Sic Wafer Market - Growth, Trends, Covid-19 Impact, and Forecasts (2023 - 2028)

Market Report | 2023-01-23 | 127 pages | Mordor Intelligence

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Report description:

The SiC Wafer Market was valued at USD 726.74 million in 2021, and it is expected to reach USD 2,025.46 million by 2027, registering a CAGR of 19.04% during the forecast period 2022-2027. Silicon carbide (SiC) is used for high-power applications owing to its wide bandgap. High-performance power ICs are often based on SiC substrates. SiC can tolerate high temperatures than silicon or gallium nitride (GaN) and improve electrical device performance.

Key Highlights
In the automotive industry, new EVs have reduced charge time and increased range and performance to meet customer expectations. Hence, automotive companies require power electronic devices capable of effective and efficient operation at elevated temperatures to offer the advantages mentioned above to customers. Thus, power modules are being developed using wide-bandgap SiC technologies, owing to SiC-based technology's advantages, such as high thermal conductivity, reduced switching losses, higher power density, and increased bandwidth capability.
There has been a growing interest in SiC power semiconductors, with many countries announcing limiting the sales of new internal combustion engine vehicles. As part of these efforts, companies operating in the market studied have been increasing their investments to set up new manufacturing facilities.
In April 2021, II-VI Incorporated, a leading company operating in wide-bandgap compound semiconductors, announced that it expanded the SiC wafer finishing manufacturing footprint in China to serve one of the largest worldwide markets for EVs and clean energy applications. To meet the increasing market demand in Asia, the company established a backend processing line for conductive SiC substrates in more than 50,000 sq. ft of new cleanroom space at the company's Asia Regional Headquarters in Fuzhou, China.
However, considering the SiC wafer market, market players have been producing 100 mm and 150 mm wafers. Some companies are focusing on creating 200 mm wafers that may be fully commercialized in the next few years. Hence, commercial sizes of SiC wafers are smaller than Si wafers. This, in turn, limits the efficiency and rate of production of SiC-based semiconductors compared to silicon-based semiconductors.
The COVID -19 pandemic affected the overall semiconductor manufacturing market from the demand and supply sides. In

addition, the global lockdowns and closure of semiconductor plants further fueled the supply shortage. The effects were also reflected in the SiC wafer market. However, many of these effects are likely to be short-term. Precautions by governments across the globe to support automotive and semiconductor sectors could help revive industry growth.

SiC Wafer Market Trends

Automotive and Electric Vehicles End-User Industry Segment to Grow Significantly

The power-handling limitations of traditional silicon are expected to pave the way for alternative power technologies such as silicon carbide in applications for electric vehicles. Silicon carbide (SiC) is a cutting-edge technology that replaces silicon (Si) in various applications. Moreover, efforts were made to raise the efficiency and range of electric cars (EVs) while reducing the weight and cost of the complete vehicle. Thus, with the increasing power density of control electronics, the notion of employing SiC for EVs was formed.
SiC is an innovative technology used to replace silicon in many applications. The adoption of SiC wafers in electric vehicles has increased the efficiency, range, weight, and cost of the entire vehicle, thereby increasing the power density of control electronics. Moreover, changing government requirements regarding the reduction of CO2 emissions coupled with the electrification of passenger vehicles by various major automakers are contributing to the growth of demand for SiC wafers in the market.
Vehicle models with different electrification levels have been introduced to the market by automakers, including full hybrid electric vehicles (HEVs), mild-hybrid electric vehicles (MHEVs), plug-in hybrid electric vehicles (PHEVs), zero-emission battery electric vehicles (BEVs), and fuel-cell electric vehicle (FCEVs), among others.
For instance, in February 2021, Ford invested USD 1 billion in an electric vehicle production facility in Cologne, Germany. The investment aligns with the company's aims to convert its European arm of automotive plants to manufacture electric vehicles.

Asia-Pacific Hold the Largest Market Share

The Asia-Pacific is a prominent region in the global SiC wafer market, as the region dominates the global semiconductor market, which is also supported by government policies. Furthermore, the region's semiconductor industry is driven by Taiwan, China, Japan, and South Korea, which account for a significant share of the global semiconductor market. In contrast, others, like Thailand, Vietnam, Singapore, and Malaysia, contribute significantly to the region's dominance in the market.
China is the largest semiconductor market in Asia and globally. As per the semiconductor industry association, China led the semiconductor market with a total chip sales of USD 192.5 billion in 2021, marking an increase of 27.1% year on year. The country is also attracting huge investments from many major chipmakers to expand chip production by launching new facilities. In June 2021, China-based Sanan Integrated Circuit (Sanan IC) opened the nation's first vertically integrated SiC line at its Hunan Sanan Semiconductor plant. Located in the Changsha high-tech industrial park in the Hunan province, the company's latest manufacturing fab, with a USD 2.5 billion investment, handles all wafer and device fabrication steps from crystal growth to power devices, packaging, and testing.
Furthermore, Japanese companies are making heavy investments to increase the production of SiC power semiconductors driven by the demand from the EV industry. For instance, in January 2022, Japan-based Fuji Electric Co. Ltd announced the decision to invest capital in Fuji Electric Tsugaru Semiconductor Co. Ltd, one of its power semiconductor production bases, for an increase in the production of SiC power semiconductors. Mass production is planned to begin in fiscal 2024.
Furthermore, in March 2022, Tokyo-headquartered Showa Denko KK launched the mass production of silicon carbide single crystal wafers (SiC wafers) with a diameter of 6 inches (150 mm), which are used as materials for SiC epitaxial wafers to be processed and installed into SiC power semiconductors.

SiC Wafer Market Competitor Analysis

The SiC wafer market is highly competitive and consists of some influential players. These players, with a noticeable share in the market, are concentrating on expanding their customer base across foreign countries. They leverage strategic collaborative actions to improve their market percentage and enhance their profitability.

March 2022 - Showa Denko KK started the mass manufacturing of silicon carbide single crystal wafers (SiC wafers) with a diameter of 6 inches (150 mm), which would be processed and integrated into SiC-based power semiconductors.
February 2022 - II?VI Incorporated announced that it had qualified its 1200 V silicon carbide MOSFET platform, on its high-quality SiC substrates, to stringent automotive standard requirements. Additionally, the company expanded its relationship with GE by signing a three-year technology access agreement (TAA) with GE Research to access the Lab's global-class SiC module technology and the team of experts to accelerate customer design-in engagement activities.

Additional Benefits:

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

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