

Case Study

Automated Optical Inspection for Wafer Fabrication

Automated Optical Inspection changes the game for manufacturing

Automated optical inspection is a turning point for manufacturing; it has been widely utilized in various industries such as PCB and semiconductors. It improves the yield rate and efficiency tremendously to create more profits with the assistance of artificial intelligence algorithms to spot defects, becoming an essential part of smart manufacturing.

Challenges

The customer is a wafer foundry that was seeking a hardware and software integration service partner to deploy AOI to run inspection in the wafer production line. In addition to a high-performance computing platform, the customer demands a toolkit to facilitate the optimization of deep learning models to speed up and simplify the deployment on Intel platforms.

Main Requirements

- High-performance industrial platform
- GPU to accelerate visual computing
- High-resolution industrial camera for capturing images
- Software toolkit to train and run deep learning models for different inference tasks

The fanless smart edge computing system provides exceptional performance with flexible configurations

Axiomtek recommends the industrial system, the IPC950, to run the AOI. The embedded platform is based on the 11th generation Intel® Core™ processor (Tiger Lake) which features Intel® Iris® Xe graphics to deliver high performance in graphic processing and AI inference. With a PCIe x 4 slot, the performance can be enhanced by an accelerator card. The operating temperature range is from -20°C to +50°C. It provides a full-size PCIe Mini Card slot and one SIM card slot for Wi-Fi, Bluetooth as well as LTE modules, and an M.2 Key E 2230 socket for wireless connection. To gain extensive storage, it has one 2.5" HDD/SSD bay and one

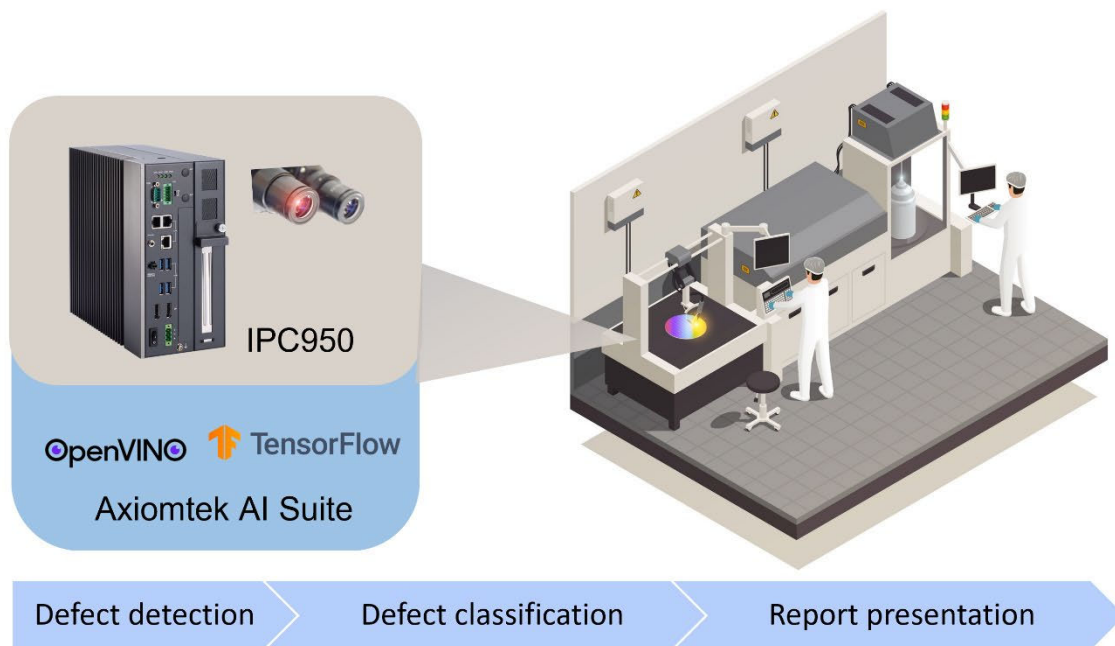


M.2 Key B+M 2280 socket. Also, it has two DDR4-3200 unbuffered SO-DIMM slots that can support up to 64GB of system memory. The front I/O includes four USB 3.1 type A ports, one 2.5G LAN and two GbE LAN ports, one RS-232/422/485 COM port, and a programmable 8 CH DIO. Users can expand the I/O via the flexible window with COM or LAN modules.

Application

Improving Defect Detection in Wafer Fabrication with AI at the Edge

The process of detecting defects with an AOI solution begins with training data. This consists of thousands of images, which serve as sources of deep learning. As a result, AI algorithms are constantly improving to detect each type of defect. One of the advantages of moving image processing, defect detection, and classification to the edge is that it reduces the data transmission and power consumption required for AOI. This approach also allows a single system to detect different types of defects in real-time, and with additional training, the built-in visual detection algorithms can be expanded to spot even more defects. Automating defect detection in the production line leads to faster inspections and a more consistent level of accuracy while eliminating human fatigue and errors resulting from subjective observation.



The Axiomtek AI Suite (AIS) is an application-ready package that is based on Tensorflow Framework, Intel® Edge Software Hub for Industrial, and the OpenVINO toolkit. AIS makes it much simpler for users to integrate advanced vision applications with sophisticated automation. By combining these advanced technologies, users can improve their defect detection capabilities, leading to higher levels of efficiency and accuracy in production.

System Configurations of the IPC950

- Intel® Core® i7 -1185G7E processor with Intel® Iris® Xe (code name: Tiger Lake)
- M.2 Key E 2230 slot for Wi-Fi/ LTE
- Supports TPM 2.0
- Supports Intel® iAMT
- Wide operating temperature from -20°C to +50°C

*For detailed specifications, please visit www.axiomtek.com or go to Products >Systems & Platforms > Industrial PC for > [Industrial System](#) for [IPC950](#)

Why Axiomtek

As an innovative leader in IPC, Axiomtek provides reliable, enduring and powerful platforms and solutions for a variety of applications to meet the needs of customers. What's more, the capability of hardware and software integration speeds up the time to market and maximizes customers' interest.

About Axiomtek Co., Ltd.

Axiomtek has experienced extraordinary growth in the past 30 years because of our people, our years of learning which resulted in our tremendous industry experience, and our desire to deliver well-rounded, easy-to-integrate solutions to our customers. These factors have influenced us to invest in a growing team of engineers including software, hardware, firmware, and application engineers. For the next few decades, our success will be determined by our ability to lead with unique technologies for AIoT and serve our key markets with innovatively-designed solution packages of hardware and software – coupled with unmatched engineering and value-added services that will help lessen the

challenges faced by our systems integrator, OEM and ODM customers and prospects alike. We will continue to enlist more technology partners and increase collaborations with our growing ecosystem who are leaders in their fields. With such alliances, we will create synergy and better deliver solutions, value, and the expertise our customers need.

Axiomtek is a Member of the Intel IoT® Solutions Alliance. A global ecosystem of more than 800 industry leaders, the Alliance offers its members unique access to Intel technology, expertise, and go-to-market support—accelerating the deployment of best-in-class solutions.