

Solution Brief

12th Generation Intel® Core™ Processors
Compute Boards for IoT



Advantech Brings DDR5 and PCIe 5.0 Possibilities to the Industrial Edge

Enabled by 12th Gen Intel® Core™ processors, Advantech SOM-C350 and ASMB-788 boards introduce PCIe 5.0 connectivity and DDR5 memory for a massive boost to I/O and compute performance

ADVANTECH

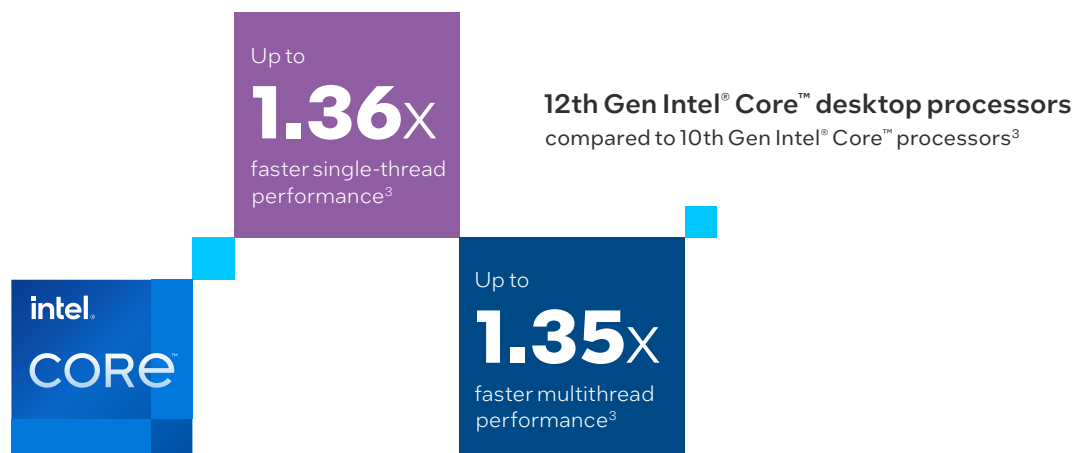
“Previous modules were smaller with a lower thermal design point (TDP), and it’s very rare to see a desktop CPU on a compute module. Now we’re able to bring up to Intel® Core™ i9 processor-level performance while still meeting space constraints or supporting more PCIe cards.”

—Max Chi, PM assistant manager at Advantech

Despite challenges related to COVID, the semiconductor manufacturing and testing market continues to forecast growth into 2028 to reach a valuation of USD 71.8M.¹ At the same time, enterprises are adopting more remote work strategies that are increasing the demand for advanced electronics, and healthcare providers are driving the demand for AI tools in devices to help analyze massive data sets.² To help meet increased demands and offset the impacts of the pandemic, manufacturers will be looking for long-lasting solutions that can enhance manufacturing precision and durability.

Challenges: The need for flexible, industrial-grade platforms

Some manufacturers in the IoT board market have turned to consumer-grade components to achieve the performance levels needed for high-precision assembly and testing. However, these components lack the ruggedness and thermal tolerance needed for high uptime, leading to more products being shipped with defects. Many platforms also need to accommodate multiple peripherals such as accelerators, robotic motion control cards, or video capture cards while balancing platform complexity, which can inflate total cost of ownership.



10th Gen Intel Core processors are the previous generation in this series for IoT. For workloads and configurations, visit [intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may vary.

Solution: Industrial and COM-HPC boards enabled by 12th Gen Intel Core processors

Advantech offers two solutions enabled by 12th Gen Intel® Core™ processors that help manufacturers achieve next-level performance and connectivity with support for DDR5 memory and PCIe 5.0. The SOM-C350 compute module offers a quick-deploy solution with industrial reliability for COM-HPC configurations. Max Chi, PM assistant manager at Advantech, says, “Previous modules were smaller with a lower thermal design point (TDP), and it’s very rare to see a desktop CPU on a compute module. But now we’re able to bring up to Intel® Core™ i9 processor-level performance while still meeting space constraints or supporting more PCIe cards.”

