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The digital transformation, recognized as a pivotal driver of global economic expansion, is fundamentally supported by the rapid deployment of next-generation information infrastructure, thereby establishing a solid foundation for intelligent connection. Fundamental breakthrough technologies have systematically alleviated the key bottlenecks associated with the transmission of massive volume of data, further driving continuous innovation across a broad spectrum of electronic components. As the result of the integration of 5G, IoT, and AI related technologies, data traffic is experiencing exponential growth globally, placing increasingly stringent requirements on data transmission rates, reliability, and low latency. These technical advancements provide indispensable physical and technical enablers for seamless cross-device collaboration, human-machine interaction, and high-efficiency data transmission.

OVERVIEW OF THE GLOBAL PCB INDUSTRY

Printed circuit boards (PCBs) serve as a fundamental component in electronic devices, providing critical functions such as precise electrical interconnection, low-loss signal transmission, and mechanical support for components. The continuous advancement in performance of electronic devices is driving increasingly stringent requirements for PCBs, particularly in terms of higher circuit density, enhanced signal integrity, and improved thermal management, which in turn directly fuels technological upgrades within the PCB industry.

Value Chain Analysis of the Global PCB Industry

The upstream of the global PCB industry value chain includes suppliers of raw materials and base materials. Raw materials encompass copper, glass fiber yarn, wood pulp, and synthetic resin, while base materials mainly refer to copper-clad laminates. The midstream consists of PCB manufacturers, which are responsible for the research, development, and production of PCB products. The types of products manufactured include FPCs, RPCBs, rigidflex PCBs, and package substrates. The downstream refers to application scenarios, covering a wide range of industries such as consumer electronics, automotive, telecommunication equipment, and data centers.

Market Size of the Global PCB Industry by Application

PCB products can be customized to address evolving application requirements through tailored design choices, specialized materials, and advanced manufacturing processes. PCBs are extensively utilized across various sectors, including consumer electronics, automotive, data centers, and telecommunications.

- **Consumer Electronics:** A specialized category of PCBs provides mechanical support and interconnections for electronic components in devices. Its product designs and technical parameters are closely aligned with the core characteristics of consumer electronics, including slim profiles, compact forms, lightweight construction, and rapid iteration cycles.

- **Automotive:** Automotive PCBs are PCBs specifically designed and manufactured for automotive electronic systems. They serve as supports for electronic components while enabling electrical connections and signal transmission between these components. These PCBs are widely applied in areas such as electrification systems, intelligent driving systems, and body control systems.

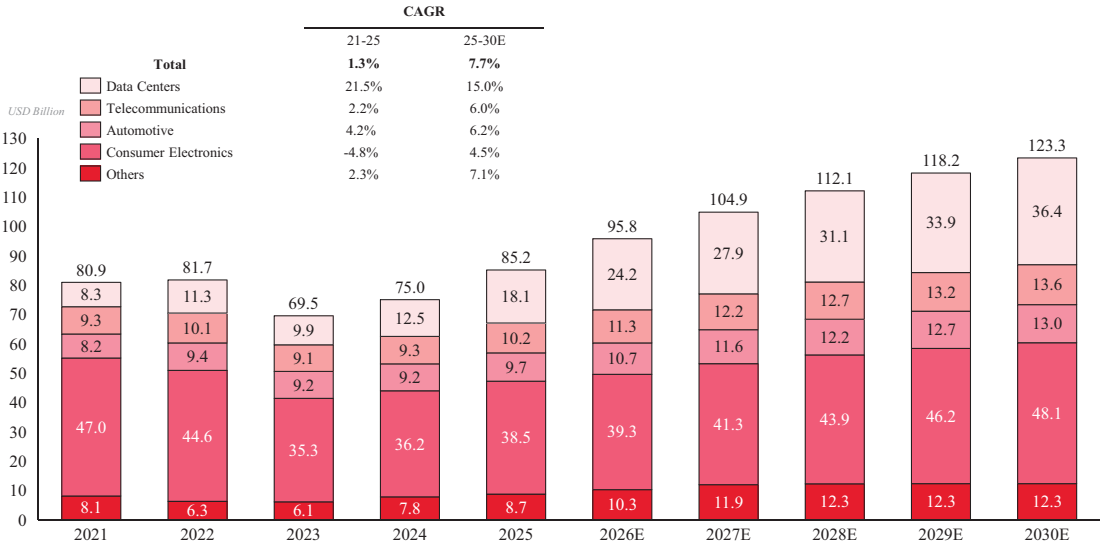
- **Data Centers:** A specialized category of PCBs mainly support the operation of general-purpose servers and AI servers, and data center switches. Data center PCBs are typically high-layer-count

PCBs and HDI that utilizing high-speed materials to facilitate massive data exchange among GPU/CPU clusters and enable high-speed signal transmission.

- **Telecommunications:** This category refers to PCB used in wired or wireless network transmission, including communication base stations, routers, switches, antennas, RF devices and backbone network transmission. The demand for PCBs within telecommunications equipment is predominantly for MLPCBs. Furthermore, 5G communication equipment imposes more stringent requirements on PCB processes and materials, necessitating capabilities for high-frequency and high-speed performance.

In 2025, the global PCB market recorded US$18.1 billion for data centers, US$10.2 billion for telecommunications, US$38.5 billion for consumer electronics and US$9.7 billion for automotive. Supported by AI and industrial intelligentisation, the four segments are forecast to rise to US$36.4 billion, US$13.6 billion, US$48.1 billion and US$13.0 billion by 2030, with corresponding CAGRs of 15.0%, 6.0%, 4.5% and 6.2% respectively. The global PCB market declined from US$81.7 billion in 2022 to US$69.5 billion in 2023, due to sluggish consumer and data center demand, macroeconomic headwinds and conservative cloud investment reduced overall PCB needs, while supply-demand imbalance intensified industry price competition.

