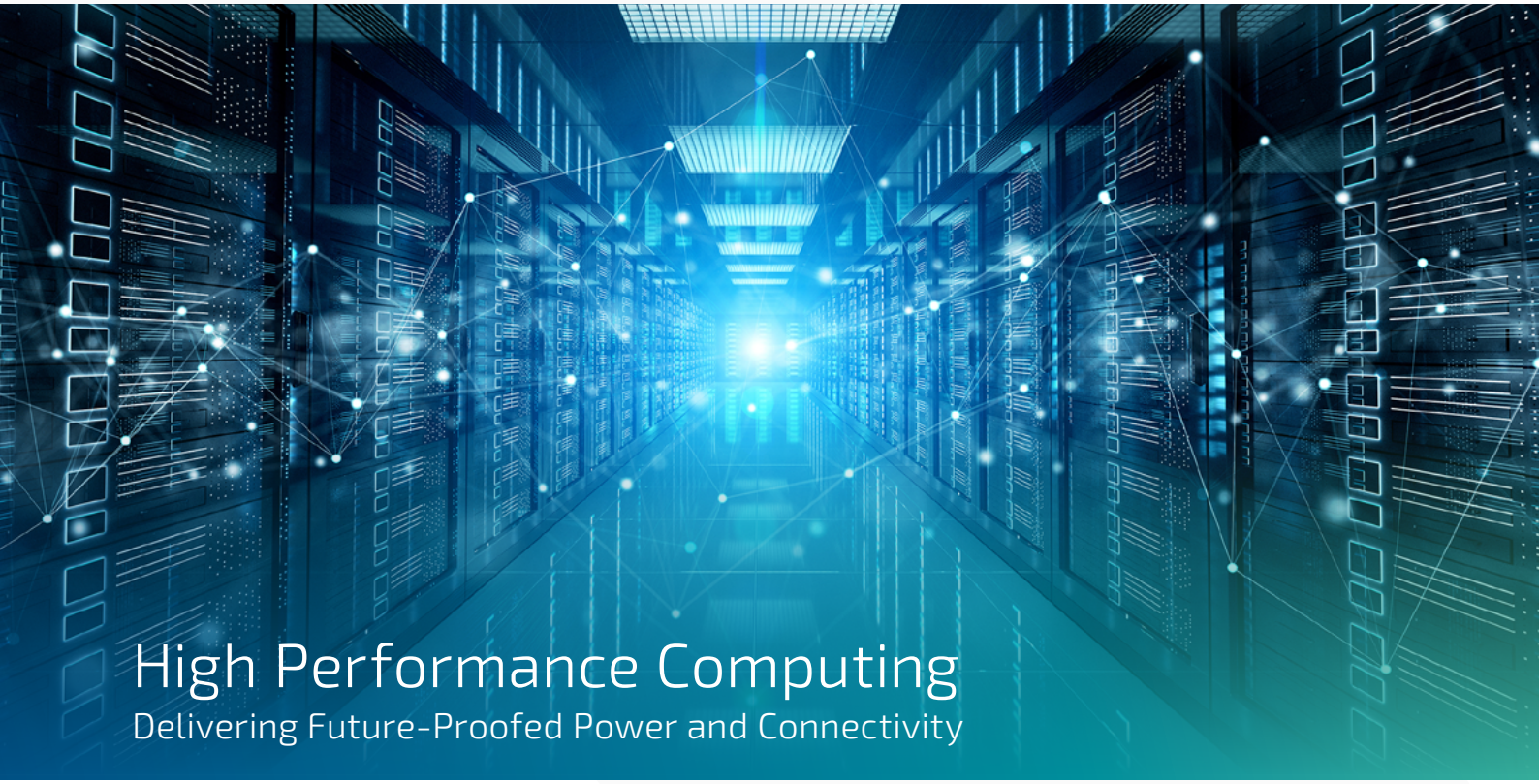


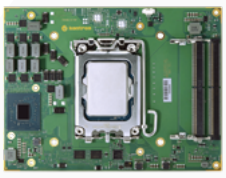
High Performance Computing

Delivering Future-Proofed Power and Connectivity

COM-HPC®

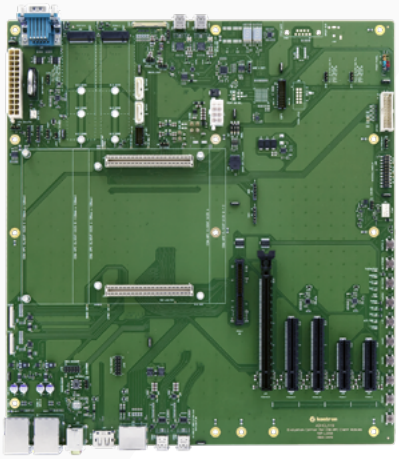
Since the PCI Industrial Computer Manufacturers Group (PICMG®) ratified the COM-HPC® high performance Computing standard almost two years ago, COM-HPC® products have become increasingly available. With market acceptance growing fast, what are the drivers for using these high performance standardized COM products and when should developers consider deploying them?

COMh-caRP/-caAP



COMh-ccAS

COMh-sdID



COMh Eval Carrier Client

kontron

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Executive Summary

Enabling more powerful and sophisticated embedded servers and client devices for high performance Computing (HPC) applications is a constant challenge for the embedded computing industry which must always be ready to anticipate and respond quickly to the challenges of future technologies and applications. The Industrial Internet of Things (IIoT) is driving these trends, some of which are already starting to make an impact. For example, Artificial Intelligence/Machine Learning/ Deep Learning and the arrival of autonomous driving and 5G wireless are creating enormous data volumes requiring unprecedented computing power and greater connectivity.

Totally new design concepts for embedded computers are urgently required as existing standards will no longer be sufficient to cope. These must withstand harsh environments, offer cooling solutions suitable for the embedded industry, enable individual system solutions, and bring all the benefits and advantages of a COM standard to the market.

In response to these growing high performance computing requirements and to ensure Computer-on-Modules remain fit-for-purpose long into the future, a new High Performance Computing standard has been defined by the PICMG: Computer-On-Modules high performance Computing (COM-HPC®). This enables more powerful COMs that extend beyond the limits and capabilities of COM Express® (Type 6 and 7) and other COM standards. While complementary, COM-HPC® is distinct from COM Express®, directly supporting the growing need for more powerful future-proofed compute, scalability, transmission, and network performance.