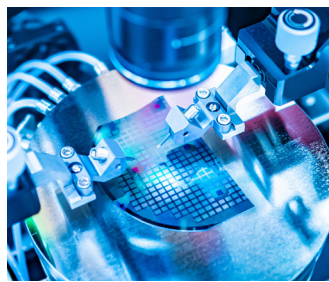
The second offering, the ASMB-788, is an industrial ATX motherboard, included in a customized 13-inch chassis, that’s designed specifically for industrial conditions while supporting greater platform consolidation through multiple PCIe add-in cards, per socket. Alma Lee, PM senior manager at Advantech, says, “Our customers use a lot of add-in cards, and older generations don’t have as many PCIe pins. This new platform will bring even higher performance with more room for more expansion, allowing for a most cost-efficient platform overall.”

SOM-C350 and ASMB-788 target use cases with 12th Gen Intel® Core™ processors

Primary use cases:



(ASMB-788) Semiconductor manufacturing and testing



(SOM-C350) High-end test equipment



(SOM-C350) Machine vision applications in manufacturing



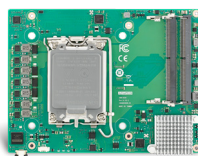
(SOM-C350) Medical imaging (ultrasound), surgical robots

Secondary use cases:

How it works

Both the SOM-C350 and ASMB-788 boards are enabled by 12th Gen Intel Core processors for better performance, connectivity, and AI acceleration.³ The SOM-C350 is purpose-built for COM-HPC configurations that combine a compute board for primary workloads with a carrier board that connects to external peripherals in edge applications. The ASMB-788 is designed specifically for high-end industrial use cases that require multiple PCIe add-in cards, such

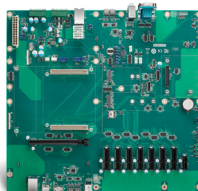
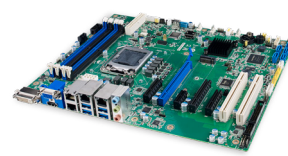
as semiconductor manufacturing and testing equipment. In these use cases, the ASMB-788 can connect to frame grabber cards, motion control cards, and accelerators through the PCIe 5.0 interconnects for top-tier I/O bandwidth. Both the SOM-C350 and the ASMB-788 bring industrial-grade, desktop-level CPU performance and give customers the option to scale up from Intel® Core™ i3 processor to Intel® Core™ i9 processor SKUs based on their needs.



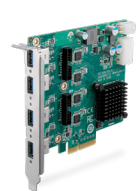
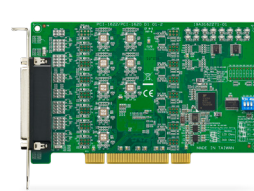
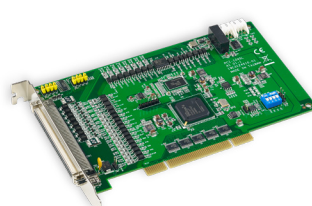
SOM-C350



Custom 13-inch chassis/ASMB-788



Carrier board



Add-in cards: motion control, frame grabber, and FPGAs

Figure 1: The SOM-C350 and ASMB-788 solutions bring industrial-grade, desktop-level performance to carrier-board and high-end industrial use cases.

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The first Intel® processors for IoT to support DDR5 and PCIe 5.0

12th Gen Intel Core processors are the first Intel® Core™ processor series for IoT that introduce support for up to DDR5-4800 memory modules and PCIe 5.0. Dramatically high levels of I/O and memory bandwidth increase the connectivity and platform expansion possibilities and the ability to support high numbers of simultaneous applications. Max comments, “Our customers have been demanding DDR5 and PCIe 5.0 for some time now. These technologies make it easier to reach better performance levels with the same footprint. For some customers that are still running 6th Gen platforms, we’re seeing that 12th Gen Intel Core processors deliver competitive performance even with entry-level Intel Core i3 processor SKUs.”