Market Size of the Global PCB Market, by Application, 2021–2030E



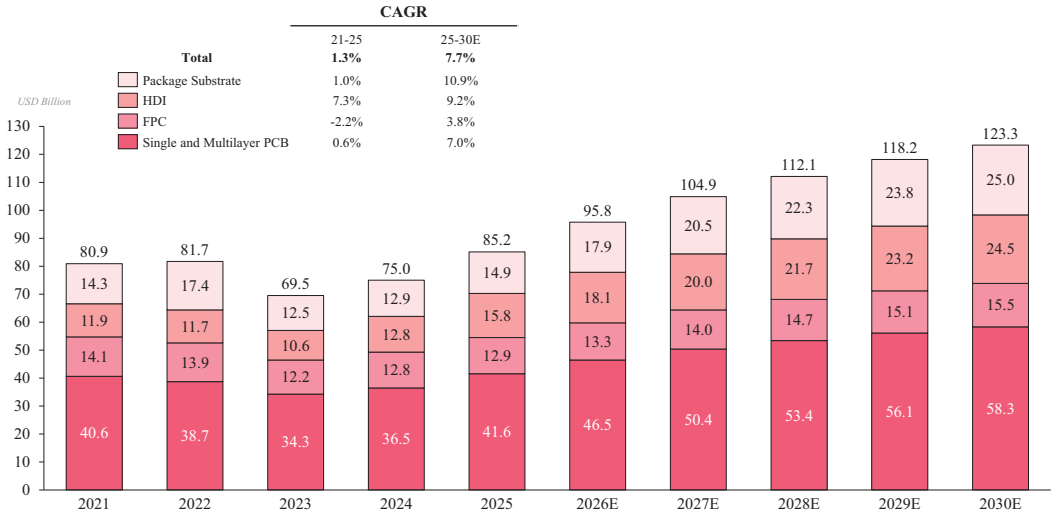
Source: Prismark, CIC Report

Note:
Others mainly refer to industrial control system, medical apparatus, etc.

Products and Segments of the Global PCB Industry

PCBs can be categorized into single and multi-layer PCBs, HDIs, FPCs, and package substrates. In 2025, the global market sizes, in terms of sales revenue, reached US$41.6 billion for single and multi-layer PCBs, US$15.8 billion for HDIs, US$12.9 billion for FPCs, and US $14.9 billion for package substrates, respectively. The global market sizes for single and multi-layer PCBs, HDI PCBs, FPCs, and package substrates are projected to reach US$58.3 billion, US$24.5 billion, US$15.5 billion, and US$25.0 billion, respectively by 2030, the corresponding CAGRs of which from 2025 to 2030 are 7.0%, 9.2%, 3.8%, and 10.9% for each segment.

Market Size of the Global PCB market, by Product Types, 2021-2030E



Source: Prismark, CIC Report

Note:
The market size of rigid-flex boards is included in that of FPCs primarily due to their core reliance on flexible substrates and the substantial overlap in manufacturing processes with FPCs, rendering them technologically and structurally affiliated with the FPC category.

Competitive Landscape of the Global PCB Market

The global PCB industry is highly competitive and fragmented with the top 10 customers accounting for 37.4% of the market share. In terms of PCB sales revenue, the Company ranked third among the global PCB market in 2025.

Ranking of the Global Providers of PCB, in Terms of Sales Revenue, 2025

Rank	Company Name	Sales Revenue (US$ million)	Market Share (%)
1	Company A	5,895.5	6.9
2	Company B	4,074.3	4.8
3	**The Company**	**3,615.3**	**4.2**
4	Company C	3,150.7	3.7
5	Company D	2,906.3	3.4
6	Company E	2,560.2	3.0
7	Company F	2,551.8	3.0
8	Company G	2,454.7	2.9
9	Company H	2,370.8	2.8
10	Company I	2,273.0	2.7
	Sum of Top 10	**31,852.6**	**37.4**

Source: Annual Reports of Listed Companies, Interviews with industry experts by CIC, CIC Report

Note:

1. Company A is a public company founded in 2006 and listed on the Taiwan Stock Exchange, headquartered in Taiwan, mainly engaged in the production and sale of diversified PCBs.
2. Company B is a public company founded in 1990 and listed on the Taiwan Stock Exchange, headquartered in Taiwan, mainly engaged in the production and sale of diversified PCBs.
3. Company C is a public company founded in 1984 and listed on the Shenzhen Stock Exchange, headquartered in Guangdong, China, primarily engaged in production and sale of diversified PCBs.

4. Company D is a public company founded in 1978 and listed on Nasdaq, headquartered in the United States, committed to providing PCBs, radio frequency and microelectronic components, as well as system integration services.
5. Company E is a public company founded in 1992 and listed on the Shenzhen Stock Exchange, headquartered in Jiangsu, China, mainly engaged in the research, development. production and sales of various types of PCBs.
6. Company F is a public company founded in 2006 and listed on the Shenzhen Stock Exchange and Hong Kong Stock Exchange, headquartered in Guangdong, China, mainly engaged in the research, development, production and sale of various PCBs.
7. Company G is a public company founded in 1973 and listed on the Taiwan Stock Exchange, headquartered in Taiwan, mainly engaged in production and sale of diversified PCBs.
8. Company H is a public company founded in 1991 and listed on the Taiwan Stock Exchange, headquartered in Taiwan, mainly engaged in the production and sale of diversified PCBs.
9. Company I is an enterprise founded in 1969 and headquartered in Japan, mainly engaged in the production and sale of diversified PCBs.

