Confidential

Independent Market Research on Global Optical Communication Core Products Industry

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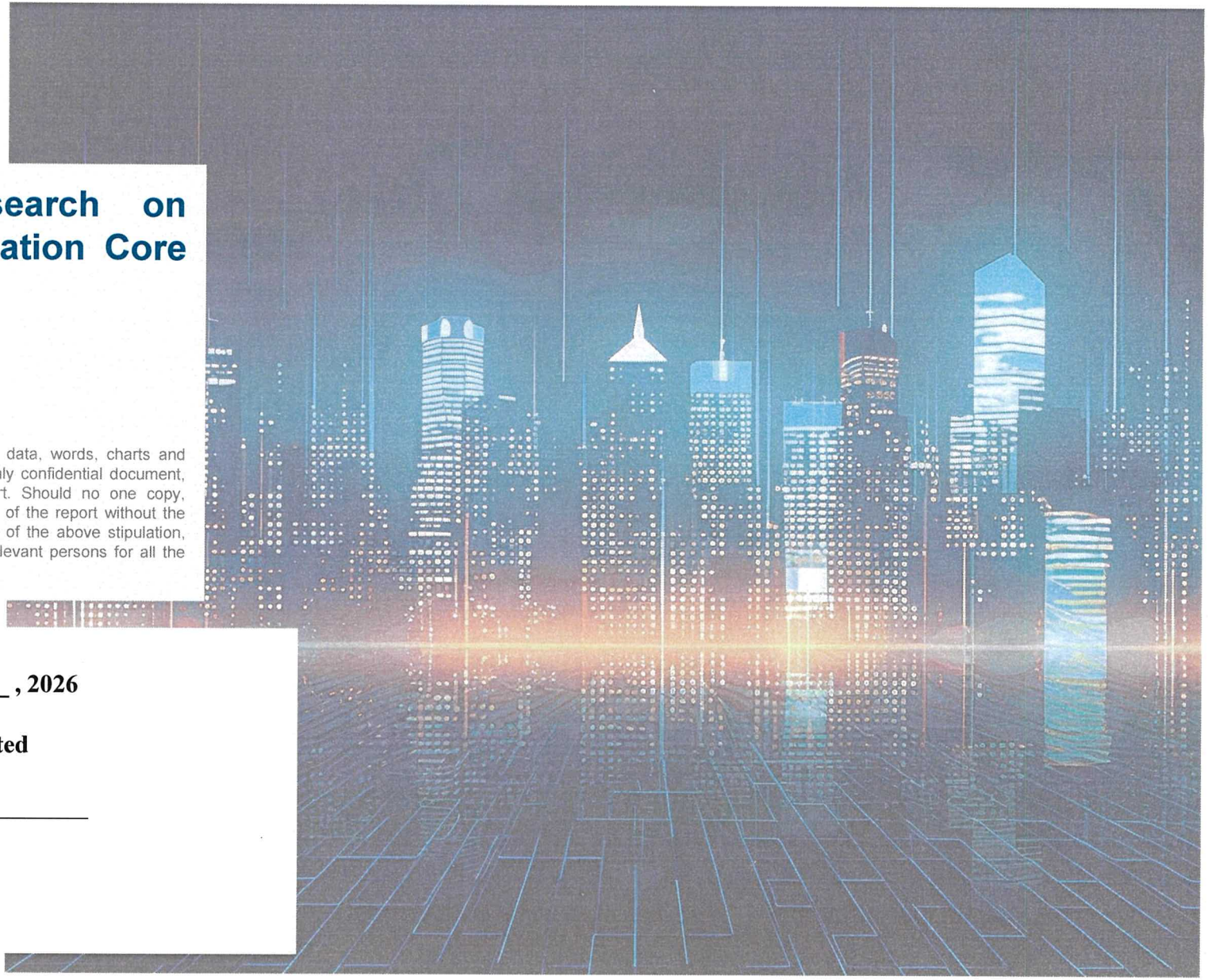


Date: September 14 **, 2026**

For and on behalf of Frost & Sullivan Limited

Name: Terry Tse

Title: Consulting Director

Agenda

Overview of Global Optical Communication Industry

Background of Optical Communication Industry (1/2)

Optical communication is a method of transmitting information using light waves as the carrier signal, primarily relying on optical fibers as the transmission medium to facilitate communication between users. Compared with traditional electrical signal transmission, optical communication offers significantly higher bandwidth and capacity, lower signal loss over long distances, stronger resistance to electromagnetic interference, and superior transmission quality. These advantages have made optical communication the dominant mode of information transmission worldwide, supporting the foundation of modern digital infrastructure and enabling high-speed, high-volume data exchange across various sectors.

Globally, the optical communication industry is experiencing accelerated growth, underpinned by increasing demand for high-speed connectivity and digital infrastructure. The future of the optical communication industry is closely intertwined with digital transformation. As AI and cloud computing advance, the need for high-speed, low-latency, and highly reliable network infrastructure continues to grow. By 2030, global AI infrastructure investment is projected to further increase to RMB6,526.5 billion, with a CAGR of 22.2% from 2025 to 2030. The explosive growth of generative AI further accelerates data center deployment and boosts demand for high-speed optical transceivers to support large-scale model training and inference. These trends will drive continuous upgrades in optical communication technologies, reinforcing their critical role as the backbone of next-generation digital infrastructure and global intelligent connectivity.

Meanwhile, the rapid expansion of cloud computing, AI, and global data traffic is placing unprecedented demands on backbone and metro transmission networks. To support high-speed, long-distance connectivity, operators are accelerating the deployment of next-generation optical transmission systems. The continued upgrade of transmission infrastructure is fueling demand for high-performance core products in optical communication.

In addition, the widespread rollout of 5G networks is acting as another strong catalyst for the optical communication industry. 5G base stations require dense fiber front-haul and back-haul connections to deliver ultra-high-speed and low-latency data transmission. As of the end of 2024, there were approximately 6.5 million 5G base stations globally, growing at a CAGR of 56.5% since 2020. This figure is expected to reach 18.8 million by 2029, enabling broader coverage and more reliable network services. The large-scale deployment of 5G, in turn, drives demand for high-performance optical transceivers and fiber network infrastructure.

Source: Frost & Sullivan

Overview of Global Optical Communication Industry

Background of Optical Communication Industry (2/2)

Furthermore, optical fiber access, especially fiber-to-the-x (FTTx), has become the mainstream fixed broadband access technology, thanks to its superior bandwidth, low latency, and high reliability. The number of global fixed broadband subscribers grew from approximately 1.2 billion in 2020 to approximately 1.6 billion in 2024, representing a CAGR of 6.3% during this period. In the PRC, the push for "new infrastructure" has significantly expanded optical networks. By the end of 2024, the number of 10G PON ports capable of delivering gigabit services reached 28.2 million, a net increase of over 5 million units year-on-year from 2023.

Core products in optical communication, such as optical transceivers and optical network terminals, are essential to build high-speed, stable digital infrastructure. Optical transceivers, powered by optical chips, enable high-bandwidth, low-latency transmission across data centers, backbone, and access networks, while optical network terminals support efficient, cost-effective connectivity in end-use scenarios. As cloud computing and AI continue to expand, demand for these devices is rising rapidly. The ongoing evolution of the optical communication industry, in turn, drives continuous upgrades in these products, reinforcing their foundational role in enabling next-generation digital connectivity.

Source: Frost & Sullivan

Agenda

Overview of Global Optical Communication Core Products Industry

Overview of Optical Communication Core Products Industry

The core products of the optical communication industry include optical chips, optical transceivers, and optical network terminals, which together form an integrated value chain supporting high-performance optical connectivity. Among them, optical transceivers play a central role, enabling high-rate, high-reliability, and low-latency data transmission across increasingly complex datacom and telecom networks.

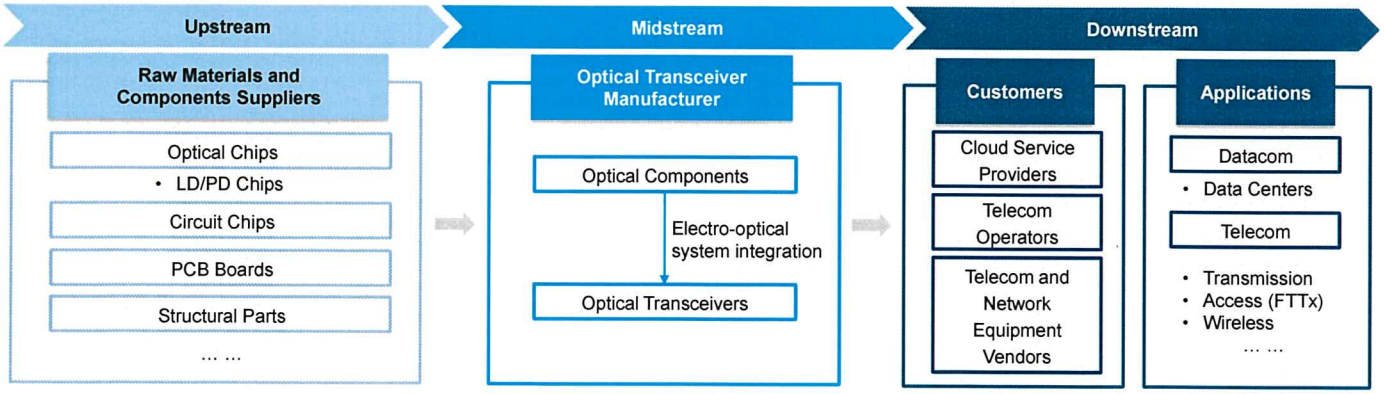
The performance of optical transceivers is fundamentally driven by the optical chips, which provide key optoelectronic functions such as signal generation, modulation, and detection. Optical transceivers can be integrated into optical network terminal (ONT) boxes, which not only function as network edge access points but also serve as critical gateways for edge computing. Optical network terminals not only connect end-users to high-bandwidth networks, but also act as vital enablers of edge computing across end-use scenarios.