This whitepaper examines the COM-HPC® specification and the types of applications and use cases this category of standardized COM products are best suited to. In addition, an overview of Kontron's current COM-HPC® offerings is provided.

Introduction

The advantages of adopting COMs for building embedded applications are widely understood and accepted by system developers. Compared to full custom designs, they can offer a faster, more flexible and scalable approach. COMs can be deployed as quickly as off-the-shelf motherboards and have the benefit of making future processor upgrades much easier.

The industry demand for COMs has therefore risen dramatically over the last 20 years. This has been driven and dominated by the success of standardized COMs due to the industry's ongoing initiatives to ensure the availability of standardized modules. These have provided designers with the peace of mind of clear technology roadmaps, long-term availability of modules in specific form factors, and wide-ranging accessories. Furthermore, standardized COMs from multiple vendors have eliminated reliance on single vendors which has stimulated healthy market competition and pricing.

COM-HPC®: A Whole New Level

The impact of the IIoT and 5G, together with new technologies such as Artificial Intelligence, Machine Learning and Deep Learning, is rapidly taking embedded computing demands and requirements to a new level. At the same time, I/O data throughput and communications performance is growing significantly. Consider, for example, the quantum leap from the original speed of 250 MT/s achieved by the original PCIe in 2003 to the current 32 GT/s of the latest PCIe Gen 5; the arrival of 100 Gbit Ethernet and USB 4.0; and the ability of remote manageability right down to embedded units.
In Industrial Automation, for example, exponential amounts of data are being produced from sensors, devices and actuators, often requiring local pre-processing at the edge. Similarly, in the Communications sector the advent of 5G wireless is generating significant data backhaul traffic volumes and processing requirements. At the same time, autonomous vehicles, factory floor and HPC workloads are demanding server-class processors for supporting much higher-end platforms.
Many of these scenarios no longer take place in a protected high performance Computing data center or in the cloud, but close to where the data originates: on mobile masts, on production lines, in warehouses, at processing plants or in autonomous vehicles.

HPC Design Requirements

- Data analysis and real-time processing on a single platform
- High scalability
- Faster networking capabilities
- Powerful multicore processing
- Reliability, availability, manageability
- Robust design for harsh environments
- Provide security of IIoT edge software applications
- Long term availability – secured upgrade path
- Flexible carrier geometry - tailored to challenging individual requirements

COM-HPC®: Key Highlights

- COM-HPC® specification allows Server and Client pinout on all five sizes
- Legacy features have been reduced as much as possible (e.g. no LVDS, no HDA, no VGA, no LPC)
- The significant increase in compute performance is enabled by the increase in power support - up to 250-300 W overall power envelope compared to the typical maximum of 80 W of COM Express® - to leverage the latest generations of multicore CPUs
- The boost in transmission and connectivity performance comes from a new module to carrier board connector (high density connector). PCIe Gen 4/5 and 10 Gbit/25 Gbit Ethernet compliant, this is offered in 5 mm and 10 mm stack heights and provides 2x 400 pin out connection rather than the 2x 220 with COM Express® - thereby doubling the total number of supported PCIe lanes from 32 (COM Express® Type 7) to 64 for COM-HPC®/Server
- COM-HPC® supports data rates of up to 32 Gbit/s per lane via PCIe (Gen 5) compared to typically 8 Gbit/s with COM Express® today.
- For high-end edge server applications, the increase in throughput speeds possible on COM-HPC®/Server modules will substantially increase overall connectivity performance: up to 8x 25 Gbit Ethernet lanes and 64 PCIe lanes (Gen 4/5) enabling data transfer rates of up to 256 Gbit/s; 2x USB 4 interfaces which nearly double the rates of USB 3.2
- COM-HPC®/Server modules can support up to eight DIMM sockets to maximize the memory capacity
- For maximum product lifetime, COM-HPC® modules are easily upgradable and interchangeable as application performance needs change with new technology developments

COM-HPC®: Out-of-Band Management

COM-HPC® defines Out-Of-Band (OOB) or remote management features that were not addressed by COM Express®. Briefly introduced in the main COM-HPC® specification document, OOB is covered thoroughly in the PICMG COM-HPC® Platform Management Interface Specification companion document.

The table below shows the total scope of the definition where all combinations between carrier and module are interchangeable. The carrier can be unmanaged or populated with a BMC (Board Management Controller) while the module can either be designed with none, or two levels of management functionality – basic or full. The embedded controller on the module - MMC (Module Management Controller) – has a small footprint with no need for additional adjacent components, allowing a cost-effective and space-saving implementation.

