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

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Abstracts

The Silicon Photonics Market size is estimated at USD 2.38 billion in 2024, and is expected to reach USD 9.02 billion by 2029, growing at a CAGR of 30.5% during the forecast period (2024-2029).

Silicon photonics is a growing technology that utilizes optical rays to transfer data within computer chips. It is a favorable technology to replace copper wires, providing greater bandwidth, longer transmission distance, and better energy efficiency.

Key Highlights

The rapidly growing internet traffic is one of the significant drivers of the silicon photonics market. With increasing demand for high-speed data transfer, data centers and telecommunications companies are seeking more efficient and cost-effective solutions to handle the growing volume of Internet traffic. Silicon photonics technology offers a favorable solution to this challenge, providing faster, more reliable, and more cost-effective data transfer than traditional copper-based systems.

This helps provide high-speed broadband connections and many broadband services over the existing network infrastructure. Additionally, a growing number of Internet users over the years also resulted in rising investments to develop average downlink and uplink speeds to provide services. According to GSMA, 5G is projected to increase from a global market penetration of 22% in 2024 to 64% in 2030.

In addition, countries are taking various initiatives to boost the deployment of 5G and 6G communication. For instance, in August 2022, the Department of Defense launched three new Innovative Beyond 5G Program projects, including creating an R&D hub for

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6G technology. Such enhancement in the telecommunication sector may propel the market's growth.

The risk of thermal effect significantly challenges the market's growth. The thermal effect occurs due to the absorption of light by silicon, which can increase the temperature in the machine. This increase in temperature can lead to a reduction in performance or even device failure.

Silicon Photonics Market Trends

Automotive Segment to Witness Major Growth

Silicon photonics is an emerging technology in the automotive sector that helps advance sensors like event-based sensors (EBS) and neuromorphic cameras and improves LIDAR. Some automotive products being upgraded to incorporate silicon photonics technology include Advanced Driver Assistance Systems (ADAS), face recognition systems, sensors & detection technology, LiDAR systems, and many other systems used in vehicles. Silicon photonics-enabled systems enhance a vehicle's safety, functionality, and performance. Moreover, silicon photonics-enabled systems in cruise control offer several benefits, such as enhanced accuracy, speed, and efficiency.

In recent years, photonics has revolutionized the automotive industry, transitioning from mere lighting functions to providing cutting-edge technology for imaging, sensing, smart displaying, and media communication networks. Consequently, photonics has taken on new dimensions far beyond lighting in cars and automotive manufacturing and quality control. Unsurprisingly, the automotive industry is showing an increased interest in innovative, photonics-based technologies such as silicon photonics.

The increasing production of buses is likely to offer lucrative opportunities for market growth. For instance, according to OICA, around 75 thousand buses and coaches were produced across India in 2022, an increase from 34.7 thousand buses and coaches in 2021. Furthermore, according to the International Energy Agency (IEA), between 2016 and 2022, China consistently registered the most significant number of electric buses. In 2021 and 2022, the number of electric bus registrations in China amounted to 50 and 54 thousand, respectively.

The increasing adoption of self-driving or autonomous vehicles is a primary growth factor for the ADAS market. For instance, according to the National Safety Council, by 2026, approximately 71% of registered vehicles will be equipped with rear cameras,

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while 60% will have rear parking sensors. Such increasing adoption of ADAS would aid the growth of the market studied. Various manufacturers of personal and commercial vehicles are establishing their facilities globally, which is also driving the market studied.

North America Holds Significant Market Share

The United States is one of the prominent countries in the data center market. Multi-tenant data center leasing activities in the country have been rising owing to expansion activities by some of the major companies in the country.

The growing data center traffic, along with rapid technological advancements in emerging areas, such as AI and IoT, is leading to increased data traffic across the country. According to the forecasts by Cisco, there will be 4.6 billion networked devices by 2023, rising from 2.7 billion in 2018. In addition, smartphones are expected to account for 7% of all networked devices by 2023.

The digitization of enterprises, be they small or large, and the resulting digital services rapidly develop a need for larger technology stacks in order to store, compute, connect, and analyze data. It also leads to the adoption of cloud services. The adoption of digitization of enterprises creates new opportunities for the silicon photonics market in the region.

It is expected that wireless operators in Canada will invest approximately USD 25.8 billion in deploying 5G infrastructure between 2020 and 2026; as a result, the government is also encouraging telecom equipment manufacturing. These initiatives will broaden the scope of the country's 5G infrastructure and provide a massive opportunity for market study vendors.

As per Ericsson, in Canada, 4 million smartphone users plan to upgrade to 5G over the next 12-15 months; 8 in 10 current 5G users don't want to return to 4G. The 5G user base has increased six-fold over the past two years. However, consumer awareness is low; 15% of users claim they are on 5G but use a 4G handset in Canada, while another 18% own a 5G capable device but have not upgraded to a 5G subscription.

The Canadian region is also expected to exhibit a significant adoption rate of silicon photonics technology due to technological advancements across its end-user industries. Also, the increasing research and development activities, coupled with several

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investments in technology, are expected to act as major drivers for the growth in adoption.

Silicon Photonics Industry Overview

The silicon photonics market is highly fragmented, with major players like Sicoya GMBH, Intel Corporation, Cisco Systems Inc., Lumentum Operations LLC (Lumentum Holdings Inc.), and Juniper Networks Inc. They are adopting partnerships and acquisitions to enhance their product offerings and gain sustainable competitive advantage.

In October 2023, Lumentum Holdings Inc. showcased its latest solutions and shared industry perspectives at the European Conference on Optical Communication 2023 in Glasgow, Scotland. Lumentum's ultra-high power, 1310 nm distributed-feedback laser (DFB) was also demonstrated at over 400 mW optical power ex-fiber at 25°C. These new ultra-high power 13xx lasers were claimed to enable higher bandwidth for AI and ML applications by using co-packaged optics, external laser source solutions, and silicon photonics transceivers for the next generation of data centers.

In September 2023, Broadcom announced that it is working with TSMC and Nvidia to develop silicon photonics and co-packaged optics (CPO). TSMC has already formed an R&D team of over 200 employees to target emerging opportunities in high-speed computing chips based on silicon photonics technology, with production expected to start as early as the second half of 2024.

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