Drivers and Future Trends of the Global PCB Industry

- **Material innovation drives technological progress:** High-frequency performance with low loss, advanced thermal management, and flexible stretchability are main directions of PCB materials advancement. These material innovations directly enhance PCB performance in signal integrity, integration density, and reliability, meeting stringent demands from downstream applications. By enabling breakthroughs in high-frequency operation, precise thermal control, and mechanical flexibility, new materials are effectively addressing core challenges within high-speed, high-density, and high-power electronic systems. Furthermore, they are accelerating development in cutting-edge fields such as 5G communication, ADAS, wearable medical devices, and sustainable electronics. Consequently, dedicated R&D investment in advanced material technologies have become pivotal for capturing future opportunities and maintaining competitive edge in the global PCB industry.

- **Proliferation of Edge Computing and Edge AI Devices:** With the development of 5G, IoT, digital intelligence of consumer and automotive electronics, massive data is being generated at the edge. This will not only increase PCB volume in applications of edge AI devices, but also impose higher requirements for reliability, miniaturization, and durability in complex environments, driving technical upgrades and value enhancement for FPC, HDI, and specialty substrate PCBs at the edge.

- **Constant Growth in Demand of High-Performance PCBs:** High-performance PCB demand is growing, driven by AI (edge AI, data centers, AI-enabled automotive) and the evolution to 5G+ and potential 6G, which require higher PCB performance. These performance requirements are approaching the physical limits of traditional raw materials. High-end PCBs (with advanced technologies and materials) have higher unit value, and industry growth will focus on enterprises with core technologies focusing on the high-end market.

- **Increasing Industry Concentration Among Leading Suppliers:** Downstream customers are demanding higher levels of stability, reliability of delivery, and technical collaborative support from suppliers. As downstream customers may face high validation costs, technical integration costs, and potential production disruption risks of switching suppliers, they prefer to establish long-term, stable partnerships with certified and leading PCB manufacturers. This trend is contributing to the increasing concentration level of the industry.

Entry Barriers of the Global PCB Industry

- **Customer Certification:** Customer certification serves as a critical entry barrier in the PCB industry. Key customers implement rigorous supplier audits and lengthy product qualification tests, and maintain long-term stable cooperation with qualified suppliers with high customer stickiness. New entrants require substantial time and capital to complete complex certification procedures, making it difficult to obtain customer recognition and core orders in a short period.

- **Capital Investment Barriers:** Capital barriers in the global PCB industry are mainly concentrated in equipment, R&D, and capacity expansion. Regarding equipment, PCB manufacturing necessitates high-end specialized equipment such as drilling machines, exposure machines, and plating lines. The equipment carries high price tags and may entail substantial maintenance and upgrade costs. In terms of R&D, companies have to continuously commit significant funds to new material development, process optimization, and product innovation so that they could meet the escalating demands for high-speed signal transmission, miniaturized design, and multi-functional integration in consumer electronics and data centers. For capacity expansion, the high production and R&D costs raise the economies of scale threshold in the PCB industry. New entrants need to consistently invest in high-standard production lines, leveraging effect of large-scale production to spread fixed costs and achieve unit cost competitiveness. Consequently, small and medium-sized PCB companies have relatively limited capital resources to compete with industry giants in equipment, technology, and production capacity.

- **Supply Chain Barriers:** Core raw materials (e.g., copper foil, copper-clad laminates) determine product performance and cost, while high-end raw materials have concentrated supply and high cooperation barriers. Leading enterprises have stable cooperation with core suppliers and global layout capabilities to avoid supply risks, while new entrants struggle to obtain stable high-end raw materials and lack related operational capabilities, being at a disadvantaged position in terms of production stability and cost control.

- **R&D and Technology Barriers:** Leading enterprises have established technical barriers through long-term R&D investment and accumulation, mastering customized design, advanced manufacturing processes, core technologies and yield control. New entrants lack stable R&D funding, core technology accumulation and production experience, making it difficult to break through technical bottlenecks and penetrate the high-end market.

Cost of the Global PCB Industry

The primary raw material of PCBs are copper-clad laminates, copper foil, and copper balls. Copper-based materials account for 70% of the total raw material cost of PCB substrate, with the intrinsic value of copper constituting approximately 30%-40% of the total cost of these primary copper-based materials. The global annual average copper settlement price increased from US$9,317.5 per MT in 2021 to US$10,800.0 per MT in 2025. In the future, the global annual average copper settlement price is projected to reach US$12,394.0 per MT by 2030. This upward trajectory is primarily attributed to demand growth, driven by the global energy transition and the expansion of new infrastructure such as data centers, which is expected to consistently outpace supply growth constrained by factors including declining ore grades and limited new capacity additions in the mining sector.