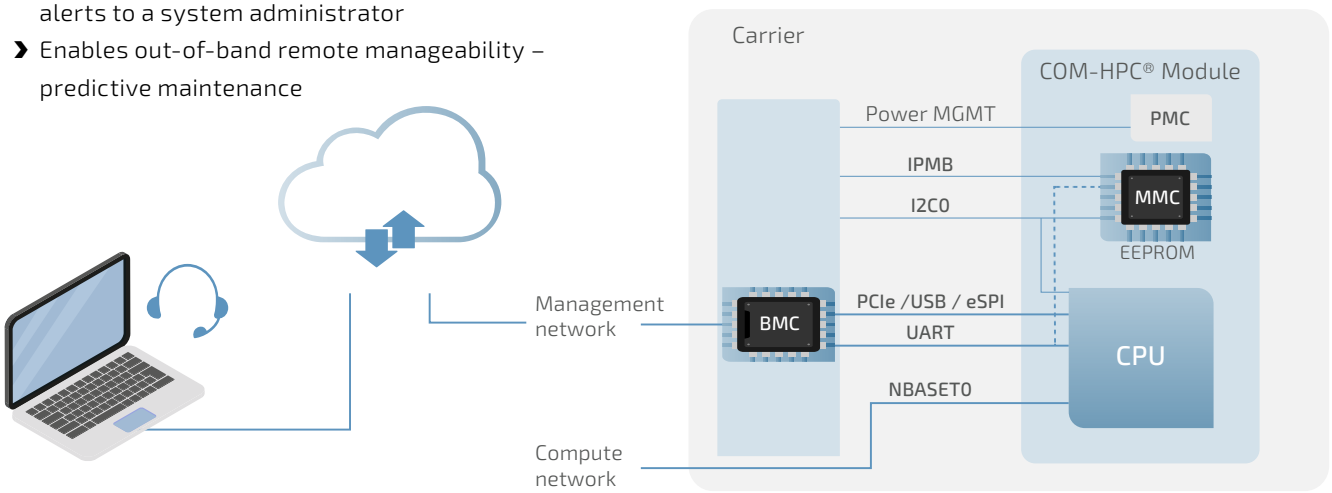
OVERVIEW: COM-HPC® MANAGEMENT SOLUTIONS

	SHORT	DESCRIPTION
Carrier	C.U	- Unmanaged - The carrier has no BMC. Power and chassis management is typically done via microcontroller
	C.M	- Managed via BMC - BMC can manage every kind of module - Communication between BMC and module via various interfaces e.g. PCIe, IPMB, USB, LAN
Module	M.U	- Unmanaged (No MMC) - Dedicated EEPROM (EeeP) for module identification
	M.B	- Basic management capabilities (e.g. via low cost MMC) - Management via external interfaces
	M.F	- Full management capabilities - Redfish and IMPI via MMC (ETH or IPMB)

The COM-HPC® specification allows the freedom of many different management concepts, however a typical implementation may comprise pairing a managed carrier with a module populated with a MMC with basic management capabilities. The MMC controller supports a subset of the overall IPMI command set to communicate with the BMC on the carrier via IPMB. Using I²C the module's EEPROM can be addressed for module identification; the UART can be used as the serial console between the main module CPU, carrier BMC and module MMC. Interfaces such as PCIe and USB allow the BMC to emulate a KVM interface.

As shown in the table below, the OOB or remote system management interface enables centralized control and scheduling for predictive maintenance. BMC on carrier and MMC on module enables sensor monitoring/alerting and providing OOB remote manageability.

- Interface to connect a MMC to a BMC
- Monitors the sensors and can send alerts to a system administrator
- Enables out-of-band remote manageability – predictive maintenance

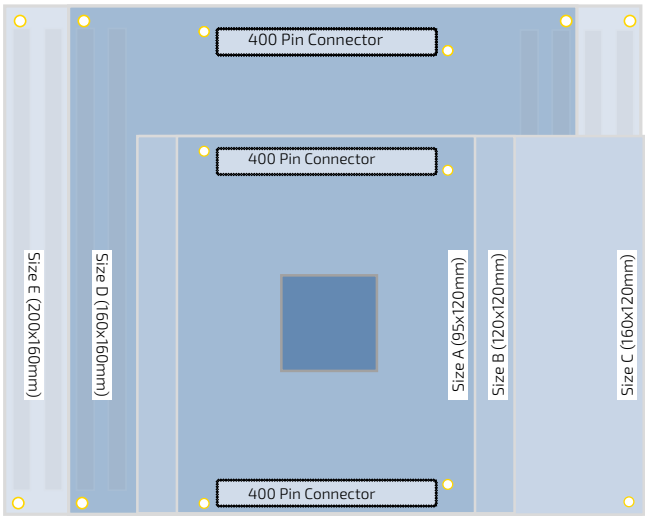


Kontron's BMC solution: RunBMC

Kontron is offering a modular approach for a BMC solution on the COM-HPC® carrier. Form factor and the electrical pinout of the module is designed according to the "RunBMC" specification of the "Open Compute Project", which defines a 260-pin SODIMM DDR4 edge-connector for mounting into a mating SODIMM DDR4 socket. The BMC module is based on the industry-proven ASPEED AST2600 controller and provides interfaces such as DisplayPort, LAN, USB, COM and other I/O and control signals which are routed via the connector to the carrier. The module is made for use in extremely rough environments to withstand mechanical and thermal stress.

COM-HPC®: Modules and Specifications

The COM-HPC® standard provides five new form factor modules designated A, B, C, D and E.



SUPPORTED INTERFACES		
COM-HPC®/Client		COM-HPC®/Server
A, B, C	SIZE	D, E
48 + 1	PCIe	64 + 1
2	MPI-CSI	-
2	25 GbE KR	8
3	DDI	-
2	SoundWire, I²C	-
2	10GBASE-T	1
4	USB4	2
-	USB 3.2	2
4	USB 2.0	4
2	SATA	2
2	UART	2
1, 2	eSPI, SPI	1, 2
1, 2	SMB / I²C	1, 2
12	GPIO	12

COM-HPC® Client

Sizes A, B, and C relate to three embedded COM-HPC®/Client modules for use in high-end embedded applications. These focus on powerful graphics and connect 2x MIPI-CSI (Mobile Industry Processor Interface – Camera Serial Interface) for imaging tasks including those required for medical equipment, autonomous vehicles and surveillance.

COM-HPC®/Client modules are positioned above COM Express® Type 6, for a wide range of embedded applications requiring increased processing and graphics capabilities, faster data transmission and network connectivity.

- Power envelope up to 150 W
- Up to 48 + 1 PCI Express® Gen4/5 lanes
- Up to 4 graphics interfaces
- Up to 2x 25 Gbit Ethernet interfaces
- Module sizes: A: 95 x 120 mm;
  B: 120 x 120 mm;
  C: 160 x 120 mm

COM-HPC® Server

Sizes D and E are for the two COM-HPC®/Server modules intended mainly for high performance edge server class applications such as AI and analytics, to manage high data volumes involving high-speed transmission and real-time processing. They are focused on providing even higher scalability, compute and communications performance than COM Express® Type 7.

- Power envelope up to 300 W
- Up to 64 + 1 PCI Express® Gen4/5 lanes
- No graphic interfaces
- Up to 8x 25 Gbit Ethernet interfaces enabling 100 Gbit Ethernet
- Module sizes: D: 160 x 160 mm;
  E: 200 x 160 mm

