



SEMICONDUCTOR MANUFACTURING EQUIPMENT OEM DE-RISKS SUPPLY CHAIN RISK WHILE UPGRADING THEIR NETWORK SPEED

Driven by technological advances in the Internet of things (IoT), artificial intelligence (AI), and 5G-enabled devices, demand for semiconductors has skyrocketed. In fact, in an April 2022 report, McKinsey Consultant Group estimated that the semiconductor industry is on track to reach \$1 trillion by 2030. These are very good times to be a semiconductor manufacturer or a maker of semiconductor manufacturing equipment (SME), to put it mildly.

However, SME OEMs face some real challenges too. Chief among them is the ongoing disruption to global supply chains triggered by the COVID-19 pandemic. Supply chain delays are difficult for any manufacturer, but for SME OEMs who frequently rely on thousands of suppliers to build a piece of equipment that costs millions of dollars, a delay can be paralyzing. To make matters worse, at the same time SME OEMs face supply chain delays they are also facing increased demand for semiconductor manufacturing equipment.

For one SME OEM, the confluence of these challenges made it necessary for the company to diversify its list of component suppliers. The OEM turned to TE Connectivity (TE) for signal and Ethernet cord sets, and also to help them pivot from 100Mbps to 1Gbps Ethernet technology.

**THE SEMICONDUCTOR
INDUSTRY IS ON
TRACK TO REACH
\$1 TRILLION
BY 2030**



SITUATION: A new supplier was needed with a global manufacturing footprint and reliable supply chain.

In early 2021, the strategic sourcing department at the SME OEM looked at their opportunities to reduce risk in their supply chain. Amid significant growth in the market and demand for their products, it was critical for the OEM not to let their customers down. One place that was ripe for de-risking? Suppliers of signal and Ethernet cord sets.

Semiconductor manufacturing equipment requires hundreds of these cord sets per machine, so the OEM needed a supplier who could not only produce a high volume of cord sets to meet their exact specifications, but who could also guarantee traceability to ensure that all components were easy to identify and evaluate. In addition, the OEM wanted to transition its 100Mbps network to 1Gbps Ethernet technology (more specifically EtherCAT) in order to take advantage of greater bandwidth and processing capabilities.

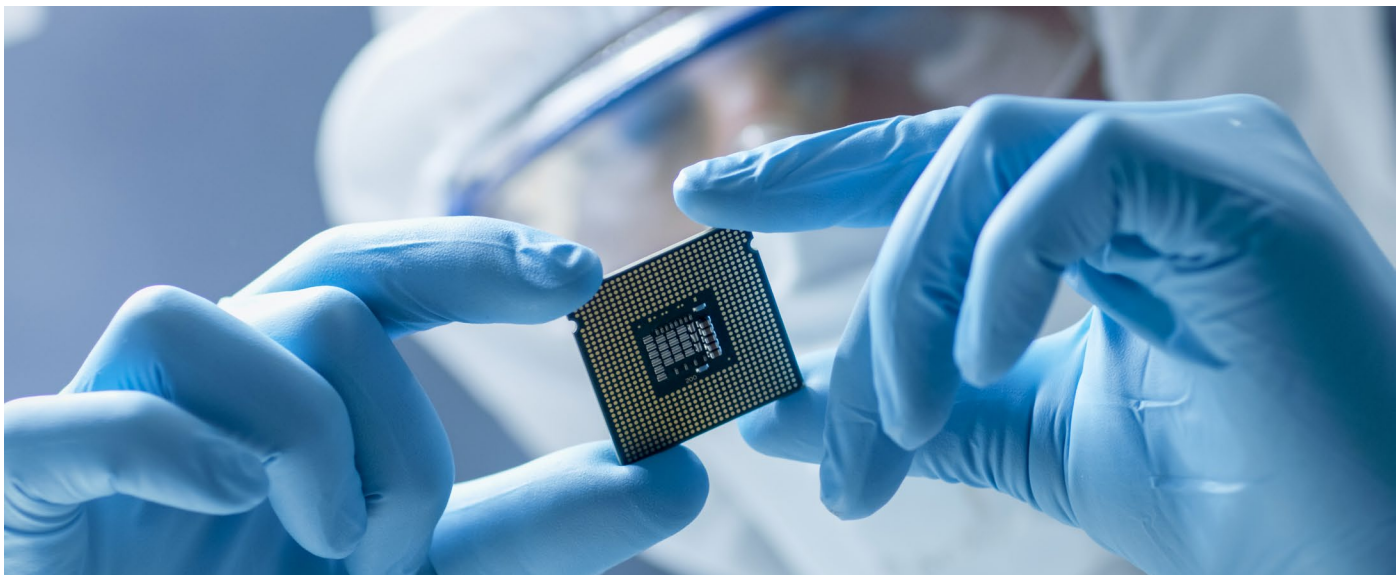
Fortunately, providing high-speed industrial Ethernet to customers with highly specialized requirements has long been a capability of TE. Plus, TE could help the OEM protect their supply chain thanks to TE's global manufacturing footprint and ability to quickly ramp up significant volume. While TE had worked with contractors who supported this OEM, the two companies had never worked directly together before. The time was right to give it a try.