Together, the three tightly-interconnected core products form the foundation of modern optical communication systems.

Source: Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Value Chain Analysis



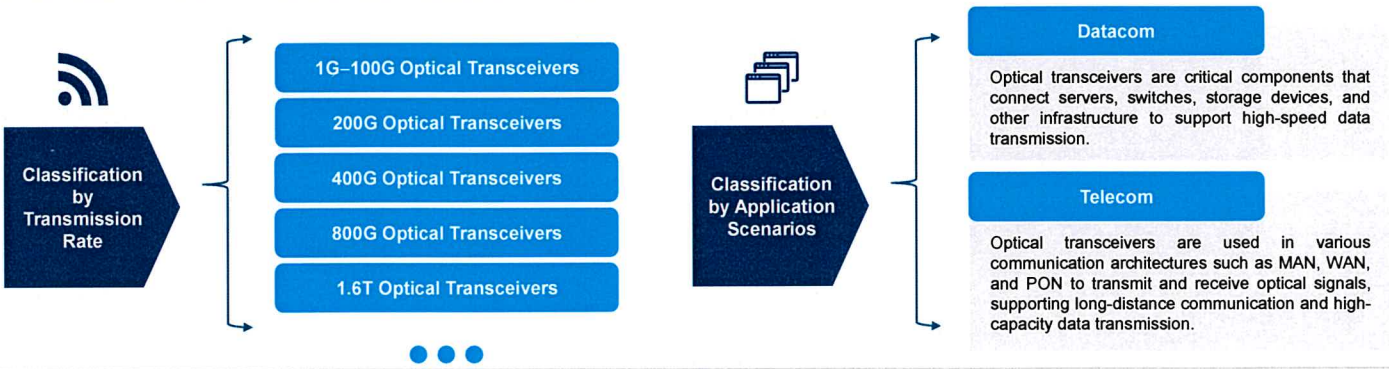
- The upstream segment of the optical communication industry chain includes critical components and raw materials such as optical chips (including laser diodes (LD) and photodetectors (PD)), circuit chips, printed circuit boards (PCBs), and structural parts. Among these, optical chips are the most technically complex elements, playing a pivotal role in determining the speed, power efficiency, and reliability of optical transceivers.
- The midstream is composed of optical transceivers. Optical and electronic components are integrated into optical transceivers to enable efficient data transmission across networks. These transceivers are built around optical chips, whose performance directly impacts signal quality and transmission efficiency.
- In the downstream segment, optical communication products are delivered to a wide array of customers such as cloud service providers (including those operating data centers), telecom operators, and telecom and network equipment vendors, supporting both datacom and telecom applications. Driven by the rapid growth of artificial intelligence (AI), cloud computing, and the accelerating demand for high-speed networking, the need for data communication core products continues to rise. This momentum is propelling technological innovation and product upgrades across the entire optical communication value chain. Meanwhile, optical network terminals not only connect end-users to broadband networks but also function as key nodes for edge computing and computing power networks, supporting diverse application scenarios across residential, enterprise, and industrial environments. ONT boxes, as a form of optical network terminals deployed at the network edge, play a bridging role between the optical access network and end-user equipment.

Source: Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Introduction to Optical Transceivers

- An optical transceiver is an optoelectronic module that converts between optical signals and electrical signals. It serves as a transmission medium between switches and other devices and is a core component in fiber optic communication systems. An optical transceiver mainly consists of optical components, circuit chips, and PCBs.
- Transmission rate is one of the key performance indicators of optical transceivers, typically measured in gigabits per second (Gbps). Based on different transmission rates, optical transceivers can be classified into models such as 1G—100G, 200G, 400G, 800G and 1.6T optical transceivers.
- Optical transceivers are mainly used in datacom and telecom sectors. In the datacom sector, optical transceivers are critical components that connect servers, switches, storage devices, and other infrastructure to support high-speed data transmission. With the rise of technologies such as AI, cloud computing and big data, the demand for high bandwidth, low latency, and long-distance transmission is increasing, driving widespread adoption of highspeed optical transceivers. Optical transceivers play a vital role in data center networks by supporting large-scale parallel computing and data storage needs while improving overall network performance. In telecom networks, optical transceivers serve as key enablers across transmission, access (FTTx), and wireless segments. They are deployed in metropolitan area networks (MAN) and wide area networks (WAN) networks for long-distance backbone transmission; in passive optical networks (PON) systems to support broadband access for home and businesses; and in wireless front-haul and back-haul links to ensure reliable, low-latency connectivity between base stations. By delivering high-capacity, stable optical links, optical transceivers underpin the performance and scalability of modem telecom infrastructure.



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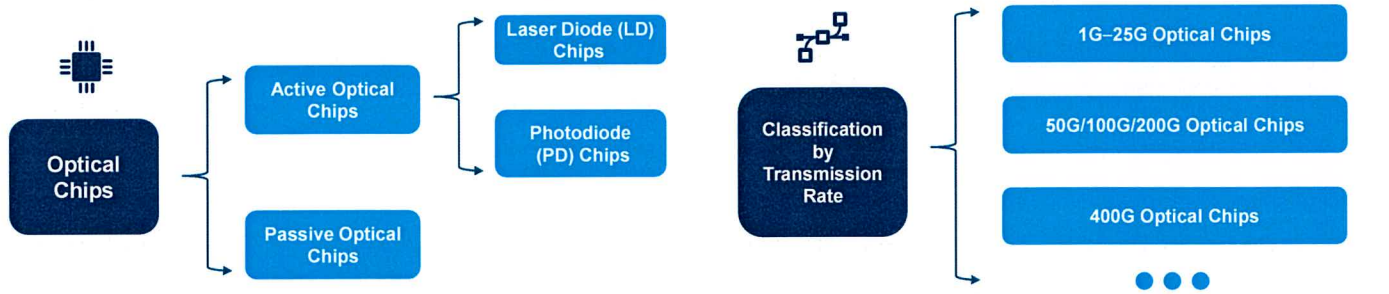
Source: Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Introduction to Optical Chips

- Optical chips are miniaturized components that use photons to transmit and process signals. They are primarily made from III/V compound semiconductor-based materials such as indium phosphide (InP) and gallium arsenide (GaAs), as well as silicon (Si). Optical chip typically integrates one or more optical functional components. As one of the core components of optical communication networks, optical chips are responsible for optoelectronic signal conversion, and their performance determines the transmission efficiency of optical communication systems. Optical chips can be further processed into optical components, which are the integrated into optical transceivers.
- Optical chips can be primarily categorized into active and passive optical chips. Active optical chips mainly include LD chips and PD chips. Among them, LD chips are primarily used for signal transmission by converting electrical signals into optical signals, while PD chips are mainly used for signal reception by converting optical signals back into electrical signals. In order to reach the stringent performance parameters, LD and PD chips raise extremely high requirements for raw material usage, structural design, as well as precision in manufacture process. As such, optical chips have the highest technical entry barrier within the optical communication value chain.
- Optical chips are advancing toward higher speed and greater integration. 100G/200G high-speed optical chips have become the mainstream of technological evolution in the industry, while 400G chips are expected to lead the next generation. 100G/200G per lane chips serve as fundamental building blocks, and combining multiple lanes of these speeds, enable the aggregation necessary for 800G and 1.6T optical transceivers. Among them, electro-absorption modulated laser (EML) chips are emerging as a key category in the technological iteration of optical chips, thanks to their excellent modulation bandwidth, high linearity and low driving voltage. Meanwhile, high-power CW-DFB laser chips, which provide greater optical output to enable longer transmission distances and higher rates, are also gaining importance as demand grows from data centers. Furthermore, silicon photonics (SiPh) chips enable optical signal modulation, transmission, and processing on silicon-based fabrication platforms. Their advantages include but are not limited to low cost, high integration, compatibility with complementary metal oxide semiconductor (CMOS) manufacturing, and potential for large-scale production. These unique features make SiPh chips well-suited for next-generation data centers, high-performance computing, and optical communication systems.