COM-HPC®: When to deploy

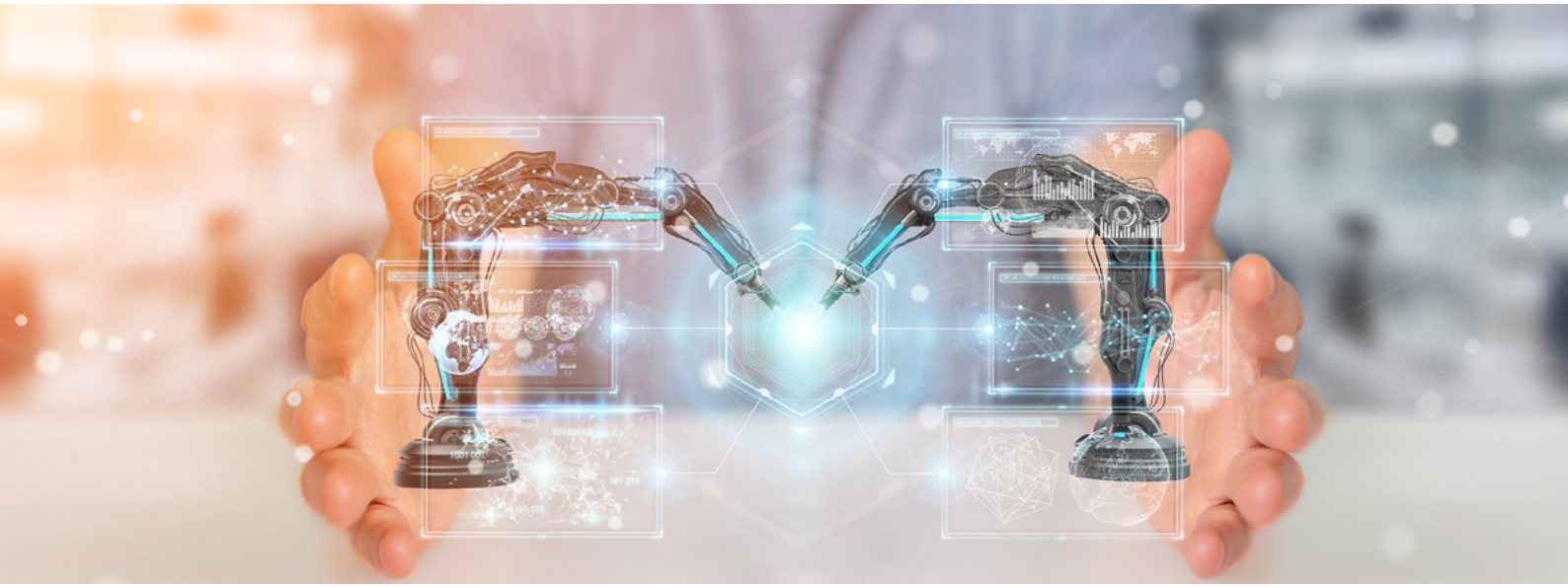
COM Express® and COM-HPC® are complementary standards and clearly differentiated with respect to performance, overall feature sets and price level.

COM Express® is most probably still the right platform when:

- The performance level and memory capacity match the application requirements – processor TDP up to 60 W – memory capacity up to 128 GByte
- A smaller footprint and thermal limit is necessary
- Extending the longevity of an existing COM Express® solution to save investment and ensure continuity
- There's a low to medium budget consideration

COM-HPC® is more likely to be viable when:

- Processor power is required beyond 60 W TDP
- Memory capacity must go beyond the limit of 128 GByte
- Faster interfaces such as USB 4.0, PCIe Gen 4/5 or 25 Gbit Ethernet (allowing 100 GbE interfaces) are required
- To accommodate the above, a larger footprint and price level is accepted



COM-HPC® - COMPARISON TO COM EXPRESS®			
COM-HPC®/Client	**COM Express® Type 6**	**COM-HPC®/Server**	**COM Express® Type 7**
2x 400 pin connector	2x 220 pin connector	2x 400 pin connector	2x 220 pin connector
2x NBase-T (max. 10 Gbit/s)	1x NBase-T (max. 10 Gbit/s)	2x NBase-T (max. 10 Gbit/s)	1x NBase-T (max. 10 Gbit/s)
48x PCIe + 1x PCIe (dedicated for BMC)	24x PCIe	64x PCIe + 1x PCIe (dedicated for BMC)	32x PCIe
2x SATA	4x SATA	2x SATA	2x SATA
4x USB 4.0, 4x USB 2.0	2x USB4 (instead of DDI) 4x USB 3.2, 4x USB 2.0	2x USB 4.0, 2x USB 3.2, 4x USB 2.0	4x USB 3.2
2x 25 GbE KR	LVDS 2x24/eDP/MIPI DSI	8x 25 GbE KR	4x 10 GbE KR
3x DDI + 1x eDP/DSI + HDA/SoundWire	3x DDI + 1xLVDS or 1x eDP + HDA/SoundWire		
1x IPMI + 1x PCIe (BMC on carrier) for remote management		1x IPMI + 1x PCIe (BMC on carrier) for remote management	1x IPMI + 1x NSCI
„Low Speed" (IPMI, eSPI, SPI (BIOS), GPP SPI, SMB, 2x I2C, 2x UART, 12x GPIO, MIPI CSI, MISC)	„Low Speed" (eSPI/LPC, SPI (BIOS), SMB, I2C, HDA, UART, 8x GPIO/SDIO, MISC)	„Low Speed" (IPMB, eSPI, SPI (BIOS), GPP SPI, SMB, 2x I2C, 2x UART, 12x GPIO, MISC)	„Low Speed" (eSPI/LPC, SPI (BIOS), SMB, I2C, UART, 8x GPIO/SDIO, MISC)

Typical Use Cases: COM-HPC®

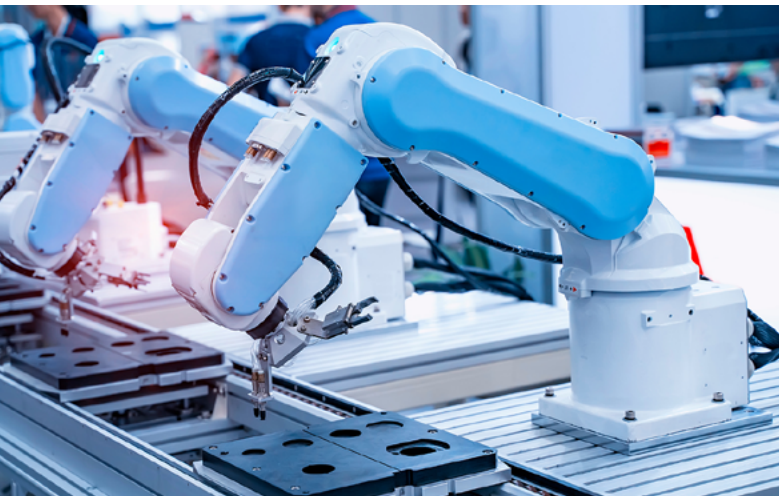
Server Modules

High performance multi-core processors and multi-LAN support up to 40G/100G Ethernet

