

Semiconductor Industry - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2024 - 2029)

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Report description:

The Semiconductor Industry is expected to grow from USD 0.72 trillion in 2024 to USD 1.21 trillion by 2029, at a CAGR of 10.86% during the forecast period (2024-2029).

Key Highlights

- The semiconductor sector is experiencing a swift expansion as semiconductors are becoming the fundamental components of contemporary technology. The progress and breakthroughs in this industry are directly influencing all subsequent technologies.
- Semiconductor devices are electronic components that use semiconducting material as their foundation. This material produces transistors, diodes, and other fundamental functional units found in integrated circuits (ICs). These devices are characterized by their ability to neither conduct electricity well nor act as effective insulators. The benefits of semiconductor devices encompass their affordability, dependability, and compact size. Over the past few decades, the utilization of these devices in the production of diverse electronics has surged in popularity, and it is projected to continue gaining momentum in the forthcoming years.
- The semiconductor industry is projected to experience strong growth in the foreseeable future as it caters to the rising need for semiconductor materials in emerging technologies like artificial intelligence (AI), autonomous driving, the Internet of Things, and 5G. This growth is fueled by intense competition among key players and consistent investment in research and development (R&D). As a result, vendors are constantly driven to innovate and gain a competitive advantage in the market.
- The market demand for semiconductor devices is projected to rise due to businesses' widespread adoption of electrification and autonomy. Electric vehicles are spearheading the movement toward a sustainable future, with electronics and semiconductors serving as crucial components. Governments across the globe are setting ambitious goals for the electrification of their transportation sectors, prompting leading automakers to make substantial investments in electric vehicle research and development. Semiconductors are emerging as the central processing units of EVs, empowering them to deliver optimal performance. Consequently, the growing investments in electric vehicles are anticipated to fuel the demand for the

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semiconductor market.

-The semiconductor industry needs more skilled workers. By the year 2030, more than one million additional skilled workers are likely to be needed to meet the industry's demand. Further, the semiconductor industry is characterized by long lead times and high capital investments. Manufacturing capacity constraints and changes in demand have led to shortages in the supply chain. These factors are expected to challenge the market's growth.

-The sector has undergone substantial changes due to COVID-19, impacting customer behavior, business revenues, and corporate operations. Additionally, the pandemic has revealed previously unnoticed risks on the supply side, potentially resulting in shortages of essential parts and components. Consequently, semiconductor companies are proactively restructuring their supply chains to enhance resilience, and these adjustments may persist in the post-pandemic era.

Semiconductor Market Trends

Discrete Semiconductors to Hold Significant Market Share in the Semiconductor Devices Segment

- The rising demand for high-energy and power-efficient devices, the increasing prevalence of wireless and portable electronic products, coupled with the increased use of these devices in the automotive industry due to the shift towards electrification are some of the key factors driving the growth of the segment.

- One of the significant trends in discrete semiconductors is efficient power management. New system architectures are improving the efficiency of AC-DC power adapters while simultaneously reducing the size and component count. New standards for Power-over-Ethernet (PoE) allow higher power transfer, which enables the development of new classes of devices, like connected lighting.

- MOSFET has always played an important part in the telecom sector, as switching power supply is the most prevalent application for power MOSFETs, which are also commonly utilized for MOS RF power amplifiers, allowing mobile networks to move from analog to digital. According to Ericsson, the number of 5G subscriptions increased by 70 million during the first quarter of 2022, reaching about 620 million. By the end of 2022, the number is predicted to reach 1 billion. Such reasons will spur the demand for power semiconductors, which will increase the demand for MOSFETs and lead to several breakthroughs in the telecom sector.

- Further, the demand for IGBT among various discrete semiconductors has been gaining traction and is widely used in low-power converters. The most popular semiconductor switches for power conversion in automotive, other motor drives, and renewable energy systems are discrete IGBTs. The main driving force is also the growing use of Insulated Gate Bipolar Transistor (IGBT) devices across a variety of sectors, including automotive, consumer electronics, industrial, IT and communications, healthcare, aerospace and defense, and others.