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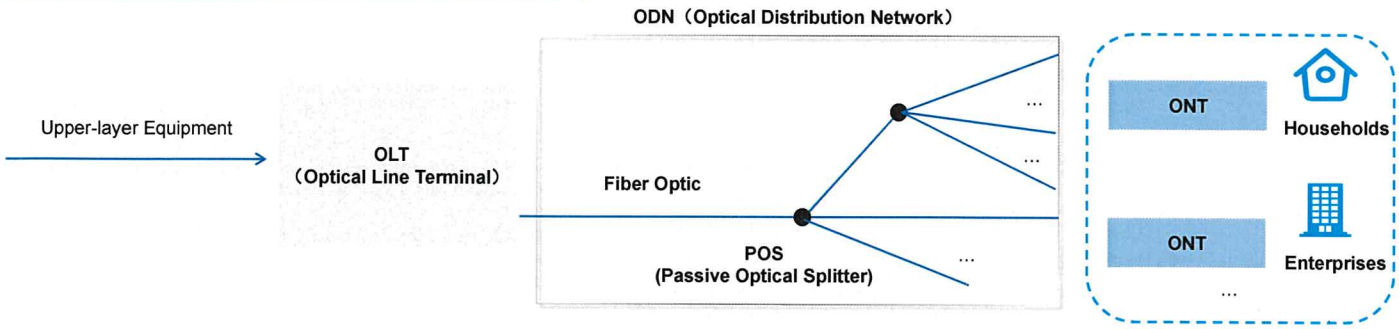
Source: Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Introduction to Optical Network Terminals

- An ONT box is a key optical network terminal device located at the user end of a fiber-optic access network, typically within a PON architecture. ONT boxes serve as the interface between the optical fiber infrastructure and the customer's local area network (LAN), converting optical signals transmitted over fiber into electrical signals for end-user devices.
- ONT boxes are widely applied in fiber-optic broadband access networks to enable high-speed internet, internet protocol television (IPTV), and voice over internet protocol (VoIP) services for residential, commercial, and industrial users. In fiber-to-the-home (FTTH) and fiber-to-the-building (FTTB) scenarios, ONT boxes are installed at customer premises to connect with the optical fiber and distribute broadband services within the home or building. In enterprise networks, ONT boxes support reliable and scalable data transmission for office connectivity and cloud-based services. In addition, ONT boxes are increasingly used in smart city infrastructure, campus networks, and industrial automation, where stable, low-latency communication is critical for real-time data exchange and intelligent control.
- In addition to ONT boxes, optical network terminals also include wireless gateways and home routers, and multimedia set-top boxes, as these products serve as key endpoints that connect optical communication networks to end-user applications by enabling data distribution, wireless access, or content delivery within home and businesses.

Overview of ONT Architecture



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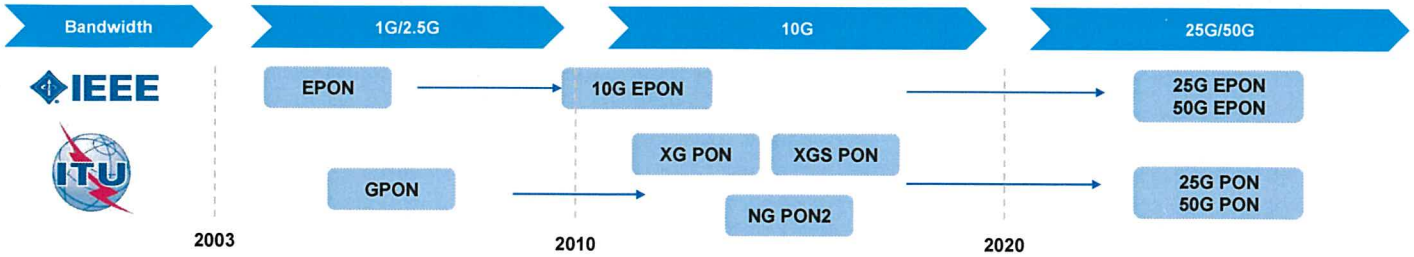
Source: Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Overview of PON Technology Evolution



GPON Technology

GPON (Gigabit Passive Optical Network) technology began its standardization process in 2003 and was commercially deployed in 2007. It has since become a widely adopted mainstream technology, especially in Fiber to the Home (FTTH) applications. The key features of GPON technology include support for downstream speeds of 2.5 Gbps and upstream speeds of 1.25 Gbps.

EPON Technology

EPON (Ethernet Passive Optical Network) technology commenced its standardization in 2004 and was commercially introduced in 2008. The primary feature of EPON is its use of Ethernet protocols, with support for downstream speeds of 1 Gbps and upstream speeds of 1 Gbps.

10G PON includes two main variants: 10G EPON and 10G GPON, with 10G GPON further divided into XG PON (asymmetric) and XGS PON (symmetric).

10G EPON

- Asymmetric: 10 Gbps downstream, 1 Gbps upstream; Symmetric: 10 Gbps for both downstream and upstream;
- Officially standardized in 2009 (IEEE 802.3av);
- Commercialized in the PRC in 2012 and driven by China Telecom and China Mobile, 10G EPON has been mainly adopted in Asia but is less prevalent in Europe and North America.

10G GPON

- XG PON (asymmetric): 10 Gbps downstream, 2.5 Gbps upstream; available since 2014;
- XGS PON (symmetric): 10 Gbps for both downstream and upstream; standardized in 2016;
- XG-PON is primarily used in the PRC, while XGS-PON dominates in Europe and North America, particularly in the U.S. **XGS-PON represents the latest generation of technology among the mainstream 10G PON solutions in the broadband sector.**

25G PON offers a downstream rate of 25Gbps and an upstream rate of 10Gbps, making it ideal for ultra-high-speed internet access and high-density user scenarios.

50G PON supports a downstream rate of 50Gbps and an upstream rate of 25Gbps, addressing the needs of large-scale data centers, 5G networks and the upcoming 6G networks.

With the growing demand for higher bandwidth, especially in data centers and large-scale applications, 25G PON and 50G PON technologies entered research and pilot phases in the early 2020s. **25G/50G PON is expected to be promoted in the coming years, and is expected to become the next-generation mainstream PON device in the broadband sector.**

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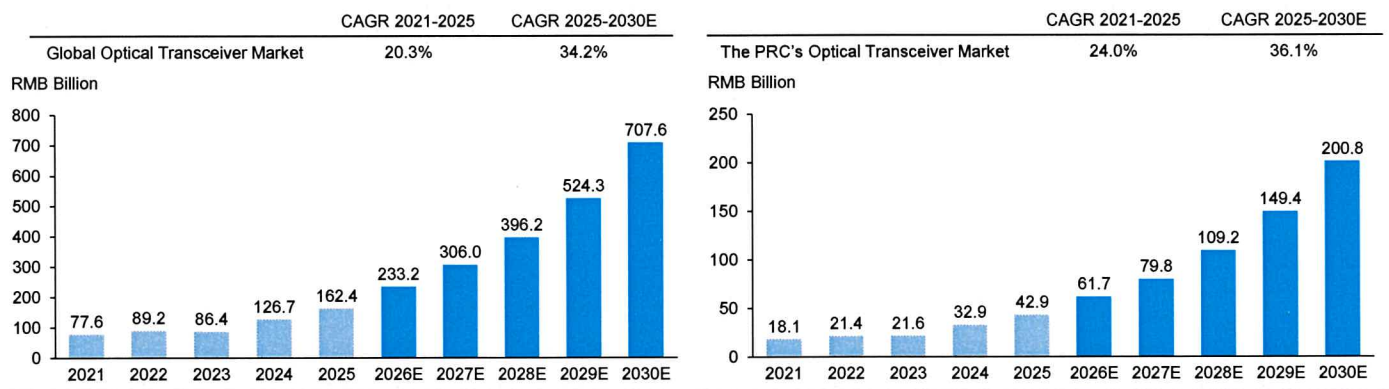
Source: Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Market Size of Optical Transceiver Industry

Sales Revenue of Optical Transceivers (Global and the PRC), 2021-2030E



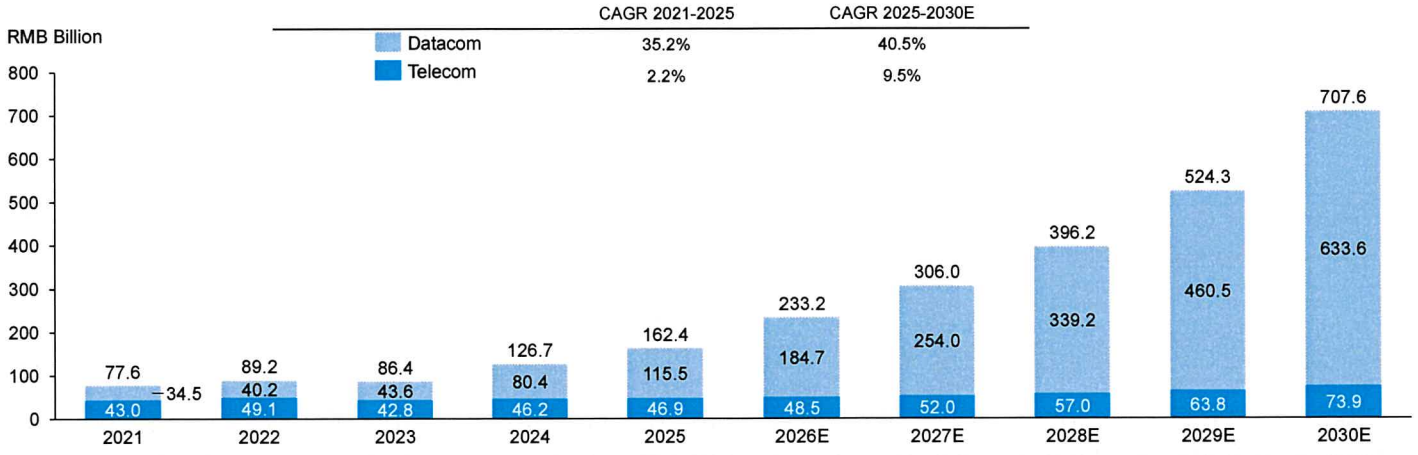
- Driven by the growing demand for high-speed data transmission and data-intensive applications such as AI, cloud computing, and 5G, the optical transceiver industry has been undergoing continuous technological innovation and industrial upgrading. The market size by sales revenue of the global optical transceiver industry grew from RMB77.6 billion in 2021 to RMB162.4 billion in 2025 at a CAGR of 20.3%. Demand from customers for product may fluctuate from time to time for various factors. For example, in 2023, the optical transceiver market experienced a downturn due to an industry-wide destocking cycle, following elevated stockpiling in prior years. Despite these challenges, optical transceivers remain a critical enabler of digital and intelligent transformation, and therefore are poised for long-term growth. With the rapid iteration and ongoing development of optical communication technologies, the global optical transceiver market is projected to reach RMB707.6 billion by 2030, representing a CAGR of 34.2% from 2025.
- In parallel, the PRC's optical transceiver market by sales revenue expanded from RMB18.1 billion in 2021 to RMB42.9 billion in 2025, achieving a CAGR of 24.0%. Looking ahead, the market is expected to reach RMB200.8 billion by 2030, with a CAGR of 36.1% from 2025. The PRC's share of the global optical transceiver market reached 26.0% in 2025 and is expected to rise further to 28% by 2030.