- 5G RAN platforms
- Network appliances
- Datacenter switching with high-speed uplinks

Processing power combined with high-speed Ethernet connectivity

- Surface inspection
- Assembly control
- Pattern recognition
- Robot control

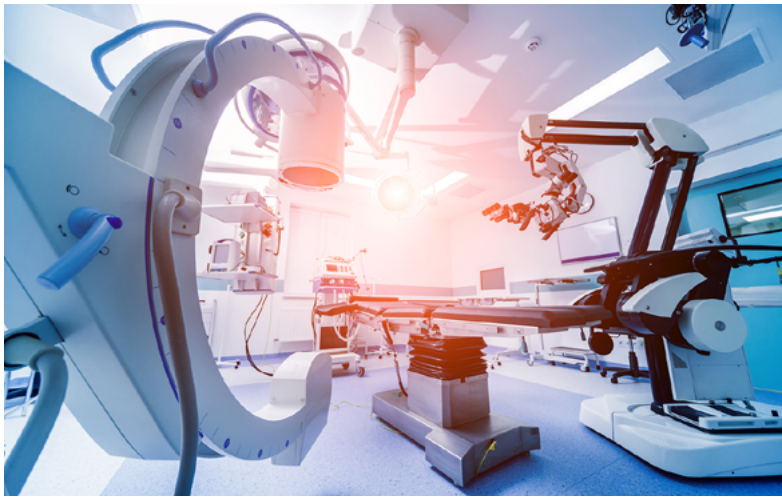


Typical COM-HPC® Server Modules use cases are foreseen in embedded servers ruggedized for field use, autonomous vehicles, outdoor cellular base stations, geophysical field equipment, medical equipment and defense systems as well as test & measurements and automation applications.

Client Modules

Multiple PCIe lanes combined with high-speed LAN connectivity and PCIe x16 ports for high performance GPGPUs/FPGAs:

- AI – machine learning + camera inspection
- Test & measurement
- Autonomous driving & truck fleet control
- Data logger
- Automotive test equipment



COM-HPC® Client Modules can be used effectively in a range of high-end embedded products requiring one or more displays. Typical uses are in networking, automation, measurement, and AI applications for medical equipment, high-end instrumentation, industrial equipment, casino gaming equipment, ruggedized field PCs, transportation and defense systems.

Kontron COM-HPC® Server Portfolio

COMh-sdID

The Kontron COMh-sdID COM-HPC® Server, featuring Intel® Xeon® D-2700 server processor technology, offers wide scalability through the easy connection of additional accelerators including GPUs, FPGAS and NVMe-based storage media - or even building a COM-HPC® module farm by connecting multiple COM-HPC® modules.

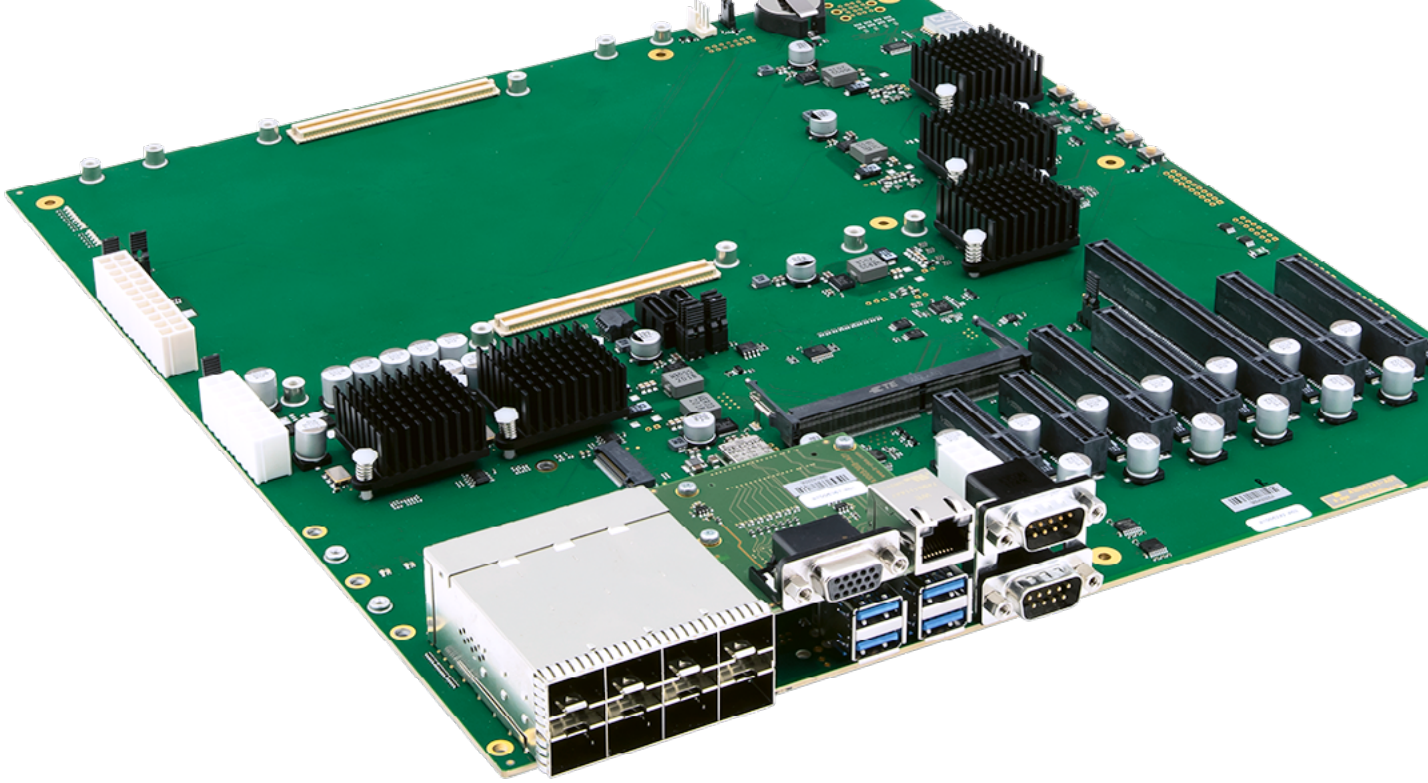
With its high performance processor - with four to 20 cores - and components it supports the real-time responsiveness that is required in many industrial applications, accommodating extended temperature ranges and offering long-term reliability with up to 10 years of continuous operation. It is therefore well-suited for workload consolidation for automation, robotics, and medical imaging; use in outdoor servers for critical infrastructure, including smart grids for utilities, transportation, and communications; AI and machine vision applications such as autonomous vehicles and video surveillance infrastructure.