CHALLENGE: Meet extremely specific and complex requirements for products and process.

Given the particulars of the semiconductor manufacturing industry, there are some make-or-break moments when it comes to identifying a good supplier. Because semiconductor chips are so precise, the components, parts, and machines that make them must be too. Any supplier must ensure 100% accuracy on everything they provide. The OEM in this case had several critical requirements for their new signal and Ethernet cord sets:

- **Build-to-print specification capability:** Due to the company's copy-exact requirements and need for high-variance/low-volume production, an off-the-shelf cord set solution was not an option. The OEM wanted to be able to control every component used on the cord set.
- **High-speed, high-quality, and long-term design:** Reliability and accuracy are vital in the semiconductor manufacturing process, especially when you are dealing with products that function at the atomic level. On top of that, the OEM also needed to ensure that the same speed, quality, and design would be engineered exactly as-is for the next 10 years.
- **Clear, consistent labeling and traceability:** Semiconductor manufacturing equipment can be in use for decades, and OEMs must be able to replace any component or part with an item exactly the same as the original throughout the machine's lifetime. To make that possible, component-makers like TE need to ensure not only that each part is exactly the same but also that each part is clearly labeled, identified, and tracked in a central system so the OEM can reference it at any time.

TE checked all the boxes. The engineers at TE worked on the specifications alongside the OEM's team, making sure to address the requirements for the cord set project as well as any concerns. As a new supplier to the OEM, it was important for TE to prove that the team could not only meet the objectives established, but also provide the consistent, stable manufacturing conditions that the OEM needed to de-risk its supply chain.



SOLUTION: High-speed Industrial Ethernet with build-to-print customization.

The first order of business for the TE team was to help the OEM transition its Ethernet network from 100Mbps to 1Gbps. Because reliability was just as important as higher speed and greater bandwidth, TE engineers outlined the following specifications for connectors, cables, and assemblies:

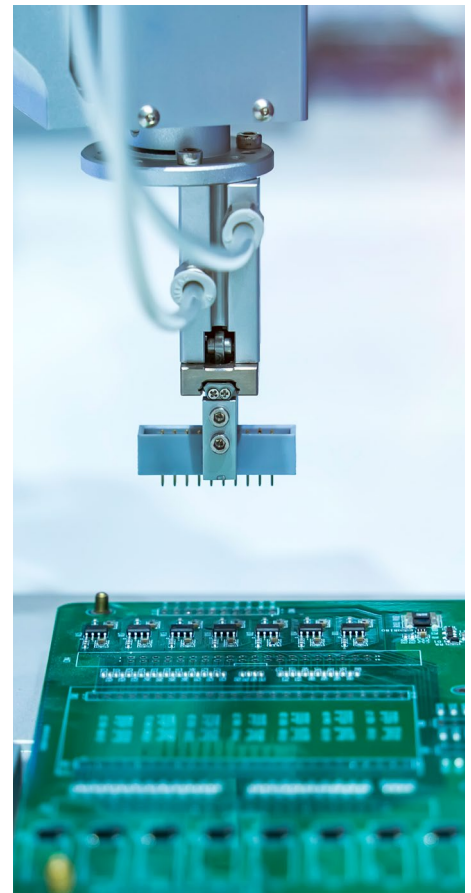
- **CAT6A compatibility for current and future Industrial Ethernet needs (500MHz max bandwidth, 10Gbps max. data rate, 100m distance)**
- **M12 X-coded connectors for high-speed Industrial Ethernet (10Gbps max. data rate) and rugged, sealed reliability**
- **Identification solutions that are high-quality and traceable over many years**

The OEM's engineers approved the specified components and parts, along with some M12 D-coded connectors and RJ45 connectors. While high-quality ingredients are critical to semiconductor manufacturing equipment, the skill and expertise of the professionals behind it are just as important. In order to meet the requirements for exceptional performance and reliability, TE engineers exceeded standard product design and testing procedures. The capable mix of TE's experienced local and global product and quality engineering teams enabled the OEM to increase to 1Gbps Ethernet speed with reliable connectivity.