OVERVIEW OF THE GLOBAL FPC INDUSTRY

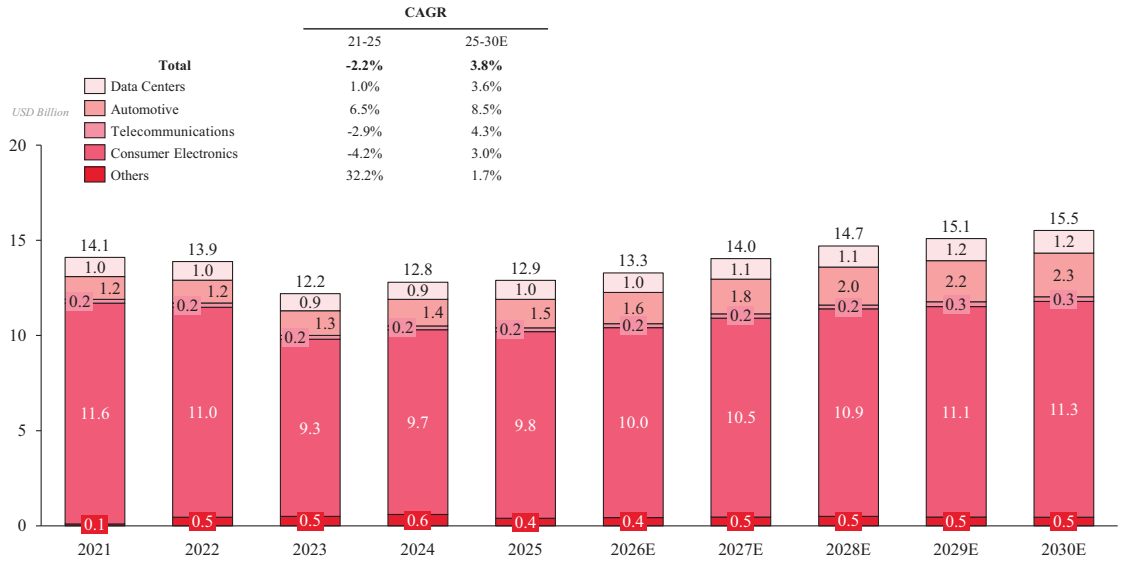
FPC refers to a type of PCB manufactured using flexible copper-clad laminates as the base material, featuring bendable and foldable properties. Endowed with performance advantages such as thinness, light weight, and high wiring density, FPC serves as a critical foundational component for achieving miniaturization, lightweight design, and highly reliable connection of electronic devices.

In consumer electronics, FPC is the mainstream solution for enabling high-speed signal transmission between internal modules, including display modules, cameras, and biometric modules, of smartphones, tablets, and wearable devices. In the automotive field, FPC is most commonly applied in automotive battery management systems (BMS) and in-vehicle displays. In industrial control, leveraging its high durability and spatial adaptability in complex environments, FPC supports industrial equipment in achieving stable and efficient connectivity. As edge AI devices pack more functions into smaller designs, FPCs, which enable 3D wiring and high-density connectivity, will see rising demand driven by the move toward high-end and customized products, making them a key driver of value in the edge-side PCB industry.

Market Size of the Global FPC Industry by Applications

The global FPC market has maintained a steady growth trend. Its market size reached US$12.9 billion in 2025 and is expected to grow to US$15.5 billion by 2030 with a CAGR of 3.8%. From 2026 to 2030, the consumer electronics market will continue to drive the expansion of the FPC market, supported by the growing shipment volumes of edge AI devices, such as smartphones, AR/VR devices, and wearable devices. On the other hand, the automotive is the fastest-growing application area for global FPC.

Market Size of the Global FPC Market, by Application, 2021-2030E



Source: Prismark, CIC Report

Note: Others mainly refer to industrial control system, medical apparatus, etc.

Competitive Landscape of the Global FPC Industry

Against the backdrop of the current global economic recovery and rapid technological advancement, the FPC industry is undergoing continuous transformation and consolidation, characterized by high industry concentration and intense competition. Additionally, driven by technological innovation and digital transformation, enterprises with leading advantages are demonstrating stronger competitiveness and influence in the market. The global FPC market features intense competition, while the competitive landscape among top players is relatively concentrated. In terms of sales revenue, the Company ranked the second in the global FPC market in 2025.

Ranking of the Global Providers of PCB, in terms of Sales Revenue of FPC, 2025

Rank	Company Name	Sales Revenue (US$ million)	Market Share (%)
1	Company A	4,030.3	31.2
2	**The Company**	**3,159.7**	**24.5**
3	Company I	1,405.6	10.9
4	Company J	911.4	7.1
5	Company K	721.9	5.6
6	Company L	574.2	4.4
7	Company M	527.3	4.1
8	Company N	401.6	3.1
9	Company O	314.0	2.4
10	Company P	278.8	2.2
	Sum of the Top 10	**12,324.8**	**95.5**

Source: Annual Reports of Listed Companies, Interviews with industry experts by CIC, CIC Report

Note:

1. Company J is a company founded in 1999 and listed on the Korea Exchange, headquartered in South Korea, mainly engaged in the research and development, production and sales of FPCs and related application components.
2. Company K is a public company founded in 2000 and listed on the Taiwan Stock Exchange, headquartered in Taiwan, mainly engaged in the research and development, production and sales of FPCs.
3. Company L is a public company founded in 1993 and listed on the Shanghai Stock Exchange, headquartered in Guangdong, China, mainly engaged in the research and development, production and sales of diversified PCBs.
4. Company M is a public company founded in 2003 and listed on the Shenzhen Stock Exchange, headquartered in Fujian, China, mainly engaged in the research and development, production and sales of FPCs.
5. Company N is a public company founded in 1918 and listed on the Tokyo Stock Exchange, headquartered in Japan, mainly engaged in the research, development, manufacturing and sales of advanced functional materials and FPCs.
6. Company O is a public company founded in 1897 and listed on the Tokyo Stock Exchange, headquartered in Japan, mainly engaged in the research, development, production and sales of electrical wires/cables, electronic components, automotive parts and FPCs.
7. Company P is a public company founded in 1885 and listed on the Tokyo Stock Exchange, headquartered in Japan, mainly engaged in the research, development, production and sales of optical fibers, cables, FPCs and electronic components.

Drivers and Future Trends of the Global FPC Industry

- **Thinness, Lightweight Design and Multi-Functional Integration of Edge AI Device:** Edge AI devices continue to evolve toward greater thinness, lightness, and compactness while integrating more complex functions, driving the growth in demand for FPC. With its bendability and high-density wiring capabilities, FPC has become an ideal choice for connecting various modules within limited spaces, effectively meeting the stringent requirements for product miniaturization and functional integration.