Intel® Xeon® D processors deliver integrated capabilities to provide a flexible, adaptable platform for innovative, AI-enabled system design. Built-in accelerators include Intel® Deep Learning Boost (Intel® DL Boost), Intel® Advanced Vector Extensions 512 (Intel® AVX-512) and Vector Neural Network Instructions (VNNI) to accelerate AI deep learning inference processing within the CPU cores. Developers can convert trained models from most popular frameworks to optimize inference and run it on any mix of Intel® architectures using the Intel® Distribution of OpenVINO™ toolkit. Per-core performance and high core counts, combined with integrated acceleration, help improve edge AI, analytics, and edge-to-cloud workload convergence. For example, the Intel® Xeon® D-2796TE processor is up to 2.97x faster and improves AI inferencing by up to 7.40x compared to the previous generation.

- Size D form factor – 160 x 160 mm
- Intel® Xeon® D-2700 (formerly Ice Lake D) Server platform
- Up to 20 cores, processor TDP up to 125 W
- 32x PCIe Gen 4.0 lanes + 16x PCIe Gen 3.0 lanes
- 8x LAN ports for various configurations - up to 100 GbE
- Memory: max. 512 GByte DIMM-DDR4 with 4x DIMM sockets
- Optional onboard storage NVMe
- Industrial temperature versions
- Embedded management controller

The larger 160 mm x 160 mm footprint also allows adequate space for enhanced memory performance: a maximum of 4x DIMM sockets for up to 512 GByte of memory for addressing high memory bandwidth and size requirements of micro and edge servers.

A further feature is enhanced I/O performance for carrier board connection: 8x high-speed Ethernet ports for a max of 2x 100G Ethernet links (one for failover) and 49 PCIe lanes for PCI Express®; one lane is reserved for an optional board management controller (BMC) on the carrier board for dedicated remote management; the remaining 48 PCIe lanes are available for connection of peripherals.



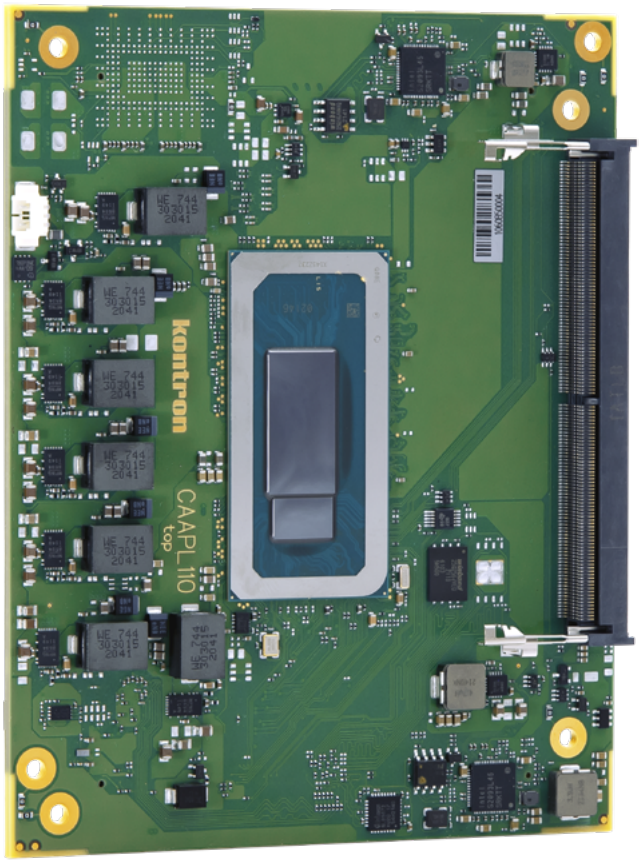
Kontron COMh Eval Carrier Server

An evaluation carrier is essential for ensuring customers quickly become familiar with the new technology and properly assess the COM-HPC® platform as a potential solution for their own system applications.

The Kontron COMh E-ATX compliant Evaluation Carrier includes all interfaces specified by the new COM-HPC®/Server standard for server modules in sizes D and E. A remarkable level of high-speed connectivity is possible with Ethernet support for 8x 10/25 GbE ports via re-timer support to SFP28 cages; breakout cables enable 100 GbE QSFP28 support; high- performance data transmission with support for 65x PCIe lanes via various PCIe card connectors and M.2 slots; 4x USB 3.1/0 interfaces. In addition, the new COM-HPC® Carrier Server includes all the necessary interfaces for programming, firmware flashing, and reset. The BMC expansion slot enables remote Server module management with optionally accommodating a so-called RunBMC module.

- Support of overall 65x PCIe lanes via various PCIe card connectors
- Support of overall 8x 10/25Gb Ethernet ports: 8x 10/25Gb Ethernet via integrated re-timer support to SFP28 cages
- 1x 10/1GBase-T interface, directly from COM-HPC®/Server module with basic EMI/ESD protection in RJ45 integrated magnetic connector
- 4x USB 3.1/0 interface, directly from COM-HPC®/Server module with basic EMI/ESD protection
- 2x SATA standard interfaces, directly from COM-HPC®/Server module
- BMC expansion slot
- External fan connector
- BIOS POST Code display in the form of 7-Segment display array
- Pin headers for COM HPC® server specific signals enabling measurement like GPIOs, I2C, SMBus and Feature connector
- External BIOS flash socket
- Mechanical size 308 x 340 mm

Kontron COM-HPC® Client Portfolio



- CPU Intel® 12th Generation Core™ family
- Intel® Iris® Xe Graphics architecture with up to 96 EUs, 4 independent displays (up to 8K)
- Optimized power/performance ratio (15 to 45W TDP)
- 14 cores, up to 20 threads
- Thunderbolt (Display and PCIe over USB)
- Up to 64 GByte DDR5 memory
- Up to 2.5 Gbit Ethernet with TSN support
- Optional NVMe SSD onboard
- 2x 4 PCIe Gen 4.0; 8x PCIe Gen3.0; optional 1x PCIe for BMC