Innovative high-performance chip design

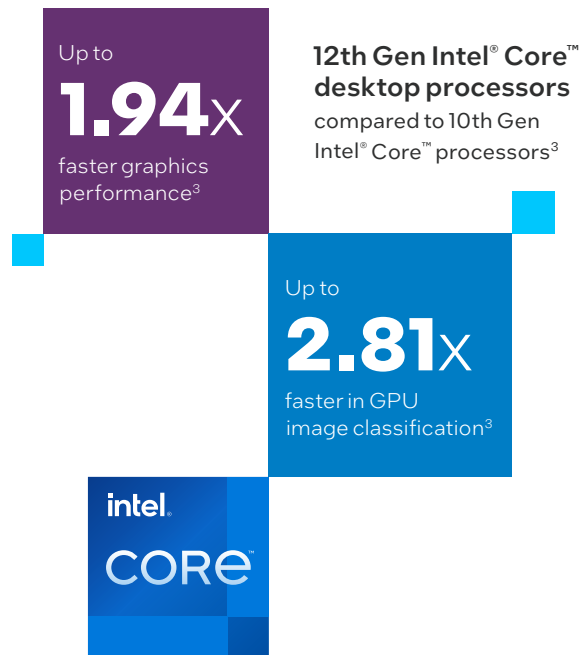
This IoT platform is among the first to feature performance hybrid architecture,* a revolutionary new chip design. In 12th Gen Intel Core processors, this design integrates up to eight Performance-cores, or P-cores, to enhance workload consolidation, and up to eight Efficient-cores, or E-cores, to enhance background task management. With up to 16 cores and 24 threads, these processors drive up to 1.36x faster single-thread performance and up to 1.35x faster multithread performance vs. 10th Gen Intel® Core™ processors.³

Industrial-grade durability meets desktop-level performance

Both 12th Gen-enabled SOM-C350 and ASMB-788 boards are built to operate in industrial conditions, with wide temperature ranges and resistance to shock and vibration. The SOM-C350 module not only provides a low z-height of 46 mm with a fan, but can also reliably operate at 65W TDP, +60° Celsius, and 100 percent CPU utilization with no performance throttling. The ASMB-788 board is an industrial-grade ATX motherboard, customized by Advantech with ample space to accommodate additional thermal flow and future platform upgrades.

Enhanced graphics performance and AI acceleration

12th Gen Intel Core processors in both Advantech board solutions deliver up to 32 graphics execution units (EUs) based on Intel® UHD Graphics 770, driven by Intel® Xe architecture. Customers will benefit from up to 1.94x faster graphics performance compared to 10th Gen Intel Core processors,³ for high-definition human-machine interfaces (HMIs) and other displays in industrial settings. The high number of graphics EUs also enables robust parallelization for AI workloads for up to 2.81x faster in GPU image classification inference performance.³ AI builders and solution providers can also benefit from hardware-accelerated AI from Intel® Deep Learning Boost (Intel® DL Boost) and key optimizations in the Intel® Distribution of OpenVINO™ toolkit. These features can help boost the inference speed for AI-enabled medical imaging in use cases like ultrasound.



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Seamless upgrades with the SOM-C350 board

In use cases featuring the SOM-C350 board, configurations will feature a dual-board solution that combines a CPU-focused compute module with a carrier board that hosts all external devices and ports, including PCIe devices, LAN, VGA, and DVI. This design allows system architects to remove and upgrade the compute module without changing the carrier board or replacing and reconfiguring connected

devices. Customers can upgrade to the SOM-C350 compute module and start benefitting right away from 12th Gen Intel Core processor performance, up to DDR5 memory, and PCIe 5.0 speed. This quick path to deployment can also carry into future upgrade cycles for less disruption and high cost-efficiency via incremental replacements.

*Not available on certain 12th Gen Intel® Core™ processors. See backup for more details.

Headroom for performance-hungry applications with the ASMB-788 board

The ASMB-788 industrial ATX board was originally conceived as a customized solution for a world-leading Advantech customer that specialized in semiconductor assembly and packaging equipment. The customer had attempted to build their equipment with consumer-grade components but struggled with reliability due to overheating, which led to high product return rates. Advantech worked with the customer to build a 12th Gen Intel Core processor-enabled platform while paying close attention to PCIe pin specifications and cable length to help ensure proper airflow throughout the chassis. The integration of 12th Gen Intel Core i9 processors also provided additional performance headroom to support more multitasking, more concurrent applications, and higher-density workloads in the future.