- **Rapid Development of Innovative Consumer Electronics Spurs Further FPC Demand Growth:** In recent years, the consumer electronics market has witnessed continuous innovation, with emerging segments such as AR/VR devices, wearable devices, and foldable smartphones experiencing rapid demand growth, further fueling demand in the FPC market. In the AR/VR sector, advancements in chips, display technologies, and communication methods have propelled the industry into a phase of rapid growth. The global shipment volume of AR/VR devices is expected to reach approximately 50 million units by 2030. In the wearable device segment, products need to accommodate more components to enable additional functions while maintaining lightweight and integrated features, which further increases requirements for wiring density. This will lead to a growing proportion of FPC usage per device.

- **Electrification, Intelligence, Integration, and Lightweight Trends in Automotive Boost In-Vehicle FPC Demand:** FPC's advantages, including high wiring density, light weight, thin thickness, foldability, 3D wiring, and safety, are unparalleled by other types of circuit boards. These advantages align better with the downstream trends of lightweight, intelligent, and integrated electronic products, making FPC particularly suitable for EV. As automotive advance toward electrification and intelligence, the share of automotive electronics in total automotive costs is projected to reach 50% by 2030. With the rise in electrification levels, the demand for electronic components in automotive autonomous driving systems, infotainment systems, lighting systems, display systems, power systems, BMS, and sensors will expand. Correspondingly, the demand for FPC used to connect these electronic components will increase, further driving growth in in-vehicle FPC demand.

OVERVIEW OF THE GLOBAL PCB INDUSTRY FOR EDGE AI DEVICES

Growth and Value Proposition of the Global Edge AI Device Industry

Edge AI refers to a technology where AI models are deployed at edge nodes close to data generation sources. Edge AI devices are specifically intelligent hardware integrated with this technology, enabling them to directly perform data collection, processing, AI model inference, and decision-making locally at the point of data generation. Compared with cloud-based IoT equipment, it features lower latency, better data privacy and higher operational stability. Edge AI devices require high computing power in a compact size, bringing stringent requirements for PCBs. Relevant circuit boards need high integration density to accommodate densely arranged core components, excellent thermal management to dissipate heat from high-power AI chips, and strong environmental adaptability to withstand temperature changes, vibration and electromagnetic interference in automotive, industrial and other complex scenarios.

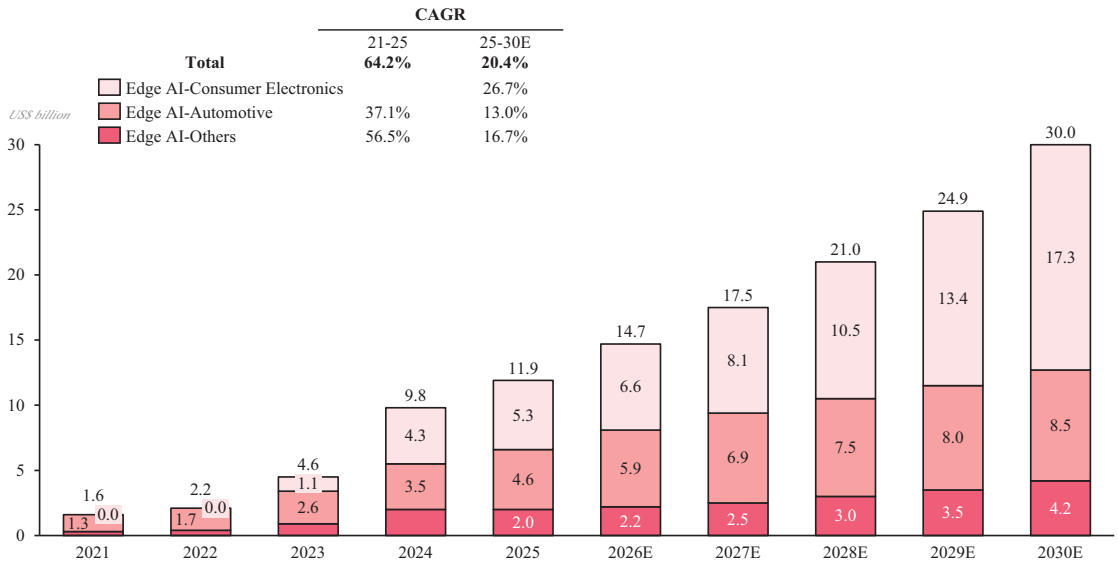
With technological advancement, edge AI has been widely applied in consumer electronics, wearables, XR devices and smart home products. In particular, automotive electrification and intelligent transformation have further driven the rapid development of edge AI terminal applications.

Market Size of the Global PCB Industry For Edge AI Devices

The commercialization of edge AI technology is becoming a core factor driving the upgrading and value restructuring of the edge AI device industry. Edge AI devices mainly include AI-enabled consumer electronics, industrial device, and medical devices, among others. On one hand, in the field of AI-enabled consumer electronics, a new cycle of hardware upgrades and increasing the value per unit further drive the market growth. On the other hand, edge AI is a key technology for ADAS and human vehicle co-piloting in intelligent cockpits in the AI-enabled automotive industry, driving automobiles to evolve from transportation tools to mobile intelligent spaces.

