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Panel Level Packaging - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2024 - 2029)

https://marketpublishers.com/r/P9A98B863CC8EN.html
Date: July 2024
Pages: 112
Price: US$ 4,750.00 (Single User License)
ID: P9A98B863CC8EN

Abstracts

The Panel Level Packaging Market size is estimated at USD 0.25 billion in 2024, and is expected to reach USD 1.38 billion by 2029, growing at a CAGR of 41.07% during the forecast period (2024-2029).

The semiconductor industry is witnessing rapid growth, with semiconductors emerging as the basic building blocks of all modern technology. The advancements and innovations in this field directly impact all downstream technologies and drive the need for the market studied.

Key Highlights

With the importance of the semiconductor industry growing, the demand for enhanced packaging solutions is also increasing, leading to the development of new semiconductor packaging techniques.

Panel-level packaging (PLP) is a technology that has gained prominence recently. PLP refers to semiconductor packaging processed on a panel size. In panel-level packaging, the assembly process includes the fabrication of die attach, redistribution lines, molding, and bumping at the panel level.

As more packages may be processed in panel and parallel formats, this type of packaging facilitates a much better area utilization (ratio between panel/wafer size and package size) compared to round wafer shapes. Hence, a lower packaging cost is among the primary drivers for the market's growth. PLP has a lower environmental impact due to a lower waste generation and carbon footprint.

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The panel-level packaging (PLP) market also encounters certain challenges. The substantial expenses linked to the technology and the intricate nature of its implementation might impede its extensive acceptance. The packaging process involves both types, mold first and RDL first. However, the type of packaging involves problems in die shift. Shifting the die is considered one of the biggest issues as it may cause lesser yield or negatively influence the yields. This increases the need for more control over the packaging process and adds complexity, restraining the market's growth.

In the post-COVID-19 period, the focus on panel-level packaging is anticipated to increase due to the cost benefits and the expansion of the packaging size from wafers to larger panel formats. Increasing the number of packages manufactured in parallel is another major advantage supporting the market's growth. PLP may adopt processes, materials, and equipment from other technology areas. Printed circuit boards (PCB), liquid crystal displays (LCD), or solar equipment are manufactured on panel sizes and offer new approaches for fan-out panel-level packaging.

Panel Level Packaging Market Trends

Consumer Electronics Segment to Hold Major Market Share

Consumer electronics such as smartphones, wearables, and tablets are becoming increasingly thin and compact. To meet the needs of miniaturization and light form factors, PLP allows manufacturers to achieve greater component density and more efficient use of space. For these devices, the reduced footprint caused by PLP is essential as it will enable sleek designs and maximize their utilization of available space.

The consumer electronics industry competes with manufacturers who strive to differentiate products. By enabling sleek designs, increased functionality, and improved performance for consumer electronics devices, PLP provides an advantage to the market. To maintain their position in the market, manufacturers take advantage of PLP to meet consumer demands and introduce innovative products.

The increasing penetration of 5G and IoT in recent years presents significant growth opportunities for the market. For instance, as per 5G Americas, the 5G subscriptions worldwide are estimated to reach 2.8 billion in 2024 and 5.9 billion by 2027.

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With the rising investments in 5G, the demand for 5G-enabled smartphones is also increasing parallelly. According to a report from Cybermedia Research, by the end of 2023, after recording a 13 times increase in 5G smartphone sales since its first introduction in 2020, shipments of 5G smartphones increased by 70% yearly. From only 4% in 2020, 5G smartphones were projected to capture a possible 45% market share in 2023.

Similarly, owing to the rising adoption of the Internet of Things (IoT), the technology that enables communications between things and people using the Internet and IP-enabled protocols, the number of connected devices has been increasing rapidly in recent years. For instance, as per Cisco, there would be 29.3 billion networked devices in 2023. The massive expansion in IoT use cases will provide a significant impetus to market growth.

China is Expected to Lead the Market

China is the largest semiconductor consumer, primarily due to the size of the domestic electronics market. The country is the world's largest producer and exporter of consumer electronics, as a significantly more significant number of global vendors have established their facilities to leverage the benefits of cheap labor costs.

The electronics manufacturing industry has also recently continued to maintain steady expansion. As per a report by the Ministry of Industry and Information Technology via China Daily, in 2023, the industrial added value of major companies in the electronic information manufacturing sector grew by 3.4% yearly. According to the ministry, among significant products, the output of mobile phones increased by 6.9% Y-o-Y to 1.57 billion units, within which the number of smartphones increased by 1.9% Y-o-Y to 1.14 billion units. Several initiatives have been taken in recent years to boost the electronics industry's growth.

China also leads in 5G adoption globally. According to the Ministry of Industry and Information Technology (MIIT), China aims to have 592.01 million 5G users as of February 2023. This number is anticipated to surpass 1 billion mark by 2025. A combined effort is being made to develop the supporting infrastructure to expand the footprint of 5G across the country.

For instance, as of October 2023, China had about 3.22 million 5G base stations, constituting 28.1% of its entire mobile base station.

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The growing implementation of 5G in the country has also increased the uptake of 5G-enabled devices. For instance, according to the China Academy of Information and Communications Technology (CAICT), in 2023, 5G smartphone shipments in the country grew by about 11.9% Y-o-Y to 240 million units, while the overall smartphone shipments market grew by about 1.1%, compared to the previous year. As advanced packaging technologies may help resolve many of the 5G chip performance requirements, such trends are anticipated to favor the studied market's growth in the country.

China is also a leading automotive market in production and consumption, which is anticipated to favor the market's growth in the country. The rising demand for cleaner and safer vehicles is among the major trends in the country's automotive industry, which supports the studied market's growth. Industry megatrends, including autonomous vehicles, electrification, enriched cabins, connectivity and software definition, and zonal architecture, also support the market's growth in the automotive segment.

Panel Level Packaging Industry Overview

The panel level packaging market is semi-consolidated with the presence of major players like Samsung Electronics Co. Ltd, Intel Corporation, Nepes Corporation, ASE Group, and Powertech Technology Inc. Players in the market are adopting strategies such as partnerships and acquisitions to enhance their product offerings and gain sustainable competitive advantage.

December 2023 - NEPES developed 'METIS,' an intelligent semiconductor for edge computing. Metis applied cx-BGA (Ball Grid Array) of nePACTM, Nepes' cutting-edge 2.5D & 3D package platform. nePACTM is a next-generation cutting-edge package technology that implements multi-layer and fine RDL wiring based on fan-out technology and flip-chip bonding technology. It is suitable for highly integrated, high-performance chips such as artificial intelligence semiconductors.

June 2023 - USI, a subsidiary of ASE Technology Holding Co. Ltd, inaugurated another factory in Poland. This move reflects the growing need for the company's products from European customers. By expanding, USI may make more goods in Poland, meet customer needs, and keep up with market growth.

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