

Semiconductor Packaging - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts 2019 - 2029

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Report description:

The Semiconductor Packaging Market size is estimated at USD 47.22 billion in 2024, and is expected to reach USD 79.37 billion by 2029, growing at a CAGR of 10.95% during the forecast period (2024-2029).

Advanced packaging can help achieve performance gains by integrating multiple chips in a package. By connecting these chips using fatter, such as through-silicon vias, interposers, bridges, or simple wires, the speed of signals can be increased, and the amount of energy required to drive those signals can be reduced. Additionally, advanced packaging allows for mixing components developed at different process nodes.

Key Highlights

- The advanced packaging (AP) industry is currently going through a fascinating phase of significant progress. As Moore's Law slows down and the advancement of devices under 2nm nodes gains significant research and development investments from industry leaders such as TSMC, Intel, and Samsung, advanced packaging has become a valuable tool for enhancing product value.
- The development of electronic hardware necessitates the utilization of computing power that is capable of delivering high performance, high speed, and high bandwidth, as well as low latency and power consumption. Additionally, the hardware must be able to provide a wide range of functionalities, as well as be able to integrate at the system level, and must be cost-effective. Advance packaging technologies are ideally suited to meet these diverse performance demands and the intricate heterogeneous integration requirements, thus providing businesses with the opportunity to capitalize on the changing demands of high-performance computing, artificial intelligence, and 5G.
- Major semiconductor packaging vendors are experiencing significant growth in sales owing to increasing demand for high-performance computing, IoT, and 5G devices. For instance, Amkor's computing segment, which includes data center, infrastructure, PC/laptop, and storage, registered a 20% share in the total revenue, up from 18% in Q2 2022. The shift toward

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vehicle electrification is being accelerated by the implementation of policies by governments around the world to reduce emissions and encourage sustainable transportation.

-A significantly high initial investment is required in the designing, developing, and setting up of semiconductor packaging units as per the requirements of different industries such as automotive, consumer electronics, healthcare, IT & telecommunication, and aerospace and defense. This can restrict the growth of the semiconductor packaging market.

-The COVID-19 pandemic forced manufacturing industries to re-evaluate their traditional production processes, primarily driving digital transformation and smart manufacturing practices across the production lines. According to the Semiconductor Industry Association, in 2023, semiconductor sales were expected to reach USD 515.1 billion worldwide. Semiconductors are crucial components of electronic devices, and the industry is highly competitive. The year-on-year decline rate in 2023 was 10.3%, although a swift recovery is expected in 2024. Notable semiconductor chip makers include Intel and Samsung Electronics, with Intel generating USD 58.4 billion and Samsung generating USD 65.6 billion in semiconductor revenue in 2022, placing them among the largest companies in terms of semiconductor industry revenues.

Semiconductor Packaging Market Trends

Ultra High-density Fan-Out Advanced Packaging Segment to Hold Significant Market Share

- The ultra-high-density fan-out (UHD FO) has more than 18 inputs and outputs (I/O) per square millimeter and line and spacing (L/S) measurements in the redistribution layer (RDL) of 5µm and 5µm. It can be considered an upgraded version of High Density (HD) FO where the L/S suits a more extensive package size for HPC applications like networking and data center servers.
- These UHD FO are beneficial for low/mid-end 2.5D applications with cost-effective solutions such as HPC or server networks compared to 2.5D silicon Through Silicon Via (TSV) interposer packaging. The ultra-high-density fan-out packaging offers dense interconnection, better electrical performance, and the ability to integrate multiple heterogeneous dies in a cost-effective, low-profile semiconductor package. UHD FO will replace Si Interposers in the future through innovative FO-on-substrate and FO-embedded bridge solutions.
- With the development of the internet and the rise of the artificial intelligence industry, high-performance semiconductor integrated circuits have become critical in the semiconductor industry. The 2.5D IC package with ultra-high-density I/O is one of the first structures applied to high-performance computing (HPC) like GPU.
- Ultra-high-density FOWLP enables manufacturers to make smaller two-dimensional connections that redistribute the output of the silicon die to a greater area, enabling higher I/O density, higher bandwidth, and higher performance for modern devices.
- A semiconductor IC quality is a fundamental component contributing to the success of mission-critical, low-latency 5G services such as autonomous driving and security monitoring. According to GSMA, 5G is forecasted to increase from a global market penetration of 13 percent in 2022 to 64 percent in 2030. The increasing number of 5G applications across countries like the United States, China, India, the United Kingdom, Canada, etc., is expected to significantly increase the number of mobile subscribers that use 5G connectivity. This is expected to increase the demand for ultra-high-density fan-out packaging for ICs.