The Advantech difference, backed by Intel

Advantech offers a one-shop service from design to certification, with return material authorization (RMA) and logistics support on a global scale. Customers benefit from high-quality, industrial-grade design that's backed by Intel's industry leadership and guidance. Close collaboration between Advantech and Intel continues to pay dividends in terms of product quality and a deeper understanding of the needs of industrial manufacturing businesses. Alma states, "We get advanced technical support and insights on the latest technology directly from the Intel team. Their experts provide schematic and layout review, assistance with spec changes and technical advisories, and marketing support. This makes a huge difference for us and our customers."

Conclusion: Setting a foundation for growth

12th Gen Intel Core processors raise the bar for performance, graphics and media, and AI. However, a key benefit to both the SOM-C350 and ASMB-788 boards is the foundation that DDR5 memory and PCIe 5.0 connectivity bring to manufacturing environments. "We expect that the COM-HPC standard, which integrates DDR5 and PCIe 5.0, will continue to shape carrier and industrial board requirements for the next decade or longer," says Max. 12th Gen Intel Core processor-enabled solutions can help customers get involved right now with the next level of platform multitasking and I/O that will influence their manufacturing environments for years to come.

Learn more

Learn more about the Advantech [SOM-C350 COM-HPC Client Size C Module](#).

Learn more about the Advantech [ASMB-788 industrial ATX motherboard](#).

Explore the capabilities of 12th Gen Intel Core processors at intel.com/alderlake-s.

About Advantech

Based in Taiwan, Advantech is a Titanium-level Intel® Partner Alliance member and Industrial Solutions Builder Specialist that provides embedded, industrial, and retail edge solutions worldwide.

[advantech.com](https://www.advantech.com)



1. "\$71,784.6Mn by 2028 Semiconductor Assembly and Testing Services Market Size Driven by Automotive Sector (4.7% CAGR)," globenewswire.com, October 2021. [globenewswire.com/en/news-release/2021/10/28/2322943/0/en/71-784-6Mn-by-2028-Semiconductor-Assembly-and-Testing-Services-Market-Size-Driven-by-Automotive-Sector-4-7-CAGR-Impact-of-Coronavirus-Outbreak-and-Global-Analysis-Forecast-by-TheIn.html](https://www.globenewswire.com/en/news-release/2021/10/28/2322943/0/en/71-784-6Mn-by-2028-Semiconductor-Assembly-and-Testing-Services-Market-Size-Driven-by-Automotive-Sector-4-7-CAGR-Impact-of-Coronavirus-Outbreak-and-Global-Analysis-Forecast-by-TheIn.html)
2. "The Worldwide AI in Medical Diagnostics Industry Is Expected to Reach \$3.8+ Billion by 2025," prnewsire.com, September 2021. [prnewsire.com/news-releases/the-worldwide-ai-in-medical-diagnostics-industry-is-expected-to-reach-3-8-billion-by-2025--301368324.html](https://www.prnewsire.com/news-releases/the-worldwide-ai-in-medical-diagnostics-industry-is-expected-to-reach-3-8-billion-by-2025--301368324.html)
3. For more complete information about performance and benchmark results, visit intel.com/PerformanceIndex.

Notices and disclaimers

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. No product or component can be absolutely secure.

Intel® processors of the same SKU may vary in frequency or power as a result of natural variability in the production process.

Not all features are available on all SKUs.

Not all features are supported in every operating system.

Intel may change availability of products and support at any time without notice. All product plans are subject to change without notice.

Your costs and results may vary.

Intel® technologies may require enabled hardware, software, or service activation.

Performance hybrid architecture combines two new core microarchitectures, Performance-cores (P-cores) and Efficient-cores (E-cores), on a single processor die. Select 12th Gen Intel® Core™ processors (certain 12th Gen Intel® Core™ i5 processors and lower) do not have performance hybrid architecture, only P-cores.

Built into the hardware, Intel® Thread Director is provided only in performance hybrid architecture configurations of 12th Gen Intel® Core™ processors; OS enablement is required. Available features and functionality vary by OS.

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