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Advantech Eases Barriers to Entry for Robotics and Optical Inspection Deployments

Advantech MIO-5377 and ARK-2251 solutions leverage 13th Gen Intel® Core™ mobile processors to condense powerful compute and AI into space-constrained robotics and industrial applications, simplifying the adoption path for customers.

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Autonomous mobile robots (AMRs) are becoming a new normal by helping automate and drive efficiencies in the simple yet technologically complex process of moving assets and resources in warehousing, logistics, and manufacturing environments. The market for autonomous robots is expected to rise at a compound annual growth rate of 43 percent starting in 2022, reaching a valuation of USD 18B by 2027 with an install base of 2.4M units worldwide.[1] This growth is driven by a surge in e-commerce over the past several years, with a global consumer base that expects fast delivery amid disruptive labor shortages.

As robotics is poised for dramatic market growth, the Intel-enabled Advantech ARK-2251 and Advantech MIO-5377 offer solution providers powerful new ways to meet this opportunity head-on.

Challenge: Condensing powerful AI and flexible expansion in a small form factor

AMRs and other computer vision applications such as industrial robots and optical inspection in industrial manufacturing are challenged by the need to condense powerful AI and camera-based inputs into small form factors. AMRs in particular may need to efficiently process data from multiple depth cameras and proximity sensors for safe navigation. These systems also need to withstand the shock and vibration of heavy movement and adjacent machinery. On top of these challenges, many deployments have unique requirements, so solution providers need a flexible platform that's open to customization and expansion. As requirements increase, so does cost, making it difficult to satisfy customer demands and stay under budget in increasingly competitive markets.

Solution: Advantech offerings enabled by 13th Gen Intel® Core™ mobile processors

Advantech has two offerings that leverage 13th Gen Intel Core mobile processors to address the compute, graphics processing, and power efficiency needs of automated applications including AMRs and optical inspection. The Advantech MIO-5377 is a single-board computer (SBC) built for flexible robotics solutions, featuring I/O connections for cameras, sensors, and servo motors. The Advantech ARK-2251 is a complete system, with flexible I/O customization through Advantech's innovative iDoor Module solution and Power over Ethernet (PoE) to support IP cameras in optical-inspection use cases.

intel® CORE™

Each of these solutions benefits from the adaptive performance of 13th Gen Intel Core mobile processors that feature performance hybrid architecture[2], intensive graphics processing with Intel® Iris® X^e graphics,[3] and DDR5 memory support. The exceptional power efficiency of the latest processor generation also contributes to low TCO and long battery life to boost operational duration of robots on the factory or warehouse floor.

How it works

The Advantech MIO-5377 drives power-efficient connectivity for robotics

The MIO-5377 SBC helps satisfy the high compute requirements that OEMs, ODMs, and solution providers need for customer robotic applications while offering expansive I/O and connectivity to help customize solutions for specific deployment demands. The board features 3x I2C connectors for adding in sensors, lidar, and cameras and 2x CAN bus connectors for servo motors, wheel control, and remote controls to open and close doors in the work environment. The board also takes advantage of the Intel® CPU's support for Thunderbolt™ connections that allow add-in cards as needed for data acceleration and wireless connectivity and to accommodate a wide range of customer needs.

The Advantech ARK-2251 delivers fast value in optical inspection applications

The ARK-2251 is a complete system designed to expedite solution deployment and time to value. Up to 64 GB of DDR5-4800 memory and Intel® processors designed with performance hybrid architecture[3] create a power-efficient solution that helps reduce resource requirements for compute-intensive AI, allowing for more platform consolidation at the industrial edge. The soldered-down processor package and fanless system chassis feature no moving parts, which helps improve system integrity in high-shock/high-vibration environments such as production lines. Intel® GbE ports with PoE make it easy for manufacturers to add in IP cameras for AI optical inspection with fewer connections.

Performance hybrid architecture[2] boosts power efficiency in tight spaces

13th Gen Intel Core mobile processors feature performance hybrid architecture, which combines multithread Performance-cores (P-cores) with single-thread Efficiency-cores (E-cores). Intel® Thread Director[4] intelligently designates primary workloads to P-cores and background tasks to E-cores to help optimize overall system performance. As a result, system builders will see improved performance, especially for advanced use cases such as AI computer vision at the edge.

Advantech solutions with 13th Gen Intel® Core™ mobile processors
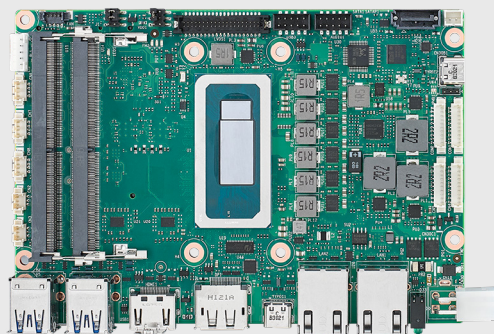
Advantech MIO-5377

- 13th Gen Intel Core mobile processor with up to 14 cores and 15W to 28W TDP
- Intel® Iris® X^e graphics with up to 96 graphics execution units (EUs)[3]
- Dual-channel DDR5-4800 memory
- USB4 Type-C connector
- 4x UART, 3x I2C, 2x CAN bus connectors (all 1 Mbps)
- Wi-Fi 6E ready and 5G ready
- IPC-A-610 assembly process

