

## Hitachi develops edge AI semiconductor as a core technology for physical AI to support HMAX Industry

Compatible with a wide range of industrial products, including manufacturing facilities, inspection systems, industrial robots, logistics equipment, buildings, and energy facilities

**Tokyo, April 24, 2026** - Hitachi, Ltd. (TSE:6501, “Hitachi”) and Hitachi High-Tech Corporation (“Hitachi High-Tech”) have developed an edge AI semiconductor\*<sup>1</sup> as a core technology to support HMAX Industry, a suite of next-generation solutions for the industrial sector. The semiconductor can be installed in a wide range of industrial products, including manufacturing facilities, inspection systems, industrial robots, logistics equipment, buildings, and energy facilities. Featuring high-speed processing and low power consumption, the semiconductor enables real-time analysis of diverse on-site data such as images, sounds, and vibrations directly within the equipment itself.

Evaluations using actual equipment data confirmed that the semiconductor can execute processes with more than 10 times higher power efficiency\*<sup>2</sup> than conventional approaches while operating stably within the low-power range available inside industrial equipment. These results demonstrate the feasibility of executing advanced inspection and monitoring processes, which previously required dedicated servers, directly within the equipment itself. The technology has now reached a stage at which users can implement it in a variety of on-site devices, including those in manufacturing environments where installation space and power consumption are major constraints.

Going forward, Hitachi and Hitachi High-Tech will use this edge AI semiconductor as a cross-domain execution base to support the on-site deployment of physical AI. By processing and utilizing equipment data directly at the source, the companies will expand digital services that contribute to quality stabilization, yield improvement, and productivity enhancement. Using an evaluation environment that combines the edge AI semiconductor with lightweight AI models and software, the companies will progressively advance implementation and operation tailored to customers’ equipment and production lines. As a core technology of HMAX Industry, centered on physical AI that incorporates the domain knowledge Hitachi has cultivated through its experience in industrial sectors, the technology’s scope will expand into a wide range of fields, including manufacturing, logistics, buildings, and energy.

\*1 Edge AI semiconductor: A semiconductor chip installed directly in network terminal equipment (edge devices) to execute AI inference within equipment.

\*2 Comparison of power efficiency for the developed lightweight edge AI model against state-of-the-art GPUs. GPU power efficiency was calculated based on catalog specifications.

### Background and issues

In industrial worksites such as manufacturing sites, logistics facilities, buildings, and energy facilities, there is demand for real-time analysis of equipment data to improve quality stability, productivity, and maintenance efficiency. However, conventional edge AI systems have faced bottlenecks related to power consumption, installation space, and processing loads when handling data from multiple sensors, making full-scale deployment difficult in some cases.

Hitachi previously developed edge AI technologies capable of analyzing diverse sensor data, including images, sounds, and vibrations, in real time with low power consumption.\*3 The company has now embodied these technologies in an edge AI semiconductor designed for operation within actual industrial products and will begin deployment at sites targeted by HMAX Industry.

\*3 [“Hitachi develops edge AI technologies that boost frontline application of Lumada 3.0” – R&D: October 14, 2025](#)

## Key features of the technology

### 1. Lightweight edge AI model that can be directly integrated into industrial products

Hitachi has developed a lightweight edge AI model designed for direct integration into industrial products. Equipment in factories and building facilities is subject to restrictions in power consumption and installation space, making it difficult to integrate AI that requires large computational resources. By combining a CNN\*4 capable of capturing subtle image differences with a transformer\*5 that understands overall trends, Hitachi achieved both the lightweight characteristics required for in-equipment implementation and the high inference accuracy demanded in industrial applications such as inspection and monitoring. The design is independent of specific hardware models, and use cases are being expanded through implementation and evaluation in inspection, measurement, and industrial equipment.

### 2. Application examples of processing time and computational load reduction in inspection and monitoring

In inspection and monitoring applications, large-volume imaging and complex analysis processing often become bottlenecks when high accuracy is necessary. Using measurement data from the semiconductor inspection and metrology field as a typical case, Hitachi verified the possibility of replacing conventional high-precision metrology processing, which previously required overlaying multiple images, with AI processing on a single image. This has the potential to reduce the number of imaging operations while maintaining the required accuracy level, contributing to faster in-line inspection and metrology\*6 as well as reduced equipment load. The same concept will also be progressively applied to inspection and monitoring equipment in other fields, including component-appearance inspection and equipment condition-monitoring devices.

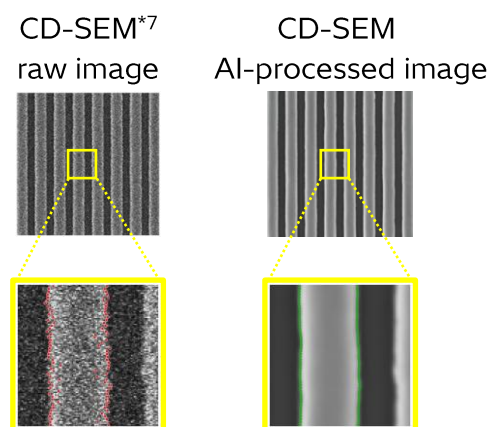


Figure 1. Processing results using the lightweight edge AI model

### 3. Verification of proprietary edge AI semiconductor enabling low-power AI processing inside equipment

Edge AI semiconductors achieve better power efficiency than general-purpose processors through the optimization of the arithmetic circuits and memory configurations for the AI models they execute. In this case, Hitachi evaluated a chip whose circuitry was designed specifically for the computation requirements of the lightweight edge AI model. The evaluation confirmed that the chip can execute processing with more than 10 times higher power efficiency than conventional approaches while still operating stably within the power range available inside industrial equipment. As a result, advanced AI processing that previously required dedicated servers can now be integrated into actual equipment, including manufacturing facilities, inspection equipment, robots, logistics equipment, buildings, and energy facilities, paving the way for the implementation phase.

