

Global Semiconductor Back-End Equipment Market - Growth, Trends, Covid-19 Impact, and Forecasts (2023 - 2028)

Market Report | 2023-01-23 | 100 pages | Mordor Intelligence

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Report description:

The Backend Semiconductor Equipment Market is estimated to register a CAGR of 7.8% during the forecast period from 2022 to 2027.

Key Highlights

Semiconductor manufacturing comprises two processes, front-end, and back-end. The process that follows in semiconductor manufacturing once the circuit is defined on the wafer is known as back-end processing. The processes comprise several steps to ensure the semiconductor chips' functionality, reliability, performance, and durability. Each process requires a specific set of equipment for performing analysis and function at very minute levels. Hence, companies cater to the need for such equipment through their products and services provided to semiconductor foundries and manufacturing units.

Firstly, the wafer is inspected for any irregularities or defects through optical inspection and Electron-beam inspection methods to avoid reliability concerns later. This is followed by the wafer test and dicing, which tests the circuit's working and signal responses, then slicing the wafer into individual dices (each wafer piece is known as a die). The dicing could be carried out with mechanical sawing and laser cutting. These processes are carried out for the die pieces ranging in 35 mm to 0.1 mm thickness spectrum. Specialized equipment ensures cutting-edge precision in the process.

The die is bonded to a substrate for better handling in later stages, as an individual die is too delicate for the following process. The die bond is followed by the internal operation of a wire bond that bonds each die to corresponding conducting patches for conduction. It is known to be best done using gold wires and layers, with the metal's nobility contributing to the long life of the chip. Other metal alternatives like aluminum and silver are used too. The metal patches are then connected to the conducting legs or ports that appear out from an IC chip for further use.

The manufacturers are focusing on strengthening the semiconductor required for manufacturing the semiconductor manufacturing equipment (SME), including back-end equipment. Phenomena like SE Multiplier Effect are considered to estimate

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the productivity these SMEs add to the existing or new semiconductor manufacturing units. For instance, according to SME, a regular FPGA (Field Programmable Gate Array) requires 80 FPGAs to be manufactured. However, registering an SME multiplier of ~4,000x, the tester test around 3,20,000 FPGAs per year.

COVID-19 shifted the focus on consumer electronics, work from home, and virtual learning essentials like PCs, laptops, and other computing devices, away from automotive manufacturing, industrial robotics, and demands, moving the need for the type of semiconductors by the respective industries. According to the SIA, this surge in demand drove the market through 2020 and was estimated to strengthen in 2021. During the lockdowns, the shortage of skilled personnel and raw material transit for semiconductor processing delayed the supply chain. The post-pandemic world is still recovering from the global chip shortage in various industries.

Semiconductor Back-End Equipment Market Trends

High Demand Among OSAT to Drive The Market

The increasing global demand for semiconductors in almost all industries drives the need for expanding the semiconductor industries. Newer emerging brands depend on Original Design Manufacturers (ODMs) and Outsourced Semiconductor Assembly and Test (OSAT) service providers, utilizing their expertise and cutting-edge equipment facilities to handle product development and manufacturing demands. Companies like Foxconn and Taiwan Semiconductor Manufacturing Company (TSMC) provide these services.

The high set-up costs and constantly evolving technological trends hinder new brands from setting up their manufacturing units to avoid dependence on OSATs. On the contrary, OSATs specialize in keeping their manufacturing units with the latest front-end and back-end equipment for semiconductor and electronics devices. This specialization attracts companies to place orders for their products, outsourcing the manufacturing services.

According to Semiconductor Industry Association (SIA), the volume of semiconductor products will be produced by around 1425 facilities globally, including 125 future production lines/facilities. New foundries and manufacturing units' introduction and regular updating create considerable demand for back-end equipment and other SMEs. Companies and governments are mainly focusing on in-house production.

As governments worldwide seek to focus on the in-house production of semiconductors to counter the dependence on foreign vendors, they are inviting direct investment programs from prominent manufacturers, offering favorable regulations. For instance, in February 2022, India announced investments worth USD 20 Billion from companies such as Vedanta with Foxconn, ISMC, and Singapore-based IGSS venture. These companies aim to set up semiconductor manufacturing units and display fabs in the country. The global chip shortage creates room for more foundries, making room for back-end equipment.

Asia Pacific to Display the Fastest Growth

Asia-Pacific is home to one of the biggest semiconductor manufacturers in the world. According to SIA, 75% of the global semiconductor manufacturing capacity is located in East Asia, comprising Taiwan, China, South Korea, and Japan. Due to the ongoing international chip shortage, various other countries in the Asia Pacific plan to set up new foundry units and attract demand for back-end equipment. According to SIA, Southeast countries like Malaysia, the Philippines, Singapore, and Vietnam are emerging with new manufacturing units.

