

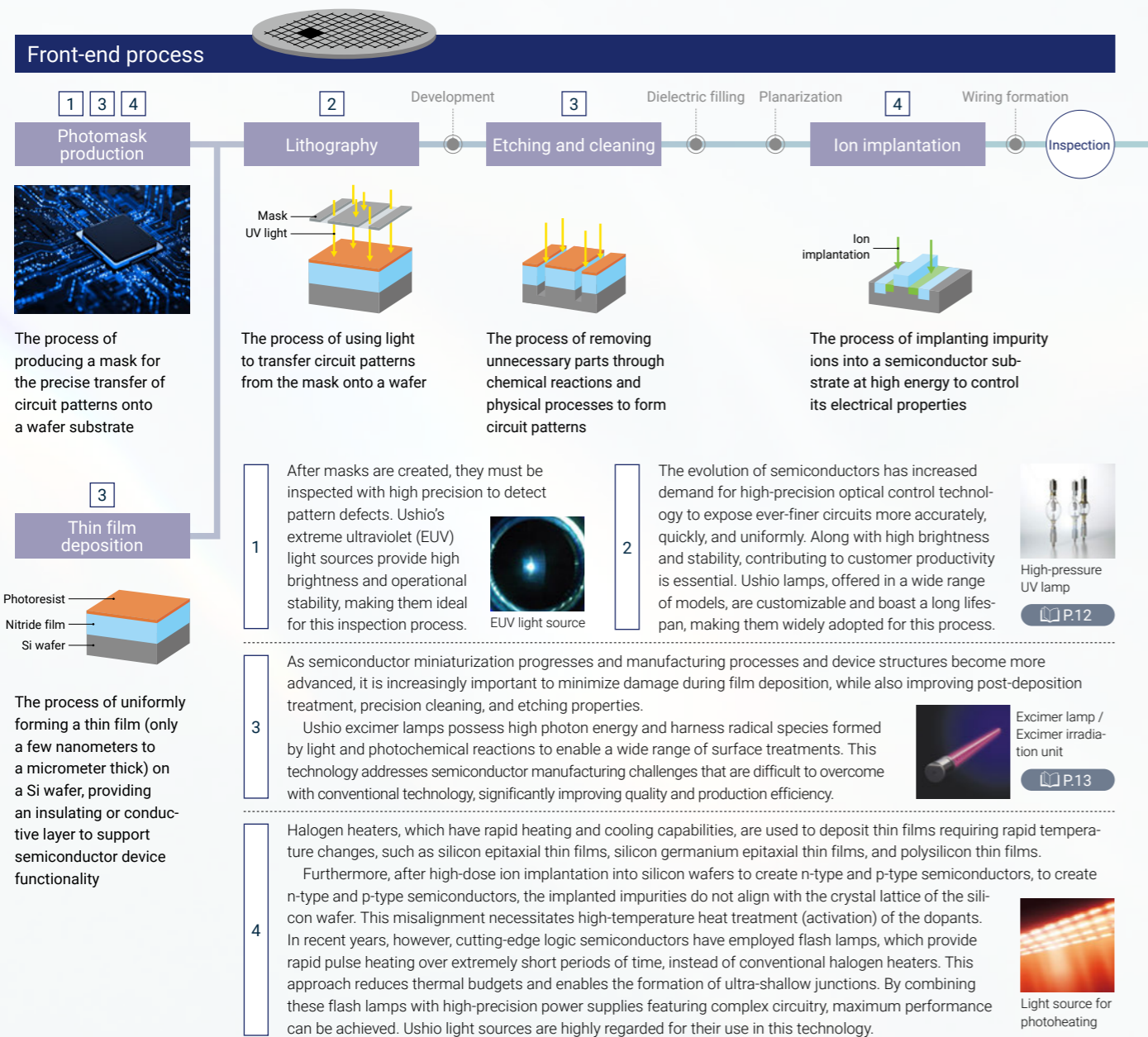
Positioning and Differentiation in the Semiconductor Market

–Lithography Equipment as a Growth Driver

► How Is the Rise of Generative AI Affecting Semiconductors?

The spread of generative AI is driving higher demand for advanced semiconductor features such as high-performance computing, low power consumption, high-speed memory, and high integration. Until now, the evolution of semiconductors has been primarily driven by front-end miniaturization technology in line with Moore's Law, which states that the number of transistors doubles approximately every two years to improve performance. However, as miniaturization approaches its physical and economic limits, further performance improvements have become increasingly difficult to achieve. This has shifted the focus toward advances in back-end processing to improve semiconductor performance, a trend accelerated by the rise of generative AI.