- The majority of discrete IGBT applications include inverters, various consumer goods like air conditioners and washing machines, switching-mode power supplies (SMPS), which are components used in personal computers, welding equipment, and induction heating devices like microwaves, electric cookers, induction stoves, etc. for soft switching and strobe flash control. The increasing demand for consumer electronic appliances like UPSs, power conditioners, air conditioners, etc., which use discrete IGBT types for lower-current applications, is credited with driving the growth of the discrete IGBT market. Discrete IGBTs have been found to have the lowest power losses in consumer goods, which is anticipated to be a key factor influencing the segment's growth in the market.

Fabrication to Hold Significant Market Share in Semiconductor Materials Segment

- Semiconductor fabrication materials form a crucial building block for the advanced microelectronics found in consumer electronics, high-end data centers, automotive applications, medical devices, IoT devices, power electronics, and more. The

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segment covers materials like process chemicals, photomasks, electronic gases, photoresist ancillaries, sputtering targets, silicon, and other materials.

- One of the primary factors driving the demand for semiconductor fabrication materials is the increasing use of digitally integrated ICs in the electrical, electronics, automotive, and telecommunication industries. Additionally, the rising investments in the energy sector are also expected to contribute positively to the growth of this segment, owing to the widespread application of semiconductors in solar panels, drives, and pumps in wind and water turbines, and protection circuits in energy conversion to ensure efficiency and minimal power loss. For instance, as per IEA, global energy investment will increase by 8% in 2022 to reach USD 2.4 trillion. Furthermore, according to IRENA, the spending on renewable energy is expected to grow steadily, boosting the market.

- While a wide range of materials can exhibit semiconductor properties, some materials are more commonly used in the fabrication of electronic devices due to their specific characteristics. Two of the most prevalent semiconductor materials are silicon and gallium arsenide. Silicon is the most widely used semiconductor material, primarily due to its abundance, low cost, and relatively stable properties at high temperatures. The electric conductivity of silicon is around 1000 S/m. Additionally, silicon has a well-established fabrication infrastructure, making it an attractive choice for manufacturers. However, silicon does have some drawbacks, such as lower electron mobility compared to other materials, which can limit the performance of high-speed devices.

- Gallium arsenide is another popular semiconductor material, valued for its higher electron mobility and direct bandgap. These properties make it well-suited for optoelectronic applications, such as lasers and solar cells. However, gallium arsenide is more expensive and less abundant than silicon, which can limit its widespread adoption. Another drawback of gallium arsenide is that it exists intrinsically as a semi-insulator rather than a semiconductor with an electrical conductivity of 0.000001 S/m.

- Aside from silicon and gallium arsenide, researchers are continually exploring new materials with promising semiconductor properties. These materials include aluminum nitride, carbon nanotubes, and many other materials that have the potential to revolutionize the industry. As the understanding of these emerging materials grows, they will likely play an increasingly important role in the future of semiconductor fabrication.

- Moreover, the market for process chemicals is expected to grow steadily due to the low-cost method and the applications for internal efficiency in the semiconductor sector. The consumption of semiconductor process chemicals is fueled by growth in installed fabrication capacity and expensive chemicals consumed by new technology, as well as processed silicon wafer surface area.

Semiconductor Industry Overview

The semiconductor industry features major players like Intel Corporation, Samsung Electronics Co. Ltd, Qualcomm Incorporated, Micron Technology Inc., and SK Hynix Inc., contributing to its semi-consolidated nature. Market participants are actively leveraging strategies such as partnerships and acquisitions to bolster their product portfolios and secure enduring competitive advantages.

In October 2023, Micron significantly expanded its 1? process node technology by introducing the 16Gb DDR5 memory. Rigorously tested and validated for in-system functionality at speeds of up to 7,200 MT/s, this new product is now being shipped to Micron's data center and PC clientele. The incorporation of advanced high-k CMOS device technology, a 4-phase clocking system, and clock-sync 1 in Micron's 1?-based DDR5 memory yield a substantial performance enhancement of up to 50%, accompanied by a 33% improvement in performance per watt compared to the prior generation.

September 2023 witnessed Intel Foundry Services (IFS) and Tower Semiconductor, a notable provider of analog semiconductor solutions, announcing a collaboration. Intel will extend its foundry services and 300mm manufacturing capacity to assist Tower in catering to its global clientele. Tower, as part of the agreement, will leverage Intel's advanced manufacturing facility in New Mexico to fulfill its operational needs.

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