Taiwan is emerging as a dominant player in semiconductor manufacturing, generating maximum demand for SMEs, including back-end equipment. According to SIA, Taiwan (92%) and South Korea (8%) account for 100% of the most advanced (below 10nm thickness) global semiconductor manufacturing capacity. Through favorable regulations, the Taiwanese government supports

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local majors like Taiwan Semiconductor Manufacturing Company (TSMC) and others. The country is investing in foreign partners to expand its capacity. For instance, in January 2022, Taiwan announced investing USD 200 million in Lithuania to support strategically important industries, including semiconductor, laser, and biotech, in both countries.

The fab equipment spending in the Asia Pacific countries is expected to increase in 2022. According to SIA, countries like Taiwan, Korea, and China are expected to report an investment of about USD 78.5 Billion, accounting for staggering growth in the semiconductor sector. These countries are hubs for handling global demands in various industries, keeping the latest technologies and their evolution focused.

The restriction of international movement during the COVID-19 pandemic increased the lead time from days to even months and years for specific end-users. The semiconductor industry was entitled "essential" for their operations to continue running. Such supportive measures from the government are helping the industry recover and yield as it grows with the demand, fairing against the high demands among OSATs.

Semiconductor Back-End Equipment Market Competitor Analysis

The semiconductor back-end equipment market is highly competitive. Various service providers are creating regular demands for back-end equipment to cope with the ever-increasing demand for semiconductors. This influx of demand and orders is best handled with the expertise of well-established brands due to extensively high setup and R&D costs. However, support from government regulations and partnerships among companies to boost production is standard in the industry.

August 2021 - Applied materials enabled panel-sized substrates to facilitate the chipmakers' increasing demand for packing in more components leveraging the 2.5D and 3D package designs. The company benefits from its recent acquisition of Tango Systems to facilitate Panel-size substrates that measure 500mm x 500mm or larger. These panels can accommodate a more significant number of packages compared to wafer-size formats. A larger panel size translates into cost-benefits, better power, performance, and area. As its customers adopt these larger panel sizes, the company provides access to large-area materials engineering technologies, including deposition, SEM review, eBeam testing, metrology, and focused ion beam for defect analysis to its customer from its Display Group.

July 2021 - KLA Corporation introduced new series of chip testing solutions for automotive chip manufacturing processes. The company debuted with the new 8935 high productivity patterned wafer inspection system, the Surfscan SP A2/A3 unpatterned wafer inspection systems, the C205 broadband plasma patterned wafer inspection system, and I-PAT inline defect part average testing screening solution. These solutions add the required precision, robustness, and reliability to the increasingly electrifying automotive industry.

Additional Benefits:

The market estimate (ME) sheet in Excel format
3 months of analyst support

Table of Contents:

1 INTRODUCTION

- 1.1 Study Deliverables
- 1.2 Study Assumptions
- 1.3 Scope of the Study

2 RESEARCH METHODOLOGY

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3 EXECUTIVE SUMMARY

4 MARKET DYNAMICS

4.1 Market Overview

4.2 Market Drivers

4.2.1 Increasing Demand for Semiconductors in Electric and Hybrid Vehicles

4.2.2 Demand for Setting Up New Foundries (International Chip Shortage)

4.3 Market Restraints

4.3.1 High Setup Costs

4.3.2 Constant Evolution of Products Influencing Demand

4.4 Value Chain / Supply Chain Analysis

4.5 Industry Attractiveness - Porter's Five Forces Analysis

4.5.1 Threat of New Entrants

4.5.2 Bargaining Power of Buyers/Consumers

4.5.3 Bargaining Power of Suppliers

4.5.4 Threat of Substitute Products

4.5.5 Intensity of Competitive Rivalry

5 MARKET SEGMENTATION

5.1 Segmentation - By Type

5.1.1 Wafer Testing

5.1.2 Dicing

5.1.3 Bonding

5.1.4 Metrology

5.1.5 Assembly and Packaging

5.2 Segmentation - By Geography

5.2.1 North America

5.2.2 Europe

5.2.3 Asia-Pacific

5.2.3.1 China

5.2.3.2 Taiwan

5.2.3.3 South Korea

5.2.3.4 Japan

5.2.3.5 Rest of Asia-Pacific

6 COMPETITIVE LANDSCAPE

6.1 Company Profiles

6.1.1 ASML Holding

6.1.2 Applied Materials

6.1.3 Lam Research

6.1.4 Tokyo Electron Limited

6.1.5 KLA Corporation

6.1.6 Advantest Corporation

6.1.7 Onto Innovation Inc.

6.1.8 SCREEN Holdings Co. Ltd

6.1.9 Teradyne Inc

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6.1.10 Toshiba Corporation

7 MARKET OPPORTUNITIES AND FUTURE TRENDS

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