Asia-Pacific Expected to Witness Major Growth

- China has a highly ambitious semiconductor agenda, supported by a substantial funding of USD 150 billion. The nation is developing its domestic IC industry to increase its chip production. The Greater China region, comprising Hong Kong, China, and Taiwan, is a significant geopolitical hotspot. The ongoing US-China trade war has further intensified tensions in this area, which houses all the leading process technology, prompting several Chinese firms to invest in their semiconductor industry.
- For instance, in September 2023, China announced its plans to launch a new state-backed investment fund to raise about USD

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40 billion for its semiconductor sector. In December 2022, China announced its commitment to a support package exceeding YUAN 1 trillion (USD 143 billion) for its semiconductor industry. This initiative is a crucial step towards achieving self-sufficiency in chip production and is a response to U.S. actions aimed at hindering China's technological progress. The demand for packaging services is anticipated to rise considerably over the forecasted period, owing to the country's intensified efforts to enhance domestic chip manufacturing.

- Japan also holds a significant position in the semiconductor and electronics industries as it is home to some of the essential integrated circuits chipset manufacturers. According to WSTS, the semiconductor industry revenue in Japan grew by 14.2% in 2022, and it is expected to grow further over the coming years. The nation's packaging demand is expanding primarily due to the country's significant advancements in the semiconductor and integrated chip businesses. Japan is quickly reviving its chip manufacturing base to ensure that its automakers and IT firms do not run out of essential components by providing significant funding and financial support to major players active in the market.

- For instance, in February 2023, Taiwan Semiconductor Manufacturing Co (TSMC) announced a plan to build a USD 7 billion chip plant on Kyushu island, with 12 and 16-nanometre chips slated to begin in 2024. To support this investment, the Japanese government has offered a JPY 476 billion subsidy, or about half the expected cost of the factory. Further, Rapidus announced entering a tie-up with IBM for developing and producing cutting-edge 2nm chips, aiming to launch a prototype line in 2025.

- Taiwan's semiconductor industry depends on companies outsourcing semiconductor assembly and testing (OSAT). ASE Technology Holding is the industry leader with its efforts in traditional and sophisticated packaging and advanced testing. Taiwan has made significant strides in the chip packaging and fabless segments of the semiconductor value chain, in addition to its foundry services. According to the latest quarterly World Fab Forecast by SEMI, published in June 2022, Taiwan is expected to lead the world in semiconductor manufacturing equipment expenditure in 2022, with a 52% increase to USD 34 billion. These impressive capabilities are expected to drive demand for packaging services, prompting vendors to enhance their offerings.

Semiconductor Packaging Industry Overview

The Semiconductor Packaging Market is semi-consolidated with the presence of major players like ASE Technology Holding Co., Ltd, Amkor Technology Inc., Intel Corporation, Taiwan, Semiconductor Manufacturing Company Limited, and JCET Group Co. Ltd. Players in the market are adopting strategies such as partnerships and acquisitions to enhance their product offerings and gain sustainable competitive advantage.

- October 2023 - ASE Technology Holding Co., Ltd announced to launch of its Integrated Design Ecosystem to enable silicon package design efficiencies that reduce cycle time by half. Integrated Design Ecosystem (IDE) is a collaborative design toolset optimized to boost advanced package architecture across its VIPack™ platform systematically.

- August 2023 - Amkor Technology Inc. announced the expansion of its advanced packaging production capacity. Monthly production of 2.5D packaging is expected to increase from 3,000 wafers in early 2023 and reach 5,000 wafers in the first half of 2024.

Additional Benefits:

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

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