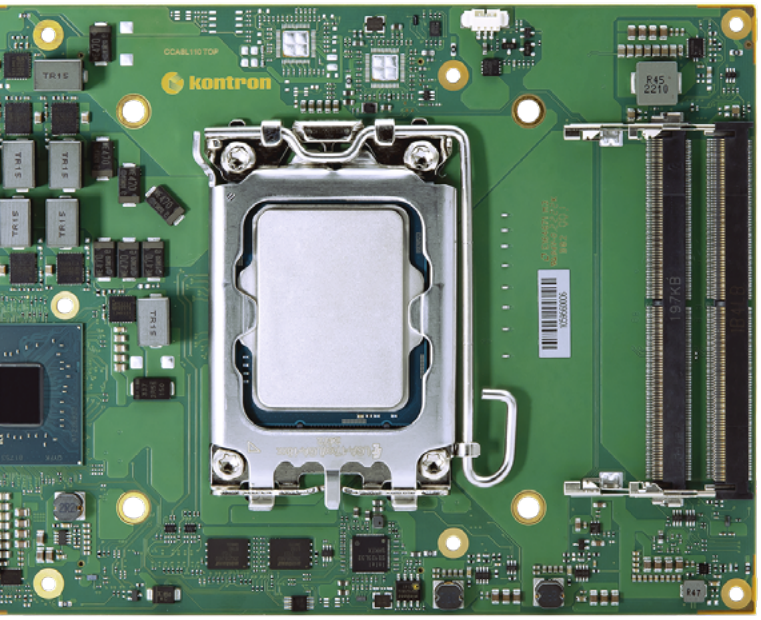
COMh-caAP

This is Kontron's Size A COM-HPC® client module, featuring a 12th Gen Intel® Core™ processor. It is well-suited to high performance computing in resource-intensive areas such as networking, automation and measurement. The COMh-caAP features an optimized power-performance ratio with a power consumption of 15 to 45 W TDP (Thermal Design Power); in multithreading up to 20 threads can be processed with 14 cores. The module also comes with up to 64 GByte of DDR5 memory and up to 2.5 Gbit Ethernet, including TSN support. As storage medium, an NVME SSD up to one terabyte can be optionally integrated onboard. The COM-HPC® module also supports Thunderbolt (display and PCIe via USB).

COMh-caRP

The COM-HPC® client module will also be available with the 13th Gen Intel® Core™ mobile processors. They deliver performance hybrid architecture with up to 14 cores and scalable processor base power from 15 W to 45 W, enabling efficient multitasking and performance per watt. Up to 96 graphics execution units driven by Intel® Iris® Xe graphics support highly parallel AI and immersive visual experiences with four display pipes and Pipelock synchronization.

This generation reintroduces essential, industrial-grade features such as support for in-band error correction code (IBECC) memory, Intel® Time Coordinated Computing (Intel® TCC), TSN, and extended temp ranges of -40 C° to +100 C° TjMAX. Selected SKUs are compliant to industrial use conditions of 100 percent operation over 10 years for best-in-class durability. IoT differentiation also brings long-life availability, 3support for Windows 10 IoT Enterprise 2021 Long-Term Servicing Channel (LTSC), EFLOW, and Linux kernel overlay to enable the easy adoption of IoT features.

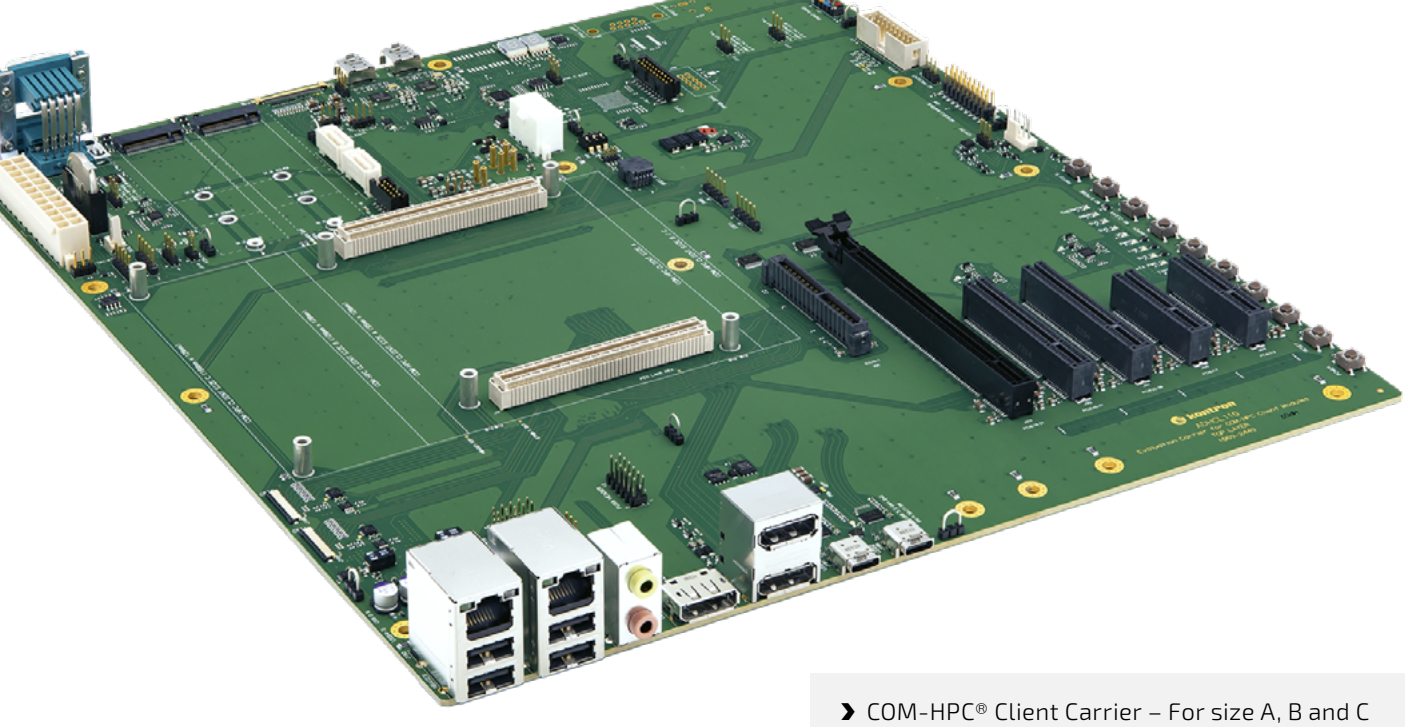


- PC client or embedded use case variants
- 12th Gen Intel® Core™ S processors (S-series, former codename Alder Lake S)
- Up to 16 cores (TDP range: 35 W-65 W) & 24 threads)
- High performance due to the CPU used (up to 65 W TDP can be used on the board)
- 3 different chipsets, depending on the expansion level
- Flexible thermal interface allows use of inexpensive standard heatsinks as well as low profile passive thermal interface
- 2x TSN enabled 2.5Gbit LAN
- 2x SPI Flashes for BIOS redundancy
- Memory: Max. 128 GByte DDR5 via 4x SODIMMs, ECC and non-ECC
- 16x PCIe Gen 5.0 lanes (for high performance CPUs) + 8x PCIe Gen 4.0 lanes (remove linebreak) + 6x PCIe Gen 3.0 lanes
- 3x DDI + 1x eDP
- TPM 2.0

