

GaN Semiconductor Devices - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2025 - 2030)

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Report description:

The GaN Semiconductor Devices Market size is estimated at USD 5.28 billion in 2025, and is expected to reach USD 14.06 billion by 2030, at a CAGR of 21.64% during the forecast period (2025-2030).

Key Highlights

- The escalating demand for renewable energy sources, including solar and wind power, has propelled the use of GaN semiconductor devices in power conversion systems. GaN's high-power density, fast switching speeds, and improved thermal performance enable efficient energy conversion, reducing energy wastage and increasing overall system efficiency.
- Solar power is one of the fastest-growing segments in the green energy sector. Solar panels, which consist of multiple discrete semiconductors, transform sunlight into electricity through the photovoltaic effect. The rising demand for solar energy, driven by factors such as government incentives and falling costs, has led to a surge in the production and installation of solar panels. This, in turn, has fueled the demand for discrete semiconductors required for the efficient functioning of these panels.
- GaN's ability to operate at high frequencies, withstand harsh environmental conditions, and deliver high power outputs makes it suitable for applications such as radar systems, electronic warfare, and communication systems. GaN devices offer improved performance, reliability, and reduced system size, contributing to advancements in aerospace and defense technologies.
- However, the high cost associated with gallium nitride semiconductor devices acts as a significant restraint to the growth of the studied market. The production process of these devices requires complex manufacturing techniques and specialized equipment, which adds to the overall cost. This makes gallium nitride semiconductor devices relatively expensive compared to other semiconductor materials, limiting their adoption in price-sensitive markets.
- The remote working environment, in the post-COVID scenario, is leading to the growth in hyper-scale data centers and increased demand for smartphones, wearables, laptops, and other IT equipment, creating a need for memory chips and resulting in increased demand for the market studied.

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- As per the the National Association of Software and Service Companies (NASSCOM), India's data center investment is slated to reach USD 4.6 billion by 2025. India's higher cost efficiency in both development and operation is its most significant advantage compared to more mature markets. Currently, India's data centers are primarily located in Mumbai, Bengaluru, Chennai, Delhi (NCR), Hyderabad, and Pune. Calcutta, Kerala, and Ahmedabad are the upcoming data center hubs. These growing data center market investments drive the growth of the market studied.

Gallium Nitride (GaN) Semiconductor Devices Market Trends

Consumer Electronics to Hold Significant Market Share

- Gallium nitride (GaN) semiconductors have emerged as crucial components in the consumer electronics industry. Due to their unique properties, these semiconductors have rapidly gained popularity in power electronics. Compared to traditional silicon-based devices, GaN semiconductors offer higher breakdown voltage and lower on-resistance.
- Compared to traditional silicon-based semiconductors, GaN semiconductors exhibit lower power losses due to their higher electron mobility and wider bandgap. In smartphones, GaN-based power management chips enable faster charging, longer battery life, and reduced heat generation. Similarly, GaN semiconductors allow for more efficient power conversion in laptops, resulting in extended battery life and reduced device weight.
- The increasing penetration of smartphones is likely to aid the growth of the studied market. According to Ericsson, in 2023, the number of smartphone mobile network subscriptions worldwide reached almost seven billion. It is expected to exceed 7.7 billion by 2028. India, China, and the United States have the highest number of smartphone mobile network subscriptions.
- GaN semiconductors perform well in high-frequency applications, making them suitable for the ever-increasing demands of modern electronic devices. In smartphones, GaN-based radio frequency (RF) amplifiers enhance signal quality, leading to improved call clarity and faster data transfer rates. In laptops, GaN-based power amplifiers enable high-speed wireless connectivity and enhance overall performance. Furthermore, in consumer wearables, GaN semiconductors facilitate stable wireless communication and enable the integration of advanced sensors.

China to Witness Significant Growth

- China has emerged as the leading manufacturer and user of semiconductors and associated goods in recent decades. The surge in demand for semiconductor chips in China is largely due to the rapid expansion of the digital environment. In addition, government programs contribute to the increased adoption of digital technologies in China. One such initiative is "Made in China 2025," which aims to encourage the integration of advanced technologies like robotics, IoT, automation, and advanced ICT solutions such as AI, AR/VR, and ML in the industrial sector.
- The growth of the country's GaN semiconductor market is also influenced by the rising popularity of smartphones, smart TVs, laptops, tablets, home appliances, etc. The consumer sector has been the primary force behind GaN adoption by OEMs due to the material's cost and efficiency advantages, and this trend is anticipated to continue without deceleration. GaN enables smartphone manufacturers to produce chargers with reduced dimensions and a better price-to-power ratio.
- China is also known as a leading producer of motor vehicles and is expanding its investment in the automotive industry to enhance its market position. As a result, the Chinese government has recently lifted various restrictions on foreign investment to promote automotive manufacturing within the nation.
- Moreover, the growing demand for luxury vehicles owing to the rising disposable income of the consumers is creating a favorable outlook for the studied market's growth as more electronic and control units feature in these vehicles, which drives the demand for GaN semiconductors. For instance, according to the China Association of Automobile Manufacturers (CAAM), in

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December 2023, monthly automobile production in China stood at 2,273 thousand units of passenger vehicles and 310 thousand units of commercial vehicles.

Gallium Nitride (GaN) Semiconductor Devices Industry Overview

The GaN semiconductor devices market is semi-consolidated. Some of the significant players in the market are Toshiba Electronic Devices & Storage Corporation, Nexperia Holding BV (Wingtech Technology Co. Ltd), Infineon Technologies AG, Efficient Power Conversion Corporation, NXP Semiconductors NV, and many more. The companies are increasing their market share by forming multiple partnerships and investing in introducing new products to earn a competitive edge during the forecast period.

- June 2024 - Infineon Technologies AG introduced the CoolGaN Transistor 700 V G4 product family. These devices excel in power conversion, specifically in the 700 V voltage range. These transistors boast a 20% performance boost in input and output figures-of-merit. This enhancement translates to heightened efficiency, minimized power losses, and more economical solutions. These applications span from consumer chargers and notebook adapters to data center power supplies, renewable energy inverters, and battery storage solutions.
- May 2024 - Toshiba Electronic Devices & Storage Corporation held a ceremony to mark the completion of a new 300-millimeter wafer fabrication facility for power semiconductors and an office building at Kaga Toshiba Electronics Corporation in Ishikawa Prefecture, Japan, one of Toshiba's key group companies. Completing construction is a significant milestone for Phase 1 of Toshiba's multi-year investment program. Toshiba will now proceed with equipment installation and start mass production in the second half of the fiscal year 2024.

Additional Benefits:

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

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