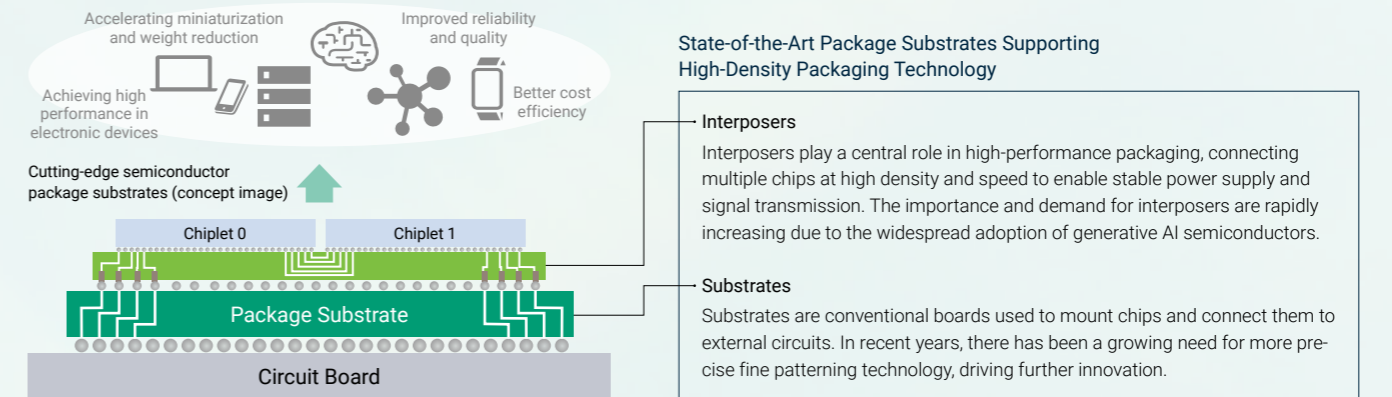
Semiconductor Manufacturing Process



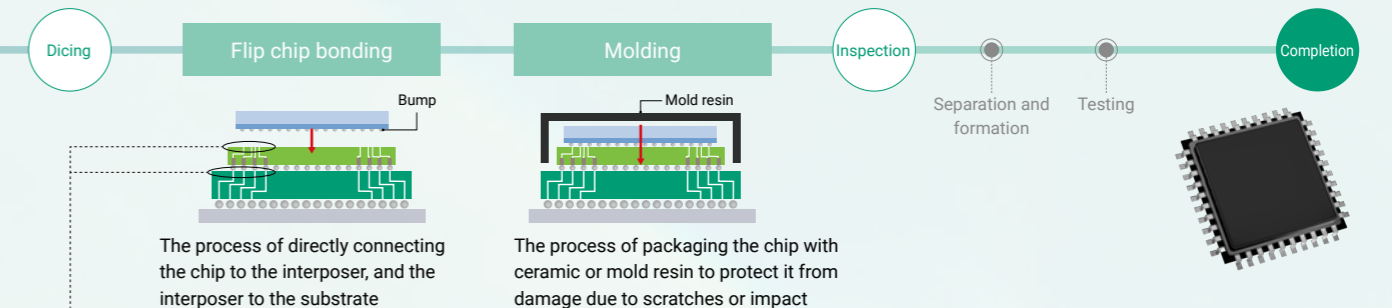
► How is innovation impacting back-end processing?

The importance of high-density packaging technology in back-end processing

Technological innovations in back-end processing are becoming increasingly important to meet the demands of improving semiconductor performance. Chiplet technology, which enables the high-density integration of multiple chips on a small substrate and high-density patterning on the substrate, are particularly essential for achieving high-speed, reliable device connections and improved performance. Furthermore, package substrates are becoming larger to accommodate more chips and complex functions. Ushio lithography equipment supports these larger substrates, contributing to the production of high-performance, high-quality semiconductor devices, including those with high-density patterning.



Back-end process (advanced packaging)



The Role of Ushio Lithography Equipment

- Advanced patterning and connection**
- Multi-layer integration through high-precision alignment**
- High productivity**

Ushio offers a wide range of lithography equipment compatible with high-density patterning technology. This equipment contributes to advancing substrate manufacturing in semiconductor back-end processing, which is enabled by its unmatched capability to accommodate complex and diverse patterning.

Lithography Equipment Lineup

- Digital lithography systems**: Lithography equipment equipped with advanced digital functionality for flexible, high-precision lithography of high-performance packages, including interposers. **2025 NEW**
- Steppers**: Lithography equipment that achieves high resolution and precision alignment, combining high productivity and reliability in the manufacture of advanced substrates that support high-performance IT equipment. **90% share**
- Direct imaging lithography equipment**: Lithography equipment providing flexible, high-precision maskless lithography for a wide range of substrate applications, including advanced package substrates. **50% share**

Please refer to [P.17](#) for digital lithography systems, and [P.16](#) for steppers.

Positioning and Differentiation in the Semiconductor Market

—Lithography Equipment as a Growth Driver

Accelerating growth in the advanced packaging market is one of the key business strategies within our New Growth Strategy. We are steadily advancing steppers (UX-5) and digital lithography equipment, core products of Ushio's advanced packaging business, as strategic priorities aimed at achieving our Guiding Principles for 2030.