As the core carrier supporting AI computing at edge nodes, the market size of the global PCB industry for edge AI devices has expanded rapidly amid the explosive growth in demand for edge computing power. The global PCB market for edge AI devices is part of the overall global PCB market, corresponding to the market size of PCBs deployed in edge AI devices. It is a key driver for the global PCB market's future growth, with its share steadily increasing. In 2025, the global PCB industry for edge AI devices exceeded US$ 11.9 billion, with a CAGR of 64.2% from 2021 to 2025. From a growth perspective, driven by the penetration of generative AI in edge scenarios and the accelerated deployment of edge AI device, the market will enter a period of high-speed growth. It is projected that the global edge AI PCB market size will increase to US$ 30.0 billion by 2030, representing a CAGR of 20.4% from 2025 to 2030, significantly outpacing the overall growth rate of the global PCB industry.

Market Size of the Global PCB Industry for Edge AI Devices[1], by Application, 2021–2030E



Source: Interviews with industry experts by CIC, CIC Report

Note:

1. The revenue used for ranking the Group's market position in the global PCB market for edge AI devices is calculated based on the Group's revenue segmented by application scenarios
2. Others mainly refer to industrial control system, medical apparatus, etc.

Competitive Landscape of the Global PCB Industry for Edge AI Devices

The global PCB industry for edge AI devices is highly focused on providing high-performance and high-reliability PCB solutions for edge AI devices. This market features high technical barriers and has formed a notably concentrated competitive landscape, dominated by a small number of leading enterprises with cutting-edge technologies, large-scale production capacity, and core customer resources across multiple sectors. In terms of sales revenue, the Company ranked first in the market in 2025. In the future, as the demand for edge AI computing power continues to rise, leading enterprises with high-end product mass production capabilities, close customer partnerships, and advanced manufacturing processes will further expand their competitive advantages, and the industry concentration is expected to keep increasing. These leading enterprises are actively advancing the globalization and intelligent upgrading of production capacity to meet the strict requirements of edge AI computing power demand for PCB performance, scale, and delivery efficiency.

Ranking of the Global Providers of PCB Industry for Edge AI Devices, in terms of Sales Revenue, 2025

Rank	Company Name	Sales Revenue (US$ million)	Market Share (%)
1	**The Company**	**3,186.7**	**26.9**
2	Company A	3,166.9	26.7
3	Company G	713.9	6.0
4	Company L	705.1	5.9
5	Company I	691.0	5.8
6	Company F	509.1	4.3
7	Company B	483.3	4.1
8	Company C	390.1	3.3
9	Company D	372.0	3.1
10	Company H	312.9	2.6
	Sum of Top 10	**10,531.0**	**88.7**

Source: Annual Reports of Listed Companies, Interviews with industry experts by CIC, CIC Report

Note:

1. The revenue amount used in ranking the Group's market position in the global PCB market for edge AI devices is calculated based on the Group's revenue segmented by application scenarios in 2025.

Drivers and Future Trends of the Global PCB Industry for Edge AI Devices

- **The Deployment of AI Applications at the Edge:** The deployment of AI applications at the edge drives demand for high-performance, low-latency PCBs in intelligent scenarios like consumer electronics and smart vehicles. In the smart vehicle sector, the iteration of ADAS, intelligent cockpits, and connected car functions raises higher requirements for automotive PCBs in high-frequency, high-temperature reliability, and long-term stability; in the consumer electronics industry, a large number of devices need local real-time data processing and decision-making, enable PCBs to evolve toward high-density integration, low signal loss, and miniaturization. In the future, with the development of telecommunications and deeper collaboration between the edge and data center, PCB will continue to upgrade toward higher frequency, higher speed, better heat dissipation, and higher reliability.

- **Innovation in Consumer Electronics Drives New Growth:** Driven by AI technology, consumer electronics are undergoing continuous innovation, driving the development of the global PCB industry for edge AI devices through performance, form factor, and functionality. Firstly, enhanced performance drives PCBs toward high-end advancement. To support local AI computing, devices require more powerful processors, which in turn demand PCBs with increased layer counts, low-loss high-speed materials, and more precise wiring processes, such as advanced HDI and Substrate-Like PCB (SLP) technologies. Secondly, miniaturized form factors are driving PCBs toward higher density and flexibility. To accommodate the compact structures of foldable screens, wearable devices, and other compact products, PCBs must achieve greater integration within a smaller footprint. As a result, HDI and FPC technologies have been widely adopted. Thirdly, diversified functions are spurring upgrades in PCBs' heat dissipation capabilities and integration levels. Complex functionalities such as multi-sensor fusion require PCBs to utilize specialized materials and adopt technologies such as System-in-Package (SiP) to ensure stable operation. The AI-driven trends of intelligence, slimness, and multi-functionality in consumer electronics continuously drive continuous upgrades in PCB for edge AI devices across materials, design, and processes via these three pathways, giving strong growth momentum into the industry.

- **A Strong Demand in Automotive Scenarios Drives the Growth of PCB Market:** the automotive sector has become a core demand segment within the whole market. As L3-L4 autonomous driving technologies accelerate their penetration, their penetration rate is projected to exceed 55% by 2025, driving up the PCB value per vehicle. Among these, high-frequency PCBs for edge AI devices used in millimeter-wave radar modules cost more than three times that of ordinary automotive PCBs, highlighting the critical role and high-value-added nature of high-end automotive PCBs in autonomous driving systems. As the complexity of autonomous driving functions continues to rise, systems are placing higher demands on PCBs for edge AI devices, in terms of signal transmission stability, high-temperature resistance, and anti-electromagnetic interference capabilities. This trend is prompting the industry to increase R&D investment, driving product iteration toward multi-layer, high-frequency, and high-speed directions. Meanwhile, the rapid popularization of EV and intelligent connected automotive is driving sustained growth in demand for PCBs for edge AI devices, and the market size of this segment is expected to expand further in the future.

