Solution Brief

AI Edge Compute
Single-Board Computers

AAEON and Intel Enable Powerful Vision and AI Inference Workloads for Space-Constrained Edge Deployments

AAEON's UP Squared Pro 7000 single-board computer Intel Atom® processors x7000E Series, Intel® Core™ i3 processors, and Intel® Processors N-Series enables OEMs, solution builders, and system integrators to quickly deploy vision and AI capabilities at the edge.

From chatbots that provide contextual responses for human operators to video analytics that bring machine intelligence to situational awareness, AI is having a profound impact on everyday processes. The technology that makes AI possible outside the data center relies on an ever-increasing performance envelope in smaller form factor devices, and the market is pouncing on the opportunity. The global edge AI market size will soar to a valuation of USD 107.5B by 2029 at a compound annual growth rate of 31.7 percent.[1]

"We chose the latest generation of Intel® processors because we know they are prepared to meet the complex and costly IoT and edge challenges that our OEM and solution builder customers face today and are flexible enough to handle their future needs."

—Owen Wei, UP e-commerce manager, AAEON

Challenge: Enabling the trifecta of performance, connectivity, and flexibility at the edge

Edge deployments for retail, healthcare, industrial automation, and robotics often face a variety of challenges that inhibit a business's ability to realize emerging and attractive use cases. These use cases include interactive self-checkout kiosks with voice recognition features, portable clinical devices with onboard AI-assisted imaging, automated in-office scanners with built-in AI for text recognition, or object recognition in robotics and automation. AI workloads typically require devices with more performance and a larger footprint, but many end user environments just don't have room to spare. OEMs and solution providers need to be able to meet customers' AI performance demands with room to add in functionality, such as MIPI cameras or audio devices, and package it all into an easy-to-deploy, space-saving edge device.

Solution: Deliver expandable high performance with UP Squared Pro 7000 and Intel® processors

The UP Squared Pro 7000 single-board computer is the latest third-generation offering in the UP Squared Pro series from AAEON and features new levels of expandability, flexibility, and performance in a compact, low-power form factor built for the edge. Powered by Intel Atom® processors x7000E Series, Intel® Core™ i3 processors, and Intel® Processors N-Series, the UP board is ideal for solution builders and OEMs looking to offer more-advanced and demanding compute, graphics, virtualization, and vision and AI capabilities in their solutions. "We chose the latest generation of Intel processors because we know they are prepared to meet the complex and costly IoT and edge challenges our OEM and solution builder customers face today," says Owen Wei, UP e-commerce manager from AAEON. "We were impressed by the new vision, AI, graphics, and real-time capabilities this processor series brings to really take embedded edge deployments to the next level."

The UP Squared Pro 7000 also uniquely offers expanded support for more connectivity and interfaces—including the MIPI-CSI interface—to give customers the ability to add more-advanced features or components based on their needs. To enable a complete solution, the AAEON UP team can provide a Linux- or Windows-compatible camera kit that's already validated with the UP Squared Pro platform, which customers can use to fast-track development with the help of AAEON-provided tutorials.

Key use cases for the UP Squared Pro 7000

Industrial automation

Autonomous mobile robots (AMRs)

Digital signage and interactive kiosks

Office automation

Healthcare

How it works

The UP Squared Pro 7000 is available as both a board and a compact edge system, giving OEMs and solution builders flexibility to create solutions that fit specific customer needs. To make application development and deployment even easier, the UP solution can also be bundled as an edge computing kit. The kit includes a power supply, power cord, and preinstalled and prevalidated software, such as Ubuntu 22.04, the Intel® Distribution of OpenVINO™ toolkit, and Intel® Media SDK. For businesses working in the robotics industry, the UP Squared Pro 7000 supports the Intel® Edge Insights for Autonomous Mobile Robots (Intel® EI for AMR) software package, which includes libraries and middleware to accelerate AMR application development and time to market.