Source: LightCounting, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Market Size of Optical Transceiver Industry

Sales Revenue of Optical Transceivers by Application Segment (Global), 2021-2030E



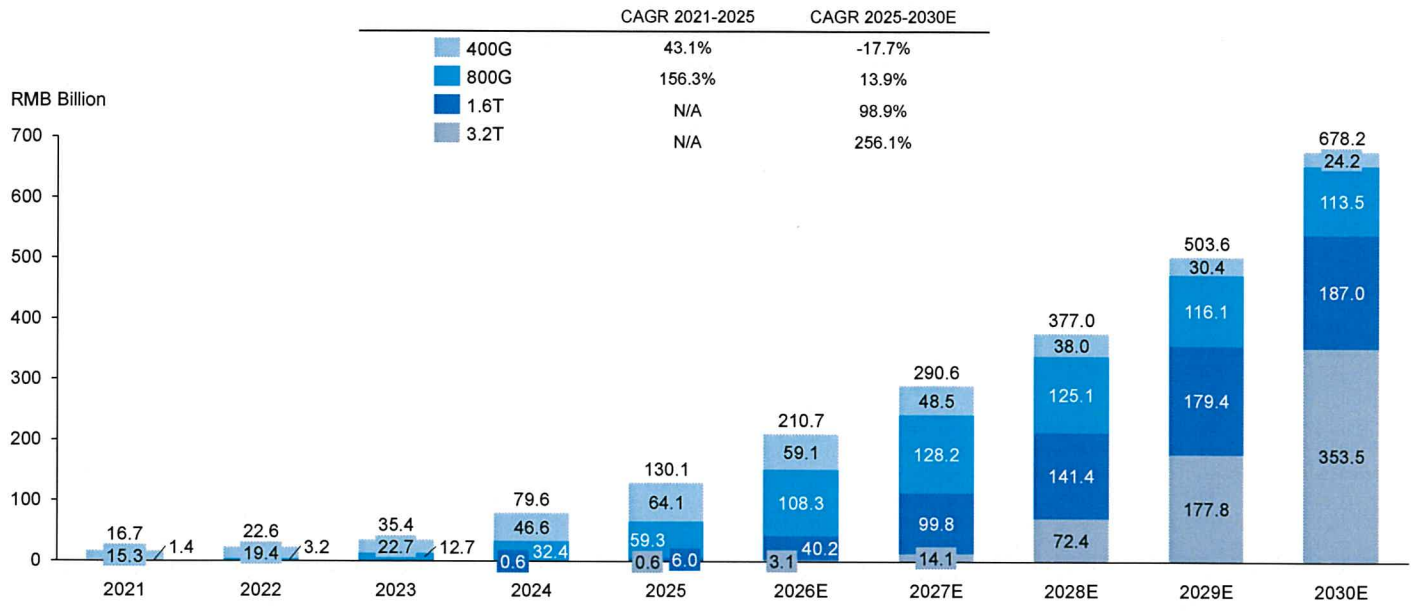
- In 2025, the datacom optical transceiver market reached approximately RMB115.5 billion, driven by the rapid expansion of data centers and advancements in AI. This segment is expected to grow significantly, reaching RMB633.6 billion by 2030, representing a CAGR of 40.5% from 2025.
- Meanwhile, the telecom optical transceiver market reached approximately RMB46.9 billion in 2025. Although the segment experienced slight declines in 2023 due to post-pandemic demand normalization, it is projected to recover, supported by the continued rollout of 6G networks and the development of next-generation optical communication technologies (e.g., 25G/50G PON). By 2030, the telecom segment is expected to reach RMB73.9 billion, with a CAGR of 9.5% from 2025.

Source: LightCounting, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Market Size of Optical Transceiver Industry

Sales Revenue of Major High-speed Optical Transceivers by Rate (Global), 2021-2030E



Source: LightCounting, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Market Size of Optical Transceiver Industry

- After the mass production of new optical transceiver products, their market share often grows quickly driven by rising demand, while the share of existing products correspondingly declines. Globally, 400G and higher-rate optical transceivers are becoming the mainstream of optical transceivers. Driven by the rapid expansion of data centers and cloud computing, high-speed optical transceivers, particularly those with transmission rate of 800G and above, are experiencing accelerated growth. The sales revenue of 800G optical transceivers achieved a CAGR of 156.3% from 2021 to 2025, and is projected to achieve a CAGR of 13.9% from 2025 to 2030. Meanwhile, 1.6T optical transceivers, representing the next-generation technology, are poised for explosive growth, driven by increasing demand for higher bandwidth, lower power consumption and AI-powered data processing. From 2025 to 2030, sales revenue of 1.6T optical transceivers is expected to grow at a CAGR of 98.9%. As hyperscale infrastructure continues to scale, 1.6T optical transceivers are on track to become mainstream, while 3.2T technology is already beginning to emerge on the horizon.

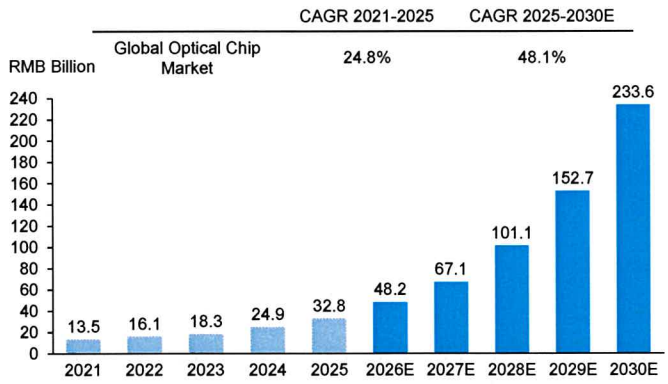
- The Company is one of the first optical transceiver manufacturers in China to have developed and mass-produced 800G and 1.6T optical transceivers.

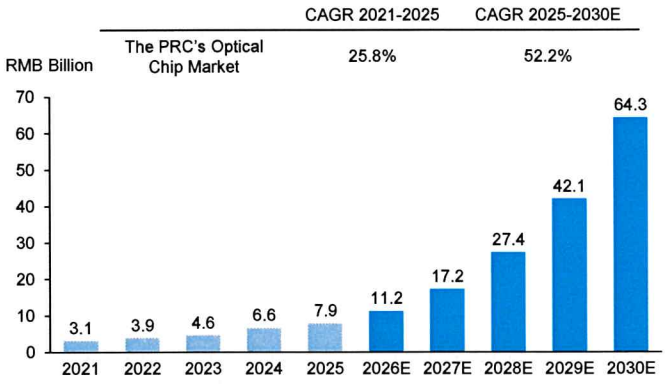
Source: LightCounting, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Market Size of Optical Chip Industry

Sales Revenue of Optical Chips (Global and the PRC), 2021-2030E





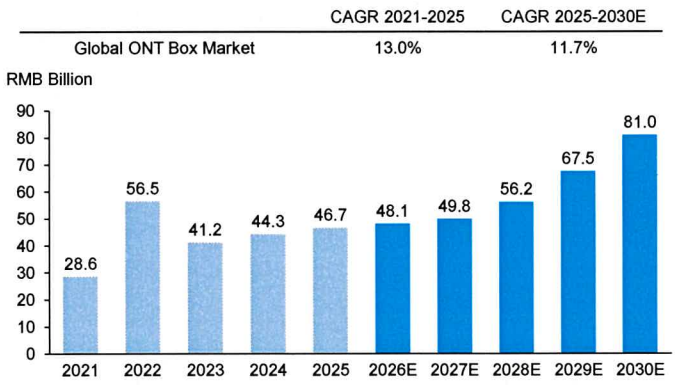
- The market size by sales revenue of the global optical chip industry increased from RMB13.5 billion in 2021 to RMB32.8 billion in 2025 at a CAGR of 24.8%. This surge has been fueled by the exponential growth of global data traffic, accelerated digital transformation across industries, and the widespread adoption of AI, 5G, and cloud computing, which have all driven demand for faster, more efficient optical communication technologies. As the core components of optical transceivers, optical chips are critical to enabling high-speed optical signal generation, modulation, and detection. They directly determine the transmission rate, power efficiency, and integration level of optical transceivers. With emerging technologies pushing the limits of speed, integration, and energy efficiency, optical chips are expected to remain a foundational enabler of next-generation optical communication. The global optical chip market by sales revenue is expected to maintain strong momentum, reaching RMB233.6 billion in 2030, with a CAGR of 48.1% from 2025. The PRC's optical chip market by sales revenue expanded from RMB3.1 billion in 2021 to RMB7.9 billion in 2025, achieving a CAGR of 25.8%. Looking ahead, the market is expected to reach RMB64.3 billion by 2030, representing a CAGR of 52.2% from 2025.

