad 4K Displays through 4x DP++
LAN	GbE1: Intel® I219LM; 1GbE (Support Wake-on-LAN and PXE) GbE2: Intel® I225-V; 2.5GbE (Support Wake-on-LAN and PXE)
USB & Serial	6x USB 3.1 Gen 2 (10 Gbps) 1x USB 3.2 Gen 2x2 (20 Gbps) Type C 6x RS-232 1x 8-bit DIO (4-in/4-out)
Storage	1x M.2 M / NVMe PCIe x4 Gen 4 / 2242, 2260, 2280 1x M.2 M / NVMe PCIe x4 Gen 4 / SATA / 2242, 2260, 2280 1x M.2 E / PCIe x2 Gen 3 / USB 2.0 / 2230
Expansion Slot	1x PCIe x16 Slot (Gen 5) 1x PCIe x16 Slot (Gen 4, 4-Lane) 1x PCIe x4 Slot (Gen 4, Open End) 1x PCIe x4 Slot (Gen 3, Open End)
Power	ATX Power 2x12-pin and 2x2-pin power connector
TPM	TPM 2.0
Operating Temperature	0°C to 60°C
Dimension	244 x 244 mm