► Competitive Edge and Future Direction of Our Lithography Equipment (UX-5)

The UX-5 was introduced in 1999. At that time, there was a growing need for denser, smaller printed circuit boards. However, standard lithography equipment, mainly using the contact lithography method, made it difficult to achieve the precise alignment required for fine pattern molds and shrinking circuit boards. Yield also decreased due to foreign matter transferring onto the mask through contact with the workpiece. To solve these issues, we leveraged the proprietary optical design technology we had developed since our founding to adopt a contactless step and repeat method using a projector lens. We were the first in the world to commercialize this technology in the form of the UX-5.

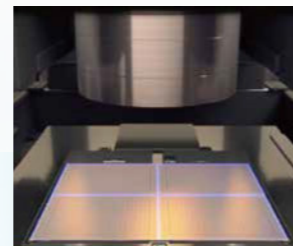
The UX-5 is lithography equipment capable of rapidly and accurately transferring fine circuit patterns, and is now widely used as mass production equipment to manufacture semiconductor packaging substrates. As demand for miniaturization of semiconductors accelerates, we have proactively achieved the three key performance elements in lithography equipment—resolution, overlay accuracy, and productivity

improvement—even before the market demand arises, while precisely addressing the unique packaging substrate needs, such as warping and particle control. This has earned us high trust and acclaim from many customers, enabling us to maintain a 90% share of the global market.

Currently, the increase in global data volumes and the resultant rise in power consumption driven by AI are creating a need for further evolution of semiconductor packages. With various packaging formats under consideration—for example, the growing demand for glass packaging substrates alongside conventional organic materials—Ushio will continue to meet these new demands and pursue development to support the evolution of our customers' semiconductor packages.



Stepper lithography equipment UX-5



The large irradiation area enables a high rate of productivity (standard panel size: 510 × 515mm)



Yoichi Nishio

Sales Section, Domestic Sales Department,
Photolithography GBU,
Photolithography Division

► Development of DLT System Business and Its Strategic Role in Advanced Packaging

With the accelerating demand for generative AI and high-performance computing, advanced packaging substrate technologies are increasingly required, and the importance of back-end semiconductor processes continues to grow. With these technological innovations, as performance improvements from front-end miniaturization no longer yield proportional gains like before, combining highly advanced back-end processes has become a major trend and a key solution to achieving the performance requirements of next-generation products.

Specifically, there is an active move to split functions (devices) that were previously integrated on silicon chips and instead combine numerous computing and peripheral devices on the package substrate to achieve a single function. As a result, substrate sizes are increasing, and the demand for finer wiring to connect these devices is rising. In response, the industry is accelerating the development of panel-level packaging (PLP) technologies to increase the number of units handled, along with multi-level fine wiring formation that significantly surpasses current substrate wiring design rules.

Against this backdrop, we are actively preparing for full-scale adoption of the DLT system, which is lithography equipment that is not limited by panel size and is capable of achieving resolutions below 1 μ m. Through close collaboration with Applied Materials, Inc. and the dedicated efforts of the manufacturing team at wholly owned subsidiary ADTEC Engineering Co., Ltd.*1's Nagaoka facility, the establishment of our production system for the DLT system is progressing ahead of the original schedule. Key milestones—including parts procurement, first-unit assembly, and customer system manufacturing—have been successfully achieved, laying a solid foundation for scaled production.

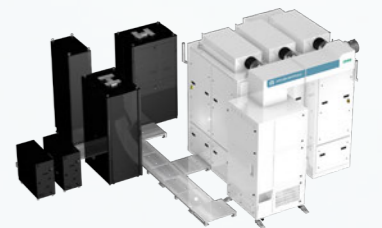
The DLT system has already attracted strong customer interest, with demonstration tests confirming its exceptional imaging quality. In head-to-head comparisons with conventional Laser Direct Imaging (LDI) technology, the DLT system has delivered performance results that were previously unattainable, earning highly positive evaluations from multiple industry leaders.

With that said, industry-wide deployment of advanced mass production processes—including large-panel formats, glass substrates, finer line-and-space (L/S) geometries, and tight overlay tolerances—remains cautious, impacting the immediate scale of market opportunities. In response, we remain agile and

customer-focused, actively adapting our technology roadmap and support capabilities to address evolving needs.

The DLT system is a maskless digital lithography platform that combines high resolution and throughput—capabilities historically limited to stepper-based systems—with the flexibility required for advanced packaging. It supports both wafer-level and panel-level packaging, enhancing chip yield and reducing back-end process costs. Notably, its Digital Dynamic Connection (DDC) function enables real-time correction of die misalignments caused by substrate warpage, directly supporting improved customer yield.

With its differentiated performance and value, the DLT system is positioned as a foundational enabler for next-generation semiconductor packaging. We remain fully committed to advancing this business through continued innovation and operational excellence, aligned with the needs of our customers and the expectations of our shareholders.



DLT System

*1 A wholly owned company in the Ushio Group



William F. Mackenzie

Group Managing Executive Officer,
General Manager, Photonics
Solutions Division,
General Manager, AUCC Division