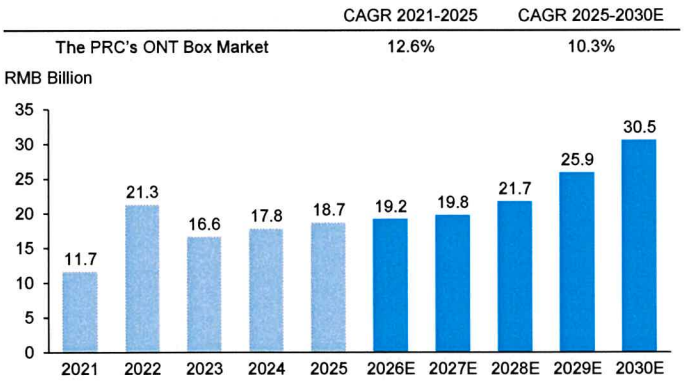
Source: LightCounting, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Market Size of ONT Box Industry

Sales Revenue of ONT Boxes (Global and the PRC), 2021-2030E





- Driven by rapid global deployment of FTTx networks and increasing demand for high-speed and stable connectivity, the global market size by sales revenue of the ONT box segment increased from RMB28.6 billion in 2021 to RMB46.7 billion in 2025, with a CAGR of 13.0%. The ONT box market saw relatively low demand in 2021, mainly because of supply chain disruptions and telecom operators' cautious investments during the COVID-19 pandemic. A notable peak occurred in 2022, driven by the post-pandemic recovery in infrastructure construction, government stimulus programs, and accelerated fiber network rollouts. The market later experienced a slight decline in 2023 due to the normalization of demand. Looking ahead, the global ONT box market is expected to keep an upward trend, reaching RMB81.0 billion in 2030, representing a CAGR of 11.7% from 2025. This sustained growth is underpinned by the global shift toward gigabit and 10G broadband, and the continued expansion of smart home and IoT applications. The PRC's ONT box market by sales revenue expanded from RMB11.7 billion in 2021 to RMB18.7 billion in 2025, achieving a CAGR of 12.6%. Looking ahead, the market is expected to reach RMB30.5 billion by 2030, with a CAGR of 10.3% from 2025.

Source: LightCounting, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Market Drivers and Developing Trends Analysis (1/3)

Policy-Driven Expansion of FTTx and AI Infrastructure

- Governments worldwide are actively promoting the development of broadband and AI infrastructure through strategic policy support, accelerating demand for optical communication products. Large-scale deployment of FTTx networks, driven by initiatives of different countries and regions, has boosted the adoption of ONT boxes, enabling high-speed access across residential and enterprise settings. For example, the PRC is actively advancing the "Gigabit Optical Network" initiative and the "Eastern Data, Western Computing" project, aiming to achieve universal gigabit access capabilities by 2025. In the United States, the Infrastructure Investment and Jobs Act passed in 2021 allocated US$1.2 trillion for various infrastructure projects, including US$65 billion specifically for improving broadband access and quality. Similarly, in 2021, the European Union released the "2030 Digital Compass: the European Way for the Digital Decade" plan, aiming to ensure gigabit network coverage for all households by 2030. At the same time, global efforts to build AI-related infrastructure, including data centers and cloud computing platforms, are generating strong demand for high-performance optical transceivers. For instance, the recent announcement of the Stargate Project in January 2025 intends to invest US$500 billion over the next four years building new AI infrastructure in the U.S. The PRC government strongly supports the rapid development of optical communication and AI technology through a series of policies, such as the "Guidance on the Construction of National Data Infrastructure" and the "Guideline for the Establishment of the National Comprehensive Standardization System for the AI Industry (2024 Version)." These policies encourage increased construction of optical fiber networks and support the construction of data centers and cloud computing infrastructure. Guided by these policies, the global optical communication core products industry is ushering in new development opportunities.

Application of AI Technology

- The rapid advancement of AIGC and other AI technologies is significantly boosting the AI industry, resulting in surging demand for high-performance computing platforms. Recent breakthroughs in large language models are lowering the barrier of AI adoption. This surge in consumer applications, driven by reduced training costs, is attracting more companies and fostering an AI ecosystem that further accelerates the demand for computing power. To meet the massive data processing demands of large-scale data transmission, real-time computing, and AI training, optical transceivers, as core components for data transmission, offer the advantages of higher bandwidth, lower latency, and longer transmission distances. Therefore, optical transceivers will serve as crucial components enabling the development of AI technology, providing solid support for the growth in computing power demand and real-time data processing.

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Source: U.S. Government, National Development and Reform Commission, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Market Drivers and Developing Trends Analysis (2/3)

Development of Advanced PON Technologies

- With the acceleration of global digital transformation and the development of emerging technologies, advanced PON technology meets the urgent need for higher bandwidth and lower latency in the market. 10G PON technology has become the mainstream solution for telecommunication operators to deploy gigabit networks and meet the growing demand for broadband. Meanwhile, with the accelerated application of emerging technologies such as AI and IoT, the industry's demand for higher bandwidth and greater data processing capabilities has increased significantly, driving the emergence of 25G/50G PON technology. In addition, the continuously evolving PON technologies will also lead to upgrades in hardware configurations of optical network terminals by improving transmission speeds and network capacity. The advancement of emerging technologies will also continuously drive the development of optical communication products toward the direction of increasing integration and level of intelligence.

Application of 5G and Emerging 6G Technologies

- The rollout of 5G and the ongoing development of 6G are accelerating upgrades in wireless communication networks, driving demand for faster, higher-capacity, and more reliable data transmission. To support growing network traffic and denser base station deployments, telecommunication operators are increasingly adopting optical transceivers for wireless front-haul/back-haul connections. Optical transceivers play a key role in ensuring low-latency, high-bandwidth links between different network units. In the future, as 6G moves closer to commercialization, with expectations for even greater speeds and more complex applications such as immersive communication and intelligent sensing, the need for advanced optical transceivers will continue to grow, fueling sustained innovation across the optical communication industry.

Increasing Demand for High-speed Optical Transceivers

- Driven by technologies such as cloud computing and AI, the construction of global data centers is entering a period of rapid growth, with surging data traffic driving demand for higher bandwidth and lower-latency communication capabilities. High-speed optical transceivers (such as 400G, 800G, and 1.6T ones), known for their high transmission rates, have become key components for interconnecting devices within and between data centers. They not only support high-performance tasks such as large-scale parallel computing and AI training/inference, but also ensure the efficient flow of data across the cloud, edge and terminal layers. At the same time, the iteration of optical transceiver technology is accelerating. The technological leap from 100G to 400G and then to 800G was achieved within just a few years, and 1.6T optical transceivers are entering the large-scale commercial application stage. The launch cycle for each product generation is becoming progressively shorter, signaling the market's entry into a phase of rapid updates. Leading manufacturers are leveraging their technological advantages to accelerate the development of next-generation products, address the growing needs of data centers and AI clusters, and drive innovation and implementation of cutting-edge technologies across the industry.

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Source: U.S. Government, National Development and Reform Commission, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Market Drivers and Developing Trends Analysis (3/3)

Evolving of Frontier Technologies in Optical Transceivers

- Driven by strong downstream demand, companies in the optical transceiver industry are actively advancing R&D in emerging technologies. For example, SiPh-based optical transceiver technology, an advanced solution built on silicon substrates, leverages mature CMOS processes to develop and integrate optical components and transceivers. Optical transceivers embedded with silicon photonic elements are increasingly adopted in high-density, high-speed, and highly-integrated application scenarios such as data centers, and are expected to become a key solution to meet growing bandwidth and energy efficiency demands. In parallel, the development of innovative packaging technologies, such as near-packaged optics (NPO), co-packaged optics (CPO), linear receive optics (LRO), and linear-drive pluggable optics (LPO), are further enhancing the performance and energy efficiency of optical transceivers. LRO is a half-linear approach yielding high power savings while keeping the DSP only at the transmitter side to maintain flexibility and scalability of a DSP-based transceiver model. LPO, by removing digital signal processors (DSP), significantly reduces power consumption and is emerging as a key trend of future optical communications. NPO and CPO shorten the transmission path between the two components, thereby improving electrical signal integrity and reducing energy consumption. As these emerging technologies mature, they are expected to reshape the industry's competitive landscape. Companies that take the lead in deploying cutting-edge optical transceiver technologies will gain a significant first-mover advantage, strengthening their position in an increasingly competitive market.

