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

Market Report | 2024-02-17 | 140 pages | Mordor Intelligence

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Report description:

The Power Module Packaging Market size is estimated at USD 2.5 billion in 2024, and is expected to reach USD 3.98 billion by 2029, growing at a CAGR of 9.78% during the forecast period (2024-2029).

A power module or power electronic module acts as a physical container for storing several power components, usually power semiconductor devices. Packaging plays a crucial role in the shift toward higher power densities, which enables more efficient power supplies, faster conversion, power delivery, and improved reliability. As the world is shifting toward faster-switching frequencies and higher power densities, there is a related shift in packaging materials used for wire bonding, die-attach, substrates, and system cooling.

Key Highlights
-Power modules are the key elements in the power inverters and converters. ?Power modules are commonly used in electric cars and other electric motor controllers, appliances, power supplies, electroplating machinery, medical equipment, battery chargers, AC to DC inverters and converters, power switches, and welding equipment. The growth of the power module packaging market is driven by a reduction in energy wastage, efficient distributed cooling schemes, a reduction in footprint, and a consequent increase in power density. Moreover, the growing demand for power modules in the industrial and consumer electronics sector is expected to drive the power module packaging market.
-The growing demand for electric vehicles and battery-powered electric vehicles, owing to rising fuel costs and increasing environmental concerns, is driving the demand for highly efficient power module packaging. The replacement of silicon IGBTs with SiC MOSFETs for automotive inverters and other applications is also fueling changes in assembly and packaging. Owing to this, key vendors are focusing on introducing SiC MOSFETs, and this factor is driving the power module packaging market.
-The increased proliferation of consumer electronics, such as smartphones, laptops, computers, and TVs, is also driving the

demand for innovative and advanced power module packaging solutions. AC-DC converters are widely used in electronic devices that require DC power, such as computers, televisions, and smartphones, as they help decrease energy waste and enhance the efficiency of electronic devices by enabling more efficient and effective power delivery. The growing prevalence of smartphones due to advancements in battery and 5G technology and new variants with additional features create demand for AC-DC converters and power modules.
-The global financial crisis has changed the regulatory frameworks, and the post-crisis market environment has had a significant impact on the advanced packaging market. To remain competitive in the market, power module packaging vendors are increasing their M&A activities to increase their market share. This is expected to continue in the coming years, with various levels of consolidation among the major players affecting the overall profitability.
-The increasing investments in R&D facilities, the growing IoT electronics market, an increasing number of foundries due to COVID-19, the trend of miniaturization and technology migration, and the high demand for power modules have an impact on the growth of the market. Moreover, many market vendors are expecting market growth in the coming years, mainly due to trends like 5G and electric vehicles.

Power Module Packaging Market Trends

Increasing Demand from the Industrial and Consumer Electronics Segment to Drive the Market

- The consumer electronics industry has experienced a significant transformation driven by the rising demand for smarter and more advanced devices. Another important trend in the electronics industry is the development of the Internet of Things (IoT). With the rise in demand for smart devices, IoT has become essential for everyday life. Thus, businesses primarily use this technology to develop new products and services.
- For instance, as per Ericsson, by 2028, around 35 billion connections will be related to the Internet of Things. Connected IoT devices include machines, connected cars, meters, point-of-sale terminals, sensors, wearables, and consumer electronics. In 2022, there were a total of 10.3 billion short-range Internet of Things (IoT) devices worldwide, which is expected to increase to 25 billion by 2027. Moreover, the wide-area IoT devices amounted to 2.9 billion in 2021 and are projected to reach 5.4 billion by 2027.
- With the growing production and sales of smartphones with better technologies and the surging incorporation of 5G and 6G, the analog IC market is expected to gain a wide share of traction globally. However, worldwide demand for smartphone was expected to decline in 2023 compared to 2022 due to inflation, decreased consumer spending, and a weaker consumer outlook, which was expected to hamper the growth of the analog IC market for a short period of time. The market is expected to recover slightly in FY 2024 owing to the increased demand for 5G smartphones and growing 5G network connectivity across the nations. The increased proliferation of 5G smartphones and foldable smartphones across the world is driving the growth of the market.
- Sales of consumer electronics such as refrigerators, computers, televisions, and chargers for handheld electronics such as cell phones or tablets are growing significantly. AC to DC converters are also used in these electronic devices using power modules. The growing demand for these appliances and devices will boost the market growth in the coming years. For instance, according to the National Bureau of Statistics of China, the household appliance industry in China has grown into a multi-billion-dollar industry. In 2022 alone, the market volume of the Chinese electrical household appliances sector amounted to about CNY 1.75 billion. As the Chinese home appliance industry flourishes, Chinese household electronics companies play an increasingly important role in the global market.