- **Leading companies solidify their market dominance through capacity scaling and M&A integration:** Rising technical and capital barriers in the edge AI sector raise operational requirements for PCB manufacturers. Edge AI devices in consumer electronics and automotive have differentiated PCB needs, so manufacturers need cross-sector technical capabilities to meet stringent computing and signal integrity demands. Increased investment in high-end production lines and R&D further lifts industry thresholds. Market leaders consolidate dominance by expanding global high-end capacity and conducting strategic M&A to acquire core patents, complementary products and high-quality customers, accelerating industry resource concentration toward leading players with strong technology, capital and customer coverage.

OVERVIEW OF THE GLOBAL OPTICAL TRANSCEIVER INDUSTRY

Development Background of the Global Optical Transceiver Industry

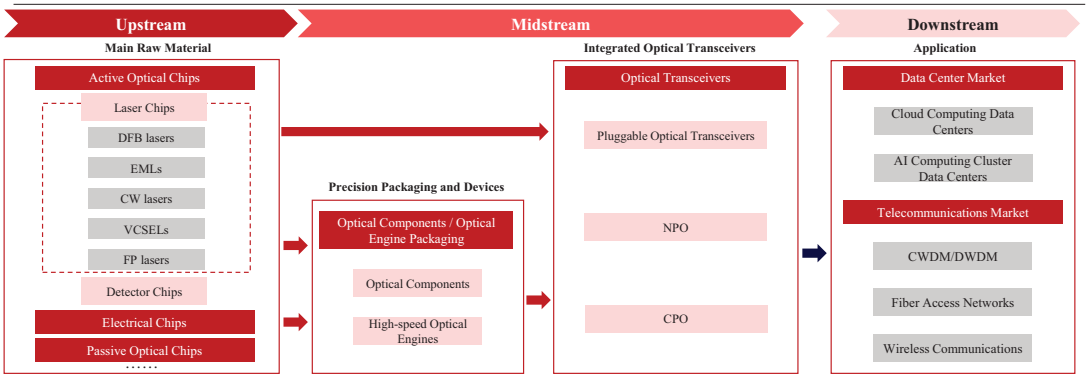
Optical transceiver technology represents a next-generation communication technology that has overcome the physical transmission bottlenecks of traditional electrical communication. Through an electrical-optical-electrical signal conversion mechanism and leveraging the optical signal transmission characteristics of optical fibers, optical transceiver technology has established generational advantages across key dimensions such as bandwidth capacity, transmission distance, anti-interference capability, and energy efficiency density. It systematically addresses the core transmission challenges of large-volume data interaction and wide-area connectivity in the digital era, and while supporting the upgrade of communication networks, it fully empowers computing infrastructure.

Analysis of the Global Optical Transceiver Industry Chain

The upstream segment of the optical transceiver industry chain mainly includes active optical chips, electrical chips and passive optical chips. Optical chips are upstream of the optical transceiver industrial chain, constituting a key link with high technical barriers and sophisticated manufacturing processes. Their performance directly underpins the transmission speed and energy efficiency of downstream optical devices, optical transceivers and the entire optical communication system. Driven by booming growth in the optical transceiver market, rapid penetration of emerging technologies including silicon photonics, and rising end-market demand for high-performance optical transceivers, the optical chip industry has registered robust expansion. As an essential core component of optical transceivers, optical chips stand to benefit materially from the aforesaid industry trends, fueling their rapid development amid a prevailing market supply shortage. The midstream of the industry value chain comprises optical transceivers. Optical and electronic components are integrated into optical transceivers to enable efficient data transmission across networks. Transmission rate is the core performance indicator, directly determining their data transmission efficiency and adaptability to downstream scenarios. The optical transceiver industry is categorized into low-to-medium speed and high-speed products based on

transmission rate. The downstream application scenarios of the optical transceiver industry cover datacom scenarios and telecom scenarios. The differentiated demands of these two types of scenarios have driven optical transceiver technology to achieve breakthroughs in multiple dimensions.

Industry Value Chain Analysis of the Global Optical Transceiver



Source: CIC Report

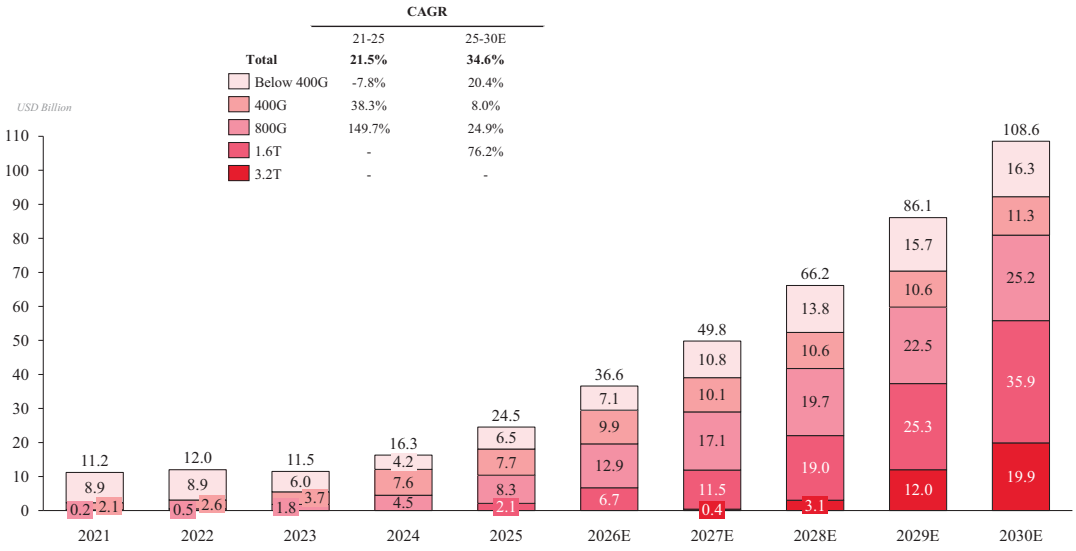
Analysis of Technological Leadership in the Global Optical Transceiver Industry

Market Size of the Global Optical Transceiver Industry

Optical transceivers are core components to break data transmission bottlenecks. Driven primarily by AI large model training's surging demand for high-bandwidth, low-latency interconnection, the global market grew from US$11.2 billion in 2021 to US$24.5 billion in 2025, representing a CAGR of 21.5% and is projected to reach US$108.6 billion by 2030. Industry growth is underpinned by technological iteration, including EML solutions retaining targeted performance advantages, silicon photonics gaining traction in high-speed interconnects, and upstream optical chip breakthroughs solidifying the industry foundation.