Strengthening of Vertically Integration Capabilities

- In recent years, leading optical transceiver manufacturers in the PRC have been actively enhancing their vertical integration capabilities, building a collaborative, full-industry-chain system that spans optical transceivers, optical chips and optical network terminals. By extending upstream, these companies have begun developing and mass-producing core optical components, achieving notable breakthroughs in optical chips such as EML chips. Meanwhile, these manufacturers are expanding downstream into optical network terminals such as ONT boxes, thereby covering the entire optical network value chain, from data centers to transmission networks, access networks, and terminal applications. By strengthening their industry chain integration, such companies are not only enhancing product compatibility but also improving their responsiveness to evolving market demands and accelerating product iteration, thereby improving customer retention. This, in turn, boosts their overall competitiveness in a rapidly advancing technological landscape.

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Source: U.S. Government, National Development and Reform Commission, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Industry Barrier Analysis (1/2)

1 Technological Research and Development Barrier

- The majority of optical communication core products are characterized by exceptionally high technical entry barriers. Core technologies span cutting-edge fields such as silicon photonics, low-power high-speed optical communication, and high-density modular integration. These areas require a deep understanding of multiple fields, including materials science, optoelectronic integration, photonic packaging, and microelectronics. A notable feature of the optical communication core products industry is that technologically advanced products launched ahead of peers may gain early-mover advantages. To remain competitive, companies must commit to long-term, sustained R&D investment and continuously adapt to rapid technological iterations. To accelerate R&D cycles and improve product quality amid rapid technical evolution, leading players often continuously enhance their smart manufacturing, automated testing, and AI-assisted design capabilities. In contrast, firms lacking strong R&D foundations, cross-domain integration capabilities, and iterative R&D mechanisms face significant technological barriers in the market.

2 Customer Barrier

- The primary customers of optical transceivers mainly include cloud service providers, telecom operators, and telecom and network equipment vendors. These customers demand high standards in product performance, reliability, delivery lead time, and service capability. Due to the large scale and strategic importance of the procurement activities, customers are highly cautious in selecting suppliers. It may take up to several years of verification, pilot deployment, and relationship-building before full-scale orders are placed. High customer stickiness and switching costs create significant entry barriers for new players.

3 Product Comprehensiveness Barrier

- The ability to offer a complete product portfolio, from optical chips to optical transceivers and optical network terminals, enables companies to deliver integrated solutions and achieve technical and resource synergies. Leading companies are active in high-speed optical transceivers and advanced optical network terminals, while also investing in the development of high-speed optical chips. This vertical integration enhances their ability to ensure supply chain stability, accelerate iteration, and reduce overall cost. Such comprehensive product portfolios, which are difficult to replicate in a short time, enable companies to lock in customers with one-stop solutions. For new entrants without full-stack capabilities or internal chip R&D, breaking into mid-to-high-end segments remains highly challenging.

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Source: Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Industry Barrier Analysis (2/2)

4 Globalization Barrier

- The optical communication core product industry serves a global customer base, requiring companies to have international R&D, manufacturing, and sales capabilities. Leading industry players build localized service operations and global logistics and sales networks to respond quickly to customer needs, improving delivery efficiency and service satisfaction. Constructing such global infrastructure requires not only significant capital investment but also deep operational expertise, mature internal management systems, and long-term partnerships with global customers. These are capabilities that cannot be built overnight, thus forming a formidable barrier to market entry for emerging companies.

Source: Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Policies and Regulations (1/2)

Policies / Plans	Release Date	Issuing Agency / Country	Content
Notice on Launching Special Work on 10 Gigabit Optical Network	2025.1	MIIT	The document proposes that by the end of 2025, in cities and regions with favorable conditions and solid foundations, pilot programs for 10-gigabit optical networks will be carried out, focusing on key scenarios such as residential communities, factories, and industrial parks. These pilots will implement technologies including 50GPON ultra-broadband optical access, coordination between FTTH/FTTR and the 7th generation wireless local area networks, high-speed and high-capacity optical transmission, and the integration of optical networks with artificial intelligence.
Guidance on the Construction of National Data Infrastructure	2024.12	NDRC, National Data Administration, MIIT	The guidance mentions that network infrastructure and computing power infrastructure should adapt to the needs of data value release, upgrading and developing towards high-speed data transmission and efficient computing power supply. It is necessary to accelerate the green development and organic synergy of diverse heterogeneous computing power, such as general-purpose computing power, intelligent computing power, and supercomputing power. Further, it is essential to facilitate 400G/800G high-bandwidth all-optical connections between national hub nodes and demand locations, guide telecommunications operators and others to enhance the efficiency of 'public transmission channels,' and advance the deep integration of computing and network.
Guideline for the Establishment of the National Comprehensive Standardization System for the AI Industry (2024 Version)	2024.6	MIIT and other three ministries	The guideline indicates that by 2026, the linkage between standards and industrial technological innovation will continue to improve. Over 50 new national and industry standards will be formulated, accelerating the formation of a standard system that leads the high-quality development of the AI industry. More than 1,000 enterprises will participate in standard dissemination and implementation promotion, further highlighting the effectiveness of standards serving enterprise innovation and development. Participation in the formulation of over 20 international standards will promote the globalization of the AI industry.
Implementation Opinions of Seven Ministries Including the MIIT on Promoting the Innovative Development of Future Industries	2024.1	MIIT and other six ministries	This opinion strengthens new infrastructure, thus deeply advancing the construction of 5G, computing power infrastructure, the industrial internet, IoE, the internet of vehicles (IoV), and gigabit optical networks. Further, this opinion guides major scientific and technological infrastructure to serve future industries, deepens the sharing of facilities, equipment, and data, and accelerates the transformation and application of cutting-edge technologies.
Opinions on Deepening the Implementation of the "Eastern Data, Western Computing" Project And Accelerating the Construction of a National Integrated Computing Network	2023.12	NDRC, MIIT, National Data Administration, Cyberspace Administration of China, National Energy Administration	The policy proposes that by the end of 2025, a comprehensive computing power infrastructure system that is inclusive, user-friendly, green, and secure will begin to take shape. The coordination mechanism for computing power between the eastern and western regions will be gradually improved, and diverse forms of computing power—including general-purpose, intelligent, and supercomputing—will accelerate in their concentration and development.

Source: The U.S. Congress, MIIT, NDRC, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Policies and Regulations (2/2)

Policies / Plans	Release Date	Issuing Agency / Country	Content
The Stargate Project	2025.1	The U.S.	The Stargate Project is a new company which intends to invest USD500 billion over the next four years building new AI infrastructure for OpenAI in the U.S.. The country plans to deploy USD100 billion. This infrastructure will secure American leadership in AI, create hundreds of thousands of American jobs and generate massive economic benefit for the entire world. This project will not only support the re-industrialization of the U.S. but also provide a strategic capability to protect the national security of America and its allies.
Bipartisan House Task Force Report on AI	2024.12	The 118th Congress	This report enforces to promote AI Innovation, specifies the US federal government leadership in responsible use of AI, sector-specific policies, etc. This report make recommendations on multiple tasks including taking an information and systems-level approach to the use of AI in the federal government, support flexible governance of AI industry, requiring that agencies provide notification of AI's role in governmental functions, facilitating and adopting AI standards for federal government use, supporting NIST in developing guidelines for federal AI systems, strengthening the understanding of the federal government's AI workforce needs, and supporting different pathways into federal service for AI talent.
Infrastructure Investment and Jobs Act: Broadband Affordability and Infrastructure	2021.11	The 117th Congress	The act will allocate USD1.2 trillion for various infrastructure projects, including USD65 billion specifically for improving broadband access and quality. The Broadband Equity, Access, and Development Program will be established and be administrated by the National Telecommunications and Information Administration. The National Telecommunications and Information Administration will allocate the $42.5 billion of the Broadband Equity, Access, and Development Program.
2030 Digital Compass: the European way for the Digital Decade	2021.3	European Commission	The policy set the objective of connectivity that all European households will be covered by a Gigabit network, with all populated areas covered by 5G by 2030.