To serve the OEM's needs, the TE team provided:

- Custom build-to-print manufacturing
- Market-leading expertise in designing high-performance connectors and cord sets
- Customized connectors and components to help optimize the cord set system for the OEM's specific needs
- Virtually complete control over all components and procedures, including labeling, testing, and packaging
- Cleanroom-ready packaging
- Long-term availability of all components in the assembly
- Extended traceability of all components and end-of-line tests, including raw data availability of each individual end-test over several years

For the SME OEM, the design support TE provided was key to the success of the project. They appreciated the discussions with TE engineers and how all parties worked together to find the best solutions for performance and quality. TE's broad product portfolio was also an asset. Specifically, the OEM valued TE's custom design of a miniature 90-degree connector that provided a tailored solution for a particularly challenging part of the equipment.



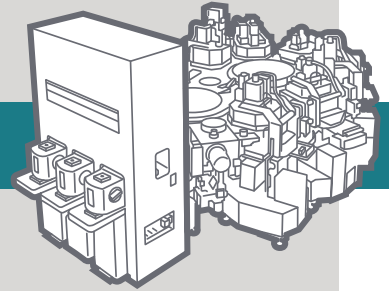
TE IS YOUR TRUSTED PARTNER IN SEMICONDUCTOR MANUFACTURING EQUIPMENT

Thanks to our local engineering expertise, global manufacturing capabilities, and stock of raw materials, we can provide the consistent, reliable supply of semiconductor manufacturing components that you need, with the quality assurance you require. In addition, TE provides tailored solutions for the unique demands of semiconductor machine wiring, control cabinets, controllers and devices, and vacuum chambers.

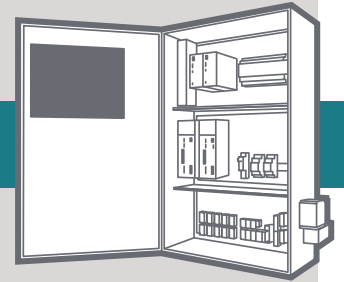
When you partner with TE, you can expect:

- Close collaboration with our engineering experts, leveraging our thousands of patents to create custom solutions
- A global network of authorized distributors to support you wherever you are located and help you select the right solutions
- Efficiency — we are the one-stop shop for your multiple connectivity needs
- Market-leading expertise in design to help ensure quality throughout the manufacturing process
- Product accuracy — we provide tailored build-to-print services to meet your copy-exact needs
- Support for your highly specialized low-volume orders
- Safer, more reliable high-performing solutions that are designed for cleanroom environments — leveled-up capabilities to provide cleaning and packaging of cord sets in a way that is cleanroom-ready
- A thorough cable identification system that provides reliable, battle-tested labels for long-term traceability
- Thorough inspection of every component and cable before it ships — we perform extensive end-of-line tests (including signal integrity testing) and can store raw data for every individual product electronically for a long time. In the unlikely event that a field error occurs, our data allows for complete traceability for all cord sets ever shipped.

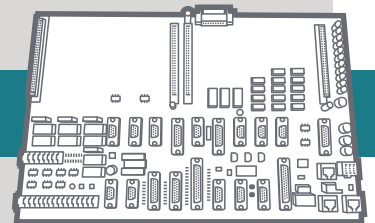
MACHINE WIRING



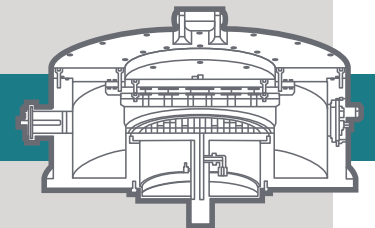
CONTROL CABINET



CONTROLLERS & DEVICES



VACUUM CHAMBER



CONCLUSION: The start of an ongoing relationship.

Semiconductor manufacturing equipment is expected — and engineered — to be in service for many years. And so are TE components. For this semiconductor equipment manufacturer, working with TE has helped reduce risk in its supply chain and upgrade its network speed and bandwidth at the same time. The OEM's team has come to value not only TE's specialized connectivity solutions and product consistency, quality, precision, and accuracy, but also TE's engineering know-how and assistance.

“We are proud to be able to support the complex needs of SME OEMs,” said Daniel Walldorf, strategy and business development manager at TE. “Supporting this OEM as they advanced their connectivity solution was especially rewarding. Our engineers enjoy working with customers who are so committed to driving performance and quality forward, and we appreciated this OEM's eye for details in particular.”

Happily for the manufacturer, in the process of working on the signal and Ethernet cord set and upgrading the Ethernet technology, TE engineers found additional ways to bring value to the project.

“While sharing our experience on how to design, validate, and test cord sets in the best possible way, we went on a journey to provide additional services to the OEM on cleaning, packaging, tracing, and data exchange,” Walldorf said. “These areas are critical for the semiconductor manufacturing equipment industry, so to be able to support the OEM's complex, highly technical needs enriched the entire experience.”

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— Daniel Walldorf, strategy and business development manager at TE

Interested in learning more about how TE's expertise can help address your semiconductor manufacturing equipment needs?

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