Asia-Pacific is Expected to Register Major Growth

- The Asia-Pacific region is expected to occupy the highest share, owing to the increasing adoption of renewable energy and the

rising number of electric/hybrid vehicles in countries like China. China has emerged as a dominant force in the renewable energy stage. The country has made significant strides in beginning a historic shift away from coal. Over the last decade, according to China's National Bureau of Statistics, coal's share of energy consumption decreased from 68.5% to 56%.
- The government is pushing for emissions reductions and improved air quality. According to Global Energy Monitor, China's solar capacity is 228 gigawatts (GW), with wind capacity at 310 GW, which is more than the rest of the world combined. China aims to hit 1,200 GW by 2030, with another 750 GW of new wind and solar projects in the pipeline.
- China's three state-owned energy companies plan to invest USD 14.5 billion in renewable energy through 2025, diversifying their business as Beijing pushes to achieve net-zero carbon dioxide emissions by 2060.
- India's ambitious renewable energy goals are transforming its power sector. Renewable electricity is growing faster in India, and the new capacity additions are expected to double by 2026. As more efficient batteries will be used to store electricity, which will further reduce the cost of solar energy by 66% compared to the current price, renewable energy is expected to make up around 49% of total electricity generation by 2040.
- The Indian government's commitment to achieving net zero emissions by 2070 and increasing its renewable energy target to 500 gigawatts by 2030 at the COP26 Summit has significantly contributed to industry growth. The government is taking several initiatives to boost India's renewable energy sector. For instance, in February 2023, the Indian government announced its plans to invest USD 4.3 billion toward the country's energy transition and net-zero targets. The government has allocated USD 2.57 billion in the Union budget of 2022-23 for a PLI program to increase the production of high-efficiency solar panels.
- The consistent increase in the installed wind power capacity in recent years has resulted in a tremendous demand for power modules in the region. With this trend likely to continue, it will further augment the demand for power modules. This is fueling the growth of the power module packaging market.

Power Module Packaging Industry Overview

The power module packaging market is semi-consolidated, with the presence of major players like Fuji Electric Co. Ltd, Infineon Technologies AG, Mitsubishi Electric Corporation, Semikron Danfoss Holding A/s (Danfoss A/S), and Amkor Technology Inc. Players in the market are adopting strategies such as partnerships and acquisitions to enhance their product offerings and gain sustainable competitive advantage.

- In December 2023, Infineon Technologies AG launched the 4.5 kV XHP 3 IGBT modules in response to the global push for downsizing and integration. The 4.5 kV XHP will fundamentally change the landscape for medium voltage drives (MVD) and transportation applications operating at 2000 to 3300 V AC in 2- and 3-level topologies.
- In August 2023, Fuji Electric Co. Ltd announced the launch of its 3rd-generation small IPM, the P633C Series, which helps reduce the power consumption of the equipment on which it is mounted, such as home appliances and machine tools. This product uses the latest seventh-generation IGBT/FWD chips, achieving a 10% reduction of power loss and a reduction of electromagnetic noise to approximately 1/3 compared with conventional products.

Additional Benefits:

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

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