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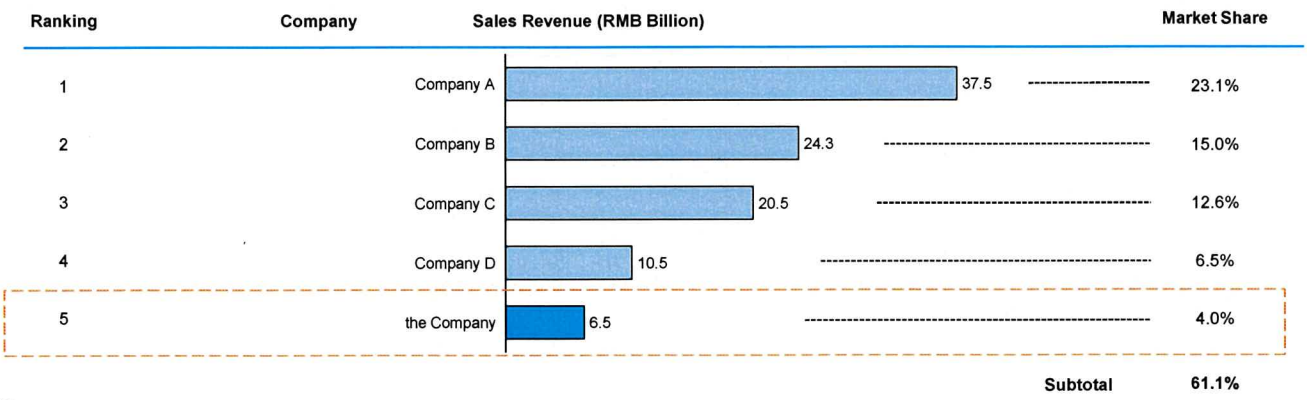
Source: The U.S. Congress, MIIT, NDRC, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Competitive Landscape of Optical Transceiver Industry

Ranking of Specialized Optical Transceiver Manufacturers by Sales Revenue (Global), 2025



Notes:

1. *Company A is a company listed on the Shenzhen Stock Exchange and the Hong Kong Stock Exchange. It was established in 2005, with a business focus on the development and manufacturing of optical transceivers.*
2. *Company B is a company listed on the Shenzhen Stock Exchange and established in 2008, which is a manufacturer of optical transceivers.*
3. *Company C is a company listed on the New York Stock Exchange and established in 1966, which is a vertically integrated manufacturing company that develops, manufactures, and markets lasers, transceivers, and other optical and optoelectronic devices, modules, and systems, as well as engineered materials, for use in the communications, industrial, instrumentation and electronics markets.*
4. *Company D is a company listed on the Shenzhen Stock Exchange and established in 2001, which is a developer and manufacturer of optoelectronic components and modules, including optical transceivers.*

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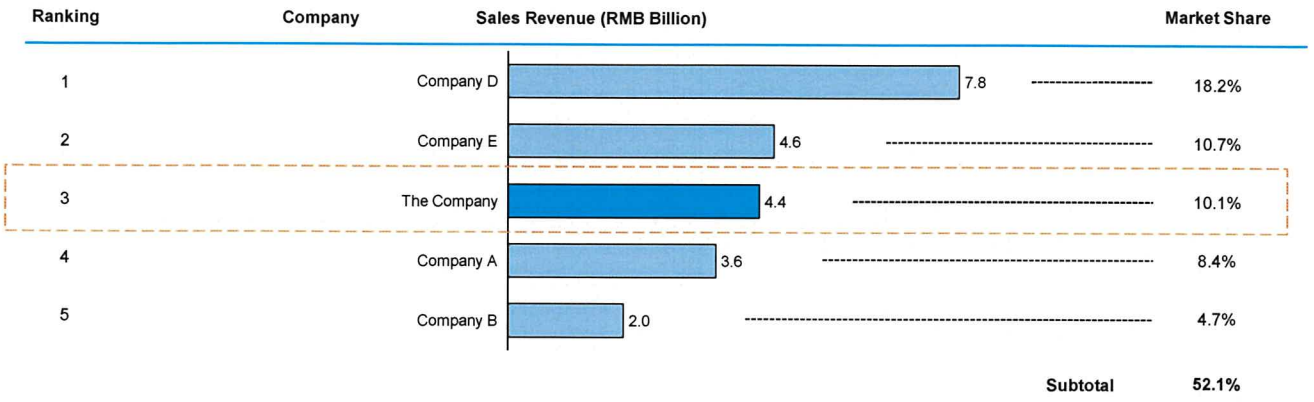
Source: Annual Reports of Listed Companies, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Competitive Landscape of Optical Transceiver Industry

Ranking of Specialized Optical Transceiver Manufacturers by Sales Revenue (the PRC), 2025



Notes:

1. *Company E is a private company established in 2002, which is a developer and manufacturer of optical transceivers. Company E is a subsidiary of a company listed on the Shenzhen Stock Exchange.*

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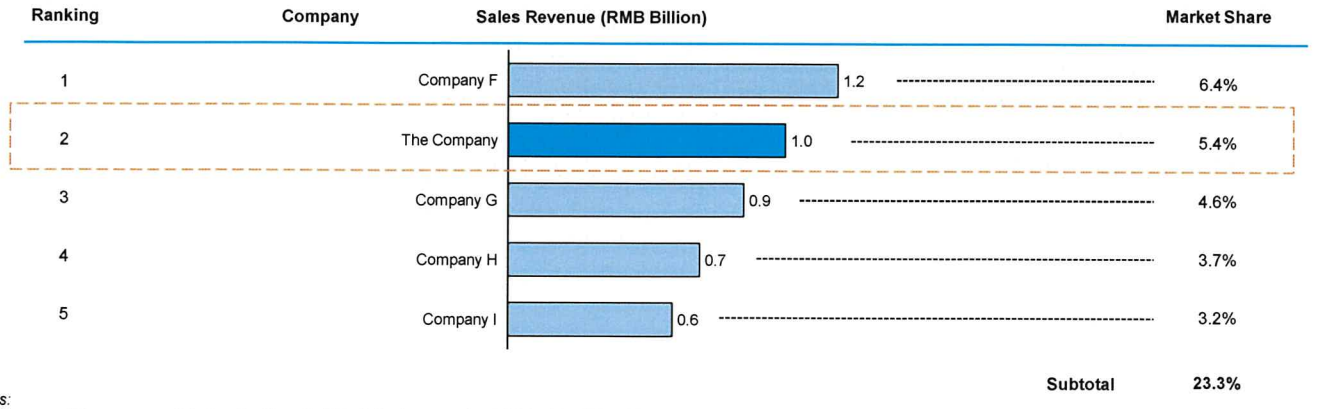
Source: Annual Reports of Listed Companies, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Competitive Landscape of ONT Box Industry

Ranking of Specialized ONT Box Manufacturers by Sales Revenue (the PRC), 2025



Notes:

1. *Company F is a company listed on the Shanghai Stock Exchange and established in 1998, with a business focus on the development and manufacturing of network communication products, including ONT boxes.*
2. *Company G is a company listed on the Shenzhen Stock Exchange and established in 2001, which specializes in the design and manufacturing of broadband network terminal equipment, including ONT boxes.*
3. *Company H is a private company established in 2009, with a business focus on the development, manufacturing and sales of optical transmission equipment, including ONT boxes.*
4. *Company I is a company listed on the Shenzhen Stock Exchange established in 2002, which is a developer and manufacturer of smart terminals, including broadband terminals and set-top boxes.*

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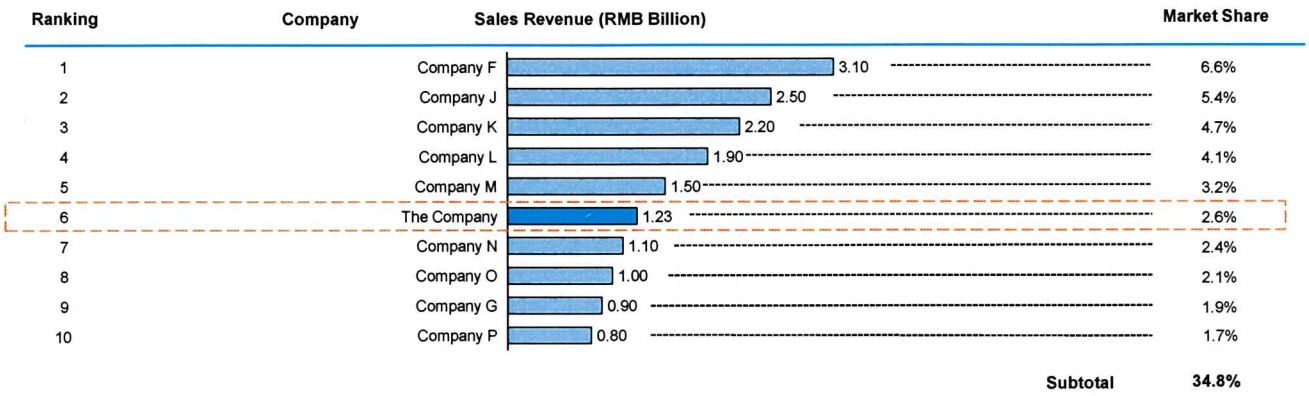
Source: Annual Reports of Listed Companies, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Competitive Landscape of ONT Box Industry

Ranking of Specialized ONT Box Manufacturers by Sales Revenue (Global), 2025



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Source: Annual Reports of Listed Companies, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Competitive Landscape of ONT Box Industry

Notes:

1. *Established in 2006, Company J is a company listed on the Shanghai Stock Exchange and the Hong Kong Stock Exchange, with a business focus on the development and manufacturing of high-speed optical transceivers, wireless and broadband access, carrier Ethernet and edge computing, including ONT boxes.*
2. *Company K is a company listed on the Taiwan Stock Exchange and established in 2003, which specializes in the design and manufacturing of broadband/wireless/multimedia products, including ONT boxes.*
3. *Company L is a company listed on the Taiwan Stock Exchange and established in 1992, whose product portfolio includes FTTx poducts, cable DOCSIS equipment, integrated access devices (IAD), small cells, smart home, mobile IoT and SMB products, including ONT boxes.*
4. *Company M is a company listed on the Taiwan Stock Exchange and established in 2003, which specializes in networking products, including ONT boxes.*
5. *Company N is a company listed on the Taiwan Stock Exchange and established in 1989, which has a portfolio of mobile and fixed-line broadband access products, including ONT boxes.*
6. *Company O is a company listed on the Taiwan Stock Exchange and established in 1996, which specializes in the design and manufacturing of communication products, including ONT boxes.*
7. *Company P is a company listed on the Taiwan Stock Exchange and established in 1988, which primarily engages in the development and manufacture of networking and communication solutions, including ONT boxes.*

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Source: Annual Reports of Listed Companies, Interviews with industry experts by Frost & Sullivan, Frost & Sullivan

Overview of Global Optical Communication Core Products Industry

Raw Material Price Analysis

Optical chip is one of the major raw materials of optical transceivers. To meet the growing demand for higher transmission speeds in downstream applications such as data centers and telecom networks, optical chips are continuously evolving toward higher data rates and greater power output. As a result, the overall price level of optical chips has exhibited an upward trend in recent years. However, significant price differences exist among optical chips of different speeds. For a single type of optical chip, as shipment volumes increase, manufacturing technologies mature, and Chinese optical chip manufacturers enhance their localization capabilities, the price of the same model has shown a gradual decline. This trend is expected to continue as next-generation high-speed and high-power optical chips enter large-scale production.

