

From Compliance to Intelligence: Secure Edge Computing



Project Background

Cybersecurity and reliability are critically important in semiconductor manufacturing due to the industry's reliance on highly sensitive intellectual property, precision machinery, and stable yield rate. Semiconductor fabs operate with complex, interconnected systems that, if compromised, can lead to production halts, IP theft, or downtime. As chips power everything from consumer electronics to national defense systems, securing manufacturing environments against cyber threats is essential to protect economic stability, technological leadership, and national security. So several of Advantech existing customers in manufacturing lithography, CMP, fab defect inspection, or data center equipment come to ARK for more secure and reliable solution to enhance their data cybersecurity and operation stability.

Customer's Pain Points

Since navigating cybersecurity compliance (e.g., IEC 62443) is complex and requires alignment across diverse tools and vendors. Also with coming AI era, tasks like equipment fault detection, visual inspection, and process anomaly detection require low-latency AI inference at the edge. Accordingly, the semiconductor equipment manufacturers are forced to seek the need for powerful, compact, but also secured AI edge devices

Benefits

Leveraging Intel® latest ATOM® and Core™ Ultra processors and Advantech SQ support, the customer can finally achieve their target stability of the semiconductor equipment in constrained space. With Advantech's AI-enabled ARK-1251 used in wafer inspection, defect detection, and yield optimization, which are essential for maintaining quality and throughput in semiconductor production. To be complied with CRA, IEC 62443-4-2 pre-certified ARK-1125 could save up to 60% development time and 50% costs to our customers. Also with SQ memory and storage support, customer can be free of frequent storage maintenance and limited performance by memory.

Key Solution Highlights

- ARK with its decades reputation on reliability and stability in industrial applications.
- ARK-1125 ultra compact system which is well-integrated in semiconductor tooling module, and with advantages of IEC 62443-4-2 pre-certified, it could enhance semiconductor cybersecurity and reduce validation costs.
- ARK-1251 built-in NPU integrated Core Ultra 5/7, delivering power-efficient visual AI inferencing for semiconductor abnormal inspection. With flexible idoor modulization design, it could support additional CANBus to fit customer's demand.
- SQFlash SATA 650 sTLC NVMe provides up to 100k P/E cycle endurance. Required for 24hrs stress testing under High temperature based on 100% full loading criteria and validate Low temperature boot-up test with 1000 cycles. The operating temperature support is up to -40~85°C environment.



SQF-S8B 650 sTLC

ARK-1125

ARK-1251

Why Advantech

- Compact design for easy semiconductor integration
- IEC 62443-4-2 certification ensures robust cybersecurity
- Scalable I/O and AI acceleration extensions