COMh-ccAS

For increased graphics and computing power requirements, Kontron's Size C COM-HPC® client module is based on the 12th Gen Intel® Core™ S processors (S-series, former codename Alder Lake S). It is particularly suited for applications in areas such as networking, automation, measurement, medical, kiosk/retail, ticketing/vending, gambling & amusement/entertainment, and Artificial Intelligence (AI) in general.

The COMh-ccAS is socketed, without CPU. It is usable also for 13th Gen Intel® Core™ processors. This brings more cores, threads, cache, and faster memory to drive compute-intensive edge use cases. Performance hybrid architecture with up to 24 cores and 32 threads, PCIe 5.0 connectivity, and up to DDR5-5600 memory supports ultraflexible configurations with powerful multitasking for even more concurrent devices and apps. Customers can choose the right processor for their deployment because Intel is offering both mainstream and IoT processors with a wide range of CPUs and PCHs for all applications.



- COM-HPC® Client Carrier – For size A, B and C
- 305 mm x 330 mm (E-ATX)
- Support of 48 PCIe lanes via various PCIe and M.2 slots
- 2x 10/1GBase-T interface
- USB 3.X and USB4 (Thunderbolt) interfaces
- 2x USB Gen 4 + 2x USB 3.2 Gen 2x1, 2x SATA
- 3x DisplayPort, 1x eDP, 2x MIPI-CSI
- BIOS POST-Code display for easy commissioning

Kontron COMh Eval Carrier Client

The Kontron COMh Client Eval Carrier offers a complete set of standard interfaces, such as USB, SATA and DisplayPort, as well as many PCIe interfaces; thus supporting and optimizing the design-in phase of COM-HPC® Clients, size A, B and C.

Kontron: Value Added

Kontron manufactures and supplies one of the industry's largest globally available ranges of off-the-shelf embedded products including Boards, SBCs, and COMs. These are designed and developed in response to market and technological developments as well as direct feedback from OEM partners. As testimony to the quality and high performance of Kontron's range of COM and board level products many of these are frequently specified in the company's own range of OEM-category systems.

All standard and customized products are backed by the company's global services and support network. This includes technical support and product training as well as the benefit of extended product lifecycle management for ensuring product longevity – Kontron's priority access to the latest processor and embedded component technology from the world's major manufacturers is a major advantage to customers when it comes to optimizing product investment. Customers are also able to take advantage of the company's portfolio of middleware and software services when designing and launching IoT solutions.

In addition, Kontron can offer all customers - developers, system integrator and OEMs - comprehensive value added services. These include the provision of full Design-in Services as well as Custom Carrier Boards for facilitating the implementation of partly or fully customized embedded modules for specific applications. The company's design excellence results from over 35 years of embedded computing experience. Extensive simulations, product validation and release tests guarantee product reliability under all operating conditions. In production, stringent quality assurance is undertaken using state-of-art manufacturing facilities and well-proven test strategies.

The kontron susietec® toolset is part of Kontron's holistic digitalization solution: By combining software, hardware and expertise, the potential of IoT and Industry 4.0 can be exploited in a new dimension.

With the aim of driving the digital transformation forward, the kontron susietec® toolset provides target-oriented tools for the automotive, pharmaceutical or high-tech industries. In this way, it is possible to create access to future-oriented business models - sustainably, efficiently and customer-oriented.

Summary

The new COM-HPC® standard was born out of necessity and has been well-received by the market. Embedded solutions based on this innovative product specification are increasingly deployed in a wide range of industrial applications with COM-HPC® servers, client modules and carrier boards offering developers and OEMs almost limitless potential for scalability, compute performance, connectivity, and high-speed communications.

As a global embedded computer solutions manufacturer, Kontron is well-qualified to support all embedded COM needs - including those of the new rapidly emerging ultra-high performance computing era. This capability is underscored by the company's long history in supporting the standardization of COM platforms. An extensive range of IoT COM platforms to match any performance, space, thermal, and communications requirement is available from Kontron including those based on the new COM-HPC® standard.

Innovative IoT Platforms to match different Performance, Space & Thermal Requirements

Up to 15 W			Up to 35 W	Up to 80 W	Up to 120-150 W	Up to 250-300 W
SMARC module	SEVEN	COM Express®	COM Express®	COM Express®	COM-HPC®	COM-HPC®
						
COM Express® Mini	COM Express® Mini	COM Express® Mini	COM Express® Compact	COM Express® Basic	COM-HPC®/Client	COM-HPC®/Server

For more information about Kontron COM-HPC® embedded solutions visit:
www.kontron.com/products/boards-and-standard-form-factors/com-hpc

About Kontron

Kontron is a global leader in IoT/Embedded Computing Technology (ECT) and offers individual solutions in the areas of Internet of Things (IoT) and Industry 4.0 through a combined portfolio of hardware, software and services. With its standard and customized products based on highly reliable state-of-the-art technologies, Kontronprovides secure and innovative applications for a wide variety of industries. As a result, customers benefit from aceerated time-to-market, lower total cost of ownership, extended product lifecycles and the best fully integrated applications.

For more information, please visit: **www.kontron.com**

About the Intel® Partner Alliance

From modular components to market-ready systems, Intel and the over 1,000+ global member companies of the Intel® Partner Alliance provide scalable, interoperable solutions that accelerate deployment of intelligent devices and end-to-end analytics. Close collaboration with Intel and each other enables Alliance members to innovate with the latest IoT technologies, helping developers deliver first-in-market solutions.

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