

Optical Modulators - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts 2019-2029

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Report description:

The Optical Modulators Market size is estimated at USD 5.69 billion in 2024, and is expected to reach USD 12.58 billion by 2029, growing at a CAGR of 17.19% during the forecast period (2024-2029).

Optical modulator plays a very crucial role in fiber-optic networks. Just as a transistor acts as a switch for electronic signals, an optical modulator acts as a switch for optical signals. Optical communication primarily uses light, so the modulator's function is to turn the light that sends a stream of binary signals over optical fibers on and off.

Key Highlights

- The boom in social media platforms, e-commerce, and software usage has been accelerating data demand significantly. 5G is also opening up new avenues for end users to consume and generate more data. For instance, according to the GSMA, by 2025, 5G networks will cover one-third of the world's population. The organization also stated that the number of 5G connections would surpass 1 billion by the end of 2022 and 2 billion by 2025, making up more than a fifth of mobile connections.
- As such, more and more businesses and enterprises are acquiring their own hyperscale data centers to manage different business functions and workloads. With a rapid growth in data generated, there is a significant need for data centers to scale up. Datacenter disaggregation, which is a modern approach to data center design and management that separates the different components of a data center into distinct units, can be an effective solution. The approach allows greater flexibility and scalability, as well as improved energy efficiency and cost savings.
- Optical interconnects are one key technology that enables data center disaggregation. Optical interconnects use fiber optic cables to transmit data at high speeds over long distances. This technology is well-suited for disaggregated data center applications due to its high bandwidth capacity and low power consumption. Optical modulation is one of the main functionalities in such interconnect solutions, which fuels the adoption of optical modulators.

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- Optical modulators are one of the primary components used in optical interconnection, and their slow commercialization and balancing performance, cost, and efficiency are some of the major challenges hampering the market's growth.?
- The outbreak of COVID-19 increased data usage globally. While offline entertainment activities halted with the pandemic, the online entertainment market, including TV and streaming platforms, boomed as people were confined to their homes, and such demand continued to progress.

Optical Modulators Market Trends

Optical Communication to Hold Significant Market Share

- Optical communication is any type of communication in which light is used to carry the signal to the remote end instead of an electrical current. Optical communication relies on optical fibers to carry signals to their destinations. A modulator/demodulator, a transmitter/receiver, a light signal, and a transparent channel are the building blocks of the optical communications system.
- The demand for bandwidth and telecommunication services has surged over the past decade, which has boosted the requirement for external modulation in fiber-optic communication systems. Notably, integrating lithium niobate (LiNbO3) external modulators is evolving as a suitable solution that offers not just the desired bandwidth but also the means for minimizing dispersion effects.
- Compared to direct modulation of a laser diode, LiNbO3-guided wave modulators can be designed for zero-chirp or adjustable-chirp operation that aids in minimizing the system degradation associated with fiber dispersion. In analog systems, linearized external modulators can provide very low modulation distortion.
- The demand for optical fiber is imperative for economic development and the need for increased fiber density to support the advancements in bandwidth that are necessary to improve the pace of innovation and economic growth. One such example is the advancements in 5G and its dependency on high-speed radio frequency and greater network densification. Thus, such factors are driving the demand for investments in optical fiber infrastructure.

North America to Hold the Largest Market Share

- The region's market is anticipated to be significantly impacted by the rising demand for high bandwidth and high data rate applications, the requirement for electronic device miniaturization, rising internet penetration, and the quick development of 5G infrastructure.
- The widespread use of optical fibers in the region's communications industry is boosted by the growing demand for higher performance and speed, portending a promising future for optical technology. This is anticipated to lead to a new generation of fiber optic communications as extensive research activities continue and are extended to practical deployment.
- The growing use of optical communication systems in data centers and high-performance computing (HPC) applications is another factor driving the market. Due to their high bandwidth and data rate requirements, data centers and high-performance computing applications are predicted to drive the demand for optical modulators. Additionally, the demand for optical modulators is anticipated to increase significantly in the area due to rising investments in constructing data centers and HPC applications.
- Cloud-based enterprise applications are thriving in the North American region. Cloud-based solutions depend on internet connectivity to function in the hosted environment. With 5G enabling much faster internet speed, it will further enhance the connectivity experience. Furthermore, the rapid growth of mobile broadband with an increase in big data analytics and cloud computing drives the demand for new data center infrastructures in the North American region. The rapid investments in cloud-based data centers are expected to provide several application opportunities for optical modulator makers.

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Optical Modulators Industry Overview

The optical modulators market is highly fragmented due to the presence of both global players and small and medium-sized enterprises. The major players in the market are Thorlabs Inc., Lumentum Holdings Inc., AA Opto-Electronic, Fujitsu Optical Components Limited, and Gooch & Housego PLC. Players in the market are adopting strategies such as partnerships and acquisitions to enhance their product offerings and gain sustainable competitive advantage.

- In February 2023, AA introduced a new line of fiber-pigtailed phase modulators. They are available from VIS to IR, with a 0.2-degree phase resolution. These products can be used for wavelengths in the visible and infrared spectrum with unparalleled accuracy, enabling precise optical phase control.
- In January 2023, Thorlabs revealed that it had signed a legally binding agreement to buy JML Optical Industries, LLC ("JML"), a custom manufacturer and designer of precision optics. JML has 70,000 square feet of space set aside for designing, manufacturing, and testing multi-element optical devices and aspherical, spherical, Plano, cylindrical, and acylindrical lenses. Thorlabs is delighted to welcome the highly skilled JML team and looks forward to utilizing its demonstrated optics capabilities to better serve the photonics industry.

Additional Benefits:

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

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