Offer more capabilities at the edge with key Intel processor features and integrated technologies

The UP Squared Pro 7000 board features your choice of the Intel Atom® processors x7000E Series, Intel® Core™ i3 processors, and Intel® Processors N-Series to support some of the most demanding graphics, media processing, and deep learning inference use cases. Built with the same Efficient-core design and Intel® UHD Graphics as 12th Gen Intel® Core™ processors, these Intel processors feature up to eight single-thread Efficient-cores and offer up to 32 graphics execution units (EUs).

Create engaging, rich 4K visual applications without relying on a discrete graphics card

With the UP Squared Pro 7000 board, OEMs and solution builders can meet the needs of customers looking to create rich visual experiences for digital signage, portable medical imaging, small-footprint point-of-sale systems, or other embedded edge use cases with graphically demanding workloads. The solution supports up to three concurrent 4K60 SDR displays without a discrete graphics card—which is especially useful when working with space-constrained deployments at the edge. Alternatively, if customers need to deploy a larger visual experience, they can leverage Pipelock on the Windows OS to sync two displays for video wall applications.

Up to **1.30X** **faster single-thread performance[2]**

Up to **1.68X** **faster graphics performance[2]**

Up to **1.09X** **faster multithread performance[2]**

Up to **6.85X** **faster GPU object detection inference performance[2]**

Intel® Processor N200

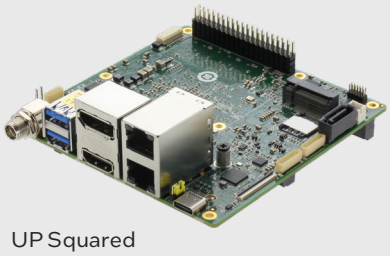
Measured performance gains compared to Intel® Pentium® N6415 processors

For workloads and configurations, visit intel.com/PerformanceIndex. Results may vary.

UP Squared Pro 7000 powered by Intel® processors

Solution Offering

UP Squared Pro 7000



UP Squared Pro 7000

UP Squared Pro 7000 with heat sink

UP Squared Pro 7000 ports

Key Specifications

Dimensions	101.6 mm × 101.6 mm
Intel processors	Intel® Core™ i3-N305 processor, Intel Atom® x7425E processor, Intel® Processor N97, Intel® Processor N50
Graphics	Intel® UHD Graphics
Power consumption	Low
System memory	Up to 16 GB dual-channel LPDDR5
Storage capacity	Up to 64 GB eMMC, 1x M.2 2280 M-key (PCIE x2, USB 2.0), 1x SATA3 port
Display	1x HDMI 2.0b, 1x DP 1.2, 1x DP 1.4a via USB Type-C
I/O	▪ 2x USB 2.0 via 10-pin wafer, 2x USB 3.2 Gen 2 Type-A, 1x USB 3.2 Gen 2 Type-C ▪ 1x audio jack ▪ 1x UART via 10-pin wafer ▪ Serial port 2x RS-232/422/485 via 10-pin header
I/O expandability	▪ 1x M.2 2230 E-key (CNVI, PCIe Gen 3 x1, USB 2.0) for Wi-Fi/Bluetooth ▪ 1x M.2 2280 M-key (PCIe Gen 3 x2, USB 2.0) for AI/storage ▪ 1x M.2 3052 B-key (USB 3.2 Gen 2 only) for 5G ▪ 40-pin HAT with various I/Os, including GPIO, SPI, I2C, I2S, ADC, PWM, and UART
Intel® TPM onboard	Version 2.0
Connectivity	Ethernet 2x 2.5GbE (Intel® i226-IT), Wi-Fi 5/6 optional via M.2 2230 E-key slot, Bluetooth optional via M.2 2230 E-key slot, LTE/4G/5G optional via M.2 3052 B-key slot

Deploy deep learning inference at the edge with accelerated AI

The UP Squared Pro 7000 board allows OEMs and solution builders to deliver deep learning inference to low-power edge devices with help from three integrated Intel® technologies: Intel® Deep Learning Boost (Intel® DL Boost), Intel® Gaussian and Neural Accelerator (Intel® GNA), and Intel UHD Graphics. Intel DL Boost accelerates inference processing on the CPU, while Intel GNA provides hardware-based acceleration for AI speech and audio applications, offloading these workloads from the CPU. The graphics EUs included with Intel UHD Graphics boost parallel processing for AI workloads, contributing to better performance overall.