Overview of Global Optical Communication Core Products Industry

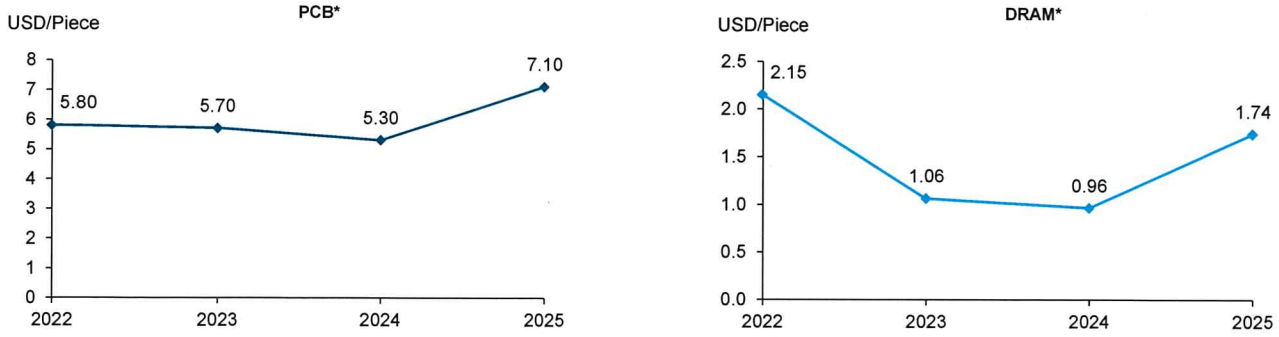
Raw Material Price Analysis

PCB is another essential raw material used in optical transceivers, mainly serving as the substrate for circuit integration and component interconnection. In the past, PCB prices remained relatively stable, supported by mature manufacturing technologies and a well-established supply chain. However, in 2025, driven by rising copper prices and stronger downstream demand from data centers and AI-related applications, the prices of PCBs used in optical transceivers increased noticeably. Looking ahead to 2026, PCB prices are expected to maintain a relatively fast growth trend, as demand for high-speed and high-performance PCB materials continues to rise.

DRAM chips are widely used in optical network terminals. After a significant price increase in 2021 driven by pandemic-related demand for consumer electronics, DRAM prices entered a downward cycle before rebounding in 2025. Since the fourth quarter of 2025, DRAM prices have shown a clear increase, with the average price of the selected specification in the chart further rising to approximately USD3.68 per piece in December 2025. This increase has been mainly driven by the rapid expansion of AI computing demand and shipment controls by major original manufacturers. Given the continued growth of AI servers and data center infrastructure, DRAM prices are expected to maintain an upward trend in 2026.

As a result of tightening supply and rising prices of core raw materials such as PCB and DRAM, the optical transceiver industry is expected to face increasing pressure from upstream cost fluctuations. This will likely lead to higher requirements for advance procurement, inventory management and supply chain coordination among optical transceiver manufacturers, in order to mitigate the risks associated with raw material price volatility and potential supply constraints.

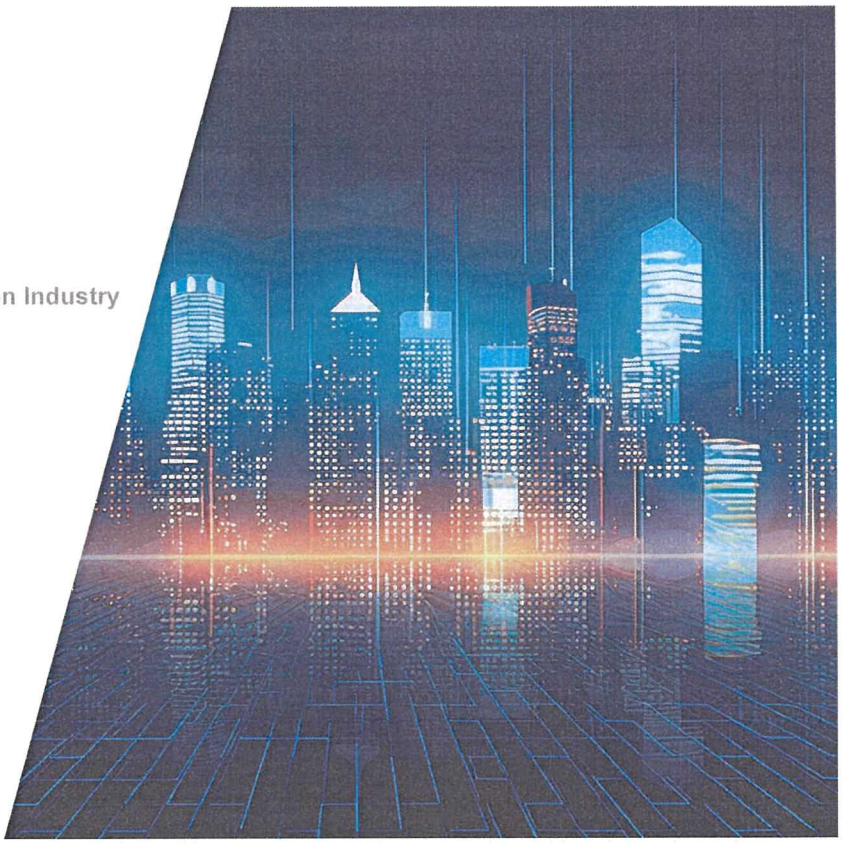
Average Price of PCB and DRAM Chip (Global), 2022-2025



Source: WIND, Frost & Sullivan

**Notes: Refer to NAND Flash(32Gb 4Gx8 MLC) and DRAM:DDR3(4Gb(512Mx8),1600MHz); Due to the price variations among different chip models and types, the selected chip prices above do not represent the industry average.*

Agenda



1 Overview of Global Optical Communication Industry

2 Overview of Optical Communication Core Products Industry

3 **Appendix**

Supporting Statements

- The Company is one of the first optical transceiver manufacturers in China to have developed and mass-produced 800G and 1.6T optical transceivers.
- The Company is one of the first optical transceiver manufacturers globally to have developed 50G PON optical transceivers.
- The Company is one of the first manufacturers in China to have developed and mass-produced 10G EML laser chips.
- The Company is one of the first optical transceiver manufacturers in China to have developed and mass-produced 400G SiPh-based optical transceivers.
- The Company is one of the first manufacturers worldwide to have developed and mass-produced 10G PON optical transceivers.
- The Company is one of the first optical transceiver manufacturers in China to have developed and produced optical chips.
- The Company's Jiangmen facility established a fully automated production line for medium- and low-rate optical transceivers in 2016, and its Qingdao facility launched a fully automated testing line for PON products in 2023, each of which was one of the first in our industry in China.
- It is not uncommon to have overlapping customers/suppliers in the optical communication industry.
- The industry in which the Company operate is highly competitive and fragmented.

Research Methodologies

- Frost & Sullivan is an independent global consulting firm, which was founded in 1961 in New York. It offers industry research and market strategies and provides growth consulting and corporate training. Its industry coverage includes automotive and transportation, chemicals, materials and food, commercial aviation, consumer products, energy and power systems, environment and building technologies, healthcare, industrial automation and electronics, industrial and machinery, and technology, media and telecom.
- The Frost & Sullivan's report includes information on optical communication core products Industry.
- Frost & Sullivan has conducted detailed primary research which involved discussing the status of the industry with certain leading industry participants and conducting interviews with relevant parties. Frost & Sullivan has also conducted secondary research which involved reviewing company reports, independent research reports and data based on its own research database. Frost & Sullivan has obtained the figures for the estimated total market size from historical data analysis plotted against macroeconomic data as well as considered the above-mentioned industry key drivers.
- Frost & Sullivan's Market Engineering Forecasting Methodology integrates several forecasting techniques with the Market Engineering Measurement-based System. It relies on the expertise of the analyst team in integrating the critical market elements investigated during the research phase of the project. These elements include:
  - ✓ Expert-opinion forecasting methodology
  - ✓ Integration of market drivers and restraints
  - ✓ Integration with the market challenges
  - ✓ Integration of the Market Engineering Measurement trends
  - ✓ Integration of econometric variables
- In compiling and preparing the Report, Frost & Sullivan has adopted the following assumptions:
  - ✓ The social, economic and political environment of the world and China is likely to remain stable in the forecast period
  - ✓ Related industry key drivers are likely to drive the market in the forecast period