Advantech ARK-2251

- 13th Gen Intel Core mobile processor with up to 10 cores and 15W TDP
- Intel Iris X^e graphics with up to 96 graphics EUs[3]
- Dual-channel DDR5-4800 memory
- 3x Intel® GbE with Power over Ethernet (PoE), 6x USB 3.1, 6x RS-232/422/485, 2x HDMI, 2x CAN bus
- Optional I/O expansion with Advantech iDoor Modules
- -20°C to 60°C operating temperature, fanless design

Intel Iris X^e graphics[3] accelerates visual and AI processing

Excellent graphics performance at the edge is essential for automated robotics and optical inspection use cases. 13th Gen Intel Core mobile processors feature Intel Iris X^e graphics with up to 96 graphics execution units (EUs) for fast visual processing. The high number of graphics EUs also enables parallel processing for AI inference workloads. This processor platform also supports the Intel® Distribution of OpenVINO™ toolkit, further enhancing AI inference optimization on Intel-enabled solutions while helping reduce dependence on external accelerators.

The lineup of Intel® mobile processors offered on Advantech's solutions is designed specifically for exceptional graphics and AI performance in space-constrained edge deployments like AMRs and optical inspection appliances on the factory floor. These edge systems need to be capable of ingesting video data and running AI inferencing to support object recognition and to properly react to changes in the environment. The responsiveness offered by Intel Iris X^e graphics allows AMRs to interpret and navigate warehouses more safely and efficiently. For optical inspection, AI enabled by Intel can quickly identify manufacturing defects and route commands to production-line appliances and conveyor belts.

DDR5 memory and fast PCIe connections

Both the MIO-5377 and ARK-2251 take advantage of the 13th Gen Intel Core mobile processor's compatibility with DDR5-4800 memory with dual-channel support and large memory footprints. DDR5 enables more simultaneous applications to drive platform consolidation, especially for small-form-factor applications in robotics and industrial IoT. All product series in the 13th Gen Intel® Core™ mobile platform deliver up to PCIe 4.0 connectivity with additional PCIe 3.0 lanes through the paired Intel® chipset. These specifications help Intel-enabled Advantech solutions move data quickly, both in individual AMRs and in networked appliances on the factory floor.

Reliable supply chains with long-life availability[5]

Industrial solutions often rely on their equipment beyond standard life cycles, as new product introductions can be costly both in terms of technology investments and downtime as new systems are integrated. 13th Gen Intel Core mobile processors in Advantech solutions deliver long-life availability[5] on IoT SKUs. Long-life availability helps ensure a steady supply chain for Intel® processors for longer durations between system replacements or upgrades. This level of reliability is especially valuable for regulated industries that need to obtain certification for their equipment prior to full-scale deployment, which can take years to accomplish.

Advantech iDoor Modules expand interface possibilities for end customers

Available with the ARK-2251 solution, Advantech's innovative iDoor Modules plug into the motherboard's Mini PCIe interface and enable system builders and customers to choose more expansion alternatives. The iDoor portfolio includes dozens of options to expand fieldbus protocol, GbE, RS-232/422/485, and USB functions. M.2 interfaces on the board also enable the installation of wireless modules, including Wi-Fi, LTE, and 5G.

Conclusion: Easing barriers to entry for advanced robotics and optical inspection

As robotics is poised for dramatic market growth, the Intel-enabled Advantech ARK-2251 and Advantech MIO-5377 offer solution providers powerful new ways to meet this opportunity head-on. Both offerings with 13th Gen Intel Core mobile processors deliver the powerful performance, soldered-down durability, and accelerated AI to achieve success in AMR and optical inspection deployments. Intel and Advantech are simplifying the path to adopt these advanced, complex, and costly solutions, so businesses can achieve results fast.

Get started

Learn more about 13th Gen Intel Core mobile processors at intel.com/13thgencoremobile-iot.

Explore the possibilities of Advantech MIO-5377 SBCs.

Discover the value of the Advantech ARK-2251 solution.

About Advantech

Based in Taiwan and focused on enabling an intelligent planet, Advantech is a leading provider of embedded, industrial, and retail edge solutions worldwide.

advantech.com

1. "Global AGV and AMR Market to Grow at a CAGR of 43% Between 2022 and 2027," PR Newswire, March 2022, prnewswire.com/news-releases/global-agv-and-amr-market-to-grow-at-a-cagr-of-43-between-2022-and-2027-301503115.html.

2. Performance hybrid architecture combines two new core microarchitectures, Performance-cores (P-cores) and Efficient-cores (E-cores), on a single processor die. Select 13th Gen Intel® Core™ processors (certain 13th Gen Intel® Core™ i3 processors and lower) do not have performance hybrid architecture, only P-cores.

3. Available on select SKUs.

4. Built into the hardware, Intel® Thread Director is provided only in performance hybrid architecture configurations of 13th Gen Intel® Core™ processors. OS enablement is required. Available features and functionality vary by OS.

5. Intel does not commit or guarantee product availability or software support by way of road map guidance. Intel reserves the right to change road maps or discontinue products, software, and software support services through standard EOL/PDN processes. Contact your Intel account rep for additional information.