The UP Squared Pro 7000 board also helps developers get their AI solutions to market faster with access to optimized, pretrained models that are part of the Intel Distribution of OpenVINO toolkit Open Model Zoo.

Support time-constrained or real-time applications

In areas like industrial automation, robotics, and healthcare, new solutions often require a precise coordination and synchronization both within and across networked devices to execute real-time workloads within defined, predictable time frames. The Intel processors powering the UP Squared Pro 7000 board are enhanced for IoT and feature Intel® Time Coordinated Computing (Intel® TCC)[3] and 2.5GbE Time-Sensitive Networking (TSN)–capable MAC to support real-time applications. Intel TCC and TSN enable OEMs and solution builders to offer new levels of predictability and reliability for critical systems with support for deterministic workloads and networking.

Drive more value from deployments with long-life availability[4] and support

AAEON and Intel help OEMs and solution builders drive additional value for their solutions by providing long-life availability and support on select Intel processors. Prolonged access to parts and replacements beyond standard five-year life cycles can help assure end customers that they will get more value out of their investments, with longer deployments in the field and longer intervals between upgrades.

Build and deploy MIPI camera–based applications faster and easier with the UP Squared Pro 7000 board

Designed with emerging machine vision and AI use cases in mind, the UP Squared Pro 7000 includes an integrated MIPI-CSI interface, MIPI driver, validated MIPI camera options, and a tutorial for developers. "We know how time-consuming and arduous camera-related development can be, especially if the camera isn't validated, which forces team members to start the entire process from scratch," says Fredy Hsu, UP product and project manager at AAEON. "We're excited to offer this new feature, knowing how much time and energy OEMs, solution builders, and end customers will be able to save by not having to research, test, and evaluate options." By integrating the MIPI interface with the board, AAEON is helping builders avoid the need to add additional drivers, boards, or cables.

Easy-to-access resources for continued project success

During any phase of a project—from development to deployment and ongoing operation to upgrading—builders, customers, or anyone else seeking help can connect directly with the AAEON team for support or access the UP community forum, wiki site, or downloads page.

Conclusion: Bring next-generation AI, vision, and real-time capabilities to edge environments

OEMs, solution builders, and customers can now deploy deep learning inference, 4K graphics, and real-time applications at the edge faster with the UP Squared Pro 7000 board, based on Intel processors. Powered by Intel, AAEON provides a flexible, expandable, and performant solution that enables OEMs and builder to quickly deliver advanced, exciting applications that meet their customers' exact needs.

Learn more

UP Squared Pro 7000

Learn more about the flexibility, expandability, and power efficiency AAEON's UP Squared Pro 7000 brings to embedded edge solutions at **up-board.org/up-squared-pro-7000**.

Intel Atom® processors x7000E Series, Intel® Core™ i3 processors, and Intel® Processors N-Series

Learn more about Intel processors built for AI, graphics, and real-time applications at the edge at **intel.com/atomx7000e-iot**.

About AAEON

AAEON Technology Inc. is a leading designer and manufacturer of advanced industrial and embedded computing platforms. Committed to innovative engineering, AAEON provides reliable and high-quality computing platforms, including industrial motherboards and systems, industrial displays, rugged tablets, embedded controllers, and network appliances and related accessories, as well as integrated solutions.

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Notices and disclaimers

1. "Edge AI Market Size, Share & COVID-19 Impact Analytics, By Component (Hardware, Network, Edge Cloud Infrastructure, Software, and Support Services), By Industry (Automotive, Manufacturing, Healthcare, Energy & Utility, Consumer Goods, IT & Telecom, and Others), and Regional Forecast, 2022-2029," Fortune Business Insights, December 2022, fortunebusinessinsights.com/edge-ai-market-107023
2. Performance varies by use, configuration, and other factors. Learn more at intel.com/PerformanceIndex.
3. Available on select SKUs.
4. 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.

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