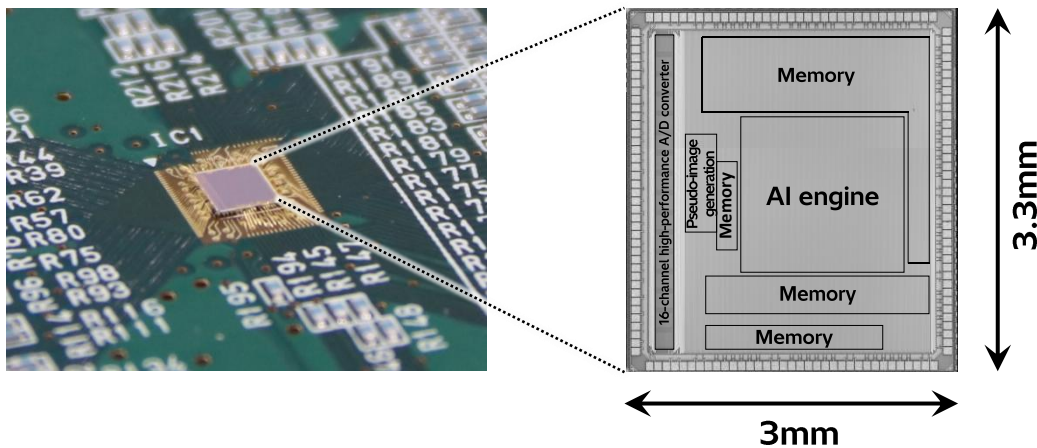


Figure 2. Edge AI semiconductor verified as effective

- \*4 CNN: Abbreviation for convolutional neural network. A deep learning model used for classification and detection by automatically extracting image features such as edges and patterns.
- \*5 Transformer: A deep learning model that captures key characteristics by focusing attention on important parts of input data. It is used not only in natural language processing but also in image analysis.
- \*6 In-line inspection and metrology: Inspection and measurement continuously performed within a manufacturing line without removing products from the line.
- \*7 CD-SEM (critical dimension-scanning electron microscope): A device specialized for measuring dimensions of fine patterns formed on semiconductor wafers, etc. Mainly used in the manufacturing lines of semiconductors and other electronic devices.

### Looking ahead

The newly developed edge AI semiconductor will be deployed across product groups targeted by HMAX Industry, including factories, logistics, buildings, and energy facilities, as a key component that enables high-speed, low-power processing at the frontline level. By advancing the “intelligence” of products so that they can make decisions directly where data is generated, Hitachi and Hitachi High-Tech will expand digital services supporting HMAX Industry, the suite of solutions embodying Lumada 3.0, from both the implementation and operational perspectives.

### Trademark notice

Company names and product names mentioned herein are trademarks or registered trademarks of their respective companies.

## About Hitachi, Ltd.

Through its Social Innovation Business (SIB) that brings together IT, OT(Operational Technology) and products, Hitachi contributes to a harmonized society where the environment, wellbeing, and economic growth are in balance. Hitachi operates globally in four sectors – Digital Systems & Services, Energy, Mobility, and Connective Industries – and the Strategic SIB Business Unit for new growth businesses. With Lumada at its core, Hitachi generates value from integrating data, technology and domain knowledge to solve customer and social challenges. Revenues for FY2024 (ended March 31, 2025) totaled 9,783.3 billion yen, with 618 consolidated subsidiaries and approximately 280,000 employees worldwide. Visit us at [www.hitachi.com](http://www.hitachi.com).

## Hitachi High-Tech

Hitachi High-Tech provides cutting-edge technologies, products and services to society and customers with its corporate vision of "Changing the World and Future with the Power of Knowledge" to contribute to a sustainable global environment, healthy, safe and secure lives, and the sustained development of science and industry. We manufacture and sell clinical analyzers, biotechnology products and radiation therapy systems in the healthcare field, semiconductor manufacturing and inspection equipment in the semiconductor field, as well as analytical systems and electron microscopes used in environmental fields and materials research. We are also engaged in a wide range of business areas globally, providing high added-value solutions in battery, communication infrastructure, railway inspection, digital and other industrial and social infrastructure fields. We provide solutions through a deeper understanding of the issues facing society and our customers to contribute to realizing a sustainable society. The company's consolidated revenues for FY2024 were approx. JPY 756.5 billion.

For further information, visit <https://www.hitachi-hightech.com/global/en/>

## Contacts

Hitachi, Ltd.  
Connective Industries Sector

Hitachi, Ltd.  
Research & Development Group

Hitachi High-Tech Corporation  
Nanotechnology Solutions Business  
Group

<https://www8.hitachi.co.jp/inquiry/hitachi-ltd/industry/en/general/form.jsp>

<https://www8.hitachi.co.jp/inquiry/hitachi-ltd/hqrd/news/en/form.jsp>

[https://www8.hitachi.co.jp/inquiry/hitachi-hightech/global/products/all/form\\_input.jsp](https://www8.hitachi.co.jp/inquiry/hitachi-hightech/global/products/all/form_input.jsp)