For product lines, 800G transceivers saw explosive growth; 1.6T products have entered mass production and become a core growth driver; 3.2T products remain in R&D; while traditional 400G and lower-rate transceivers have seen a significant growth slowdown.

Market Size of the Global Optical Transceiver Market, by Transmission Rate, 2021-2030E

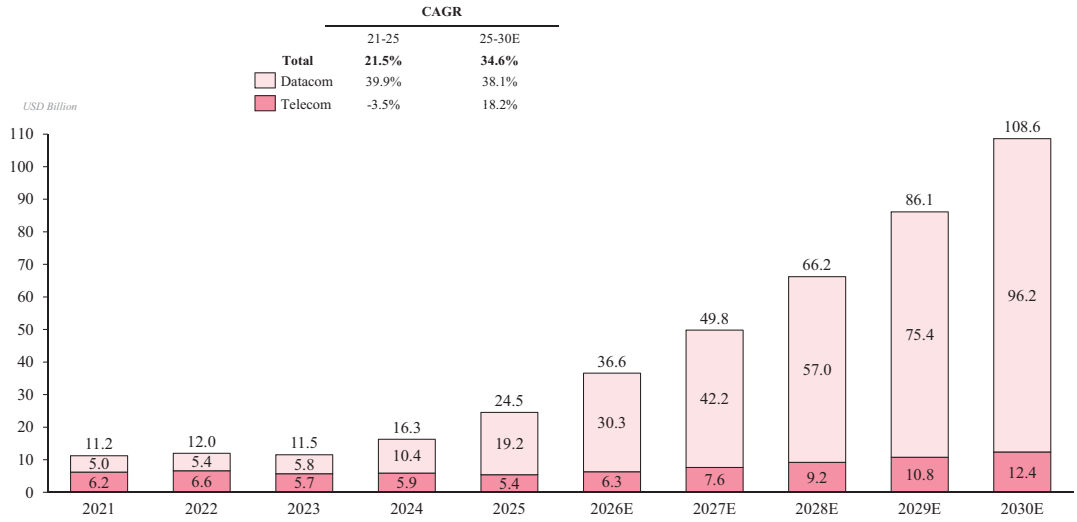


Source: LightCounting, CIC Report

Optical transceivers are categorized into datacom and telecom segments by core application: the datacom segment focuses on high-speed connectivity within and across data centers, while the telecom segment serves long-distance transmission over wide-area networks. The datacom segment, driven by global computing infrastructure expansion, has become the core growth engine of the optical transceiver market.

From 2021 to 2025, global data center construction accelerated amid exponential growth in AI large model training-driven computing power demand and sustained computing infrastructure investment from cloud service providers. The datacom optical transceiver market to grow from US$5.0 billion in 2021 to US$19.2 billion in 2025, with a CAGR of 39.9%. Looking ahead, the datacom segment will see further strengthened demand resilience. Driven by rising cloud data center investment shifting toward computing power clustering, and superlinear computing power growth from AI model scaling, the datacom market is projected to reach US$96.2 billion by 2030, with a 38.1% CAGR from 2025 to 2030. In-datacenter demand for extreme bandwidth density and energy efficiency has spurred the development of low-power solutions including LPO and CPO technology, while SiPh technology is gaining higher penetration in high-speed products for its high integration and cost advantages.

Market Size of the Global Optical Transceivers, by Application, 2021-2030E



Source: LightCounting, CIC Report

Competition Landscape of the Global Optical Transceiver Industry

The global optical transceiver industry is propelled by growing demand for high-speed data transmission. Its competitive landscape is highly concentrated, wherein a few leading enterprises hold a substantial market share. This is largely attributable to their technological leadership in high-speed (800G and above), high-reliability products and consistent supply enabled by their stable mass-production capabilities.

Meanwhile, the rising R&D costs and stringent quality requirements in core application fields such as data centers and 5G base stations have further intensified this concentration trend, setting a high threshold for new entrants. The global optical transceiver industry is exhibiting trends of technology-driven development and vertical industrial chain integration; leading industry participants will continue to enhance their market share by continuously improving their R&D capabilities and mass production capacity.

In the competitive landscape of global optical transceiver suppliers, the Company ranked seventh in 2025, with a market share of 2.9%. Furthermore, the Company maintains a leading position in terms of production volume of optical chips. In 2025, it ranked sixth globally in terms of optical chip production volume, accounting for 8.6% of the market.

Ranking of Optical Transceiver Suppliers, in Terms of Sales Revenue of Optical Transceivers, 2025

Rank	Company Name	Revenue (US$ million)	Market Share (%)
1	Company Q	5,285.5	21.5
2	Company R	3,505.5	14.3
3	Company S	2,648.1	10.8
4	Company T	1,194.2	4.9
5	Company U	922.1	3.8
6	Company V	860.3	3.5
7	**The Company**	**714.5**	**2.9**
8	Company W	655.8	2.7
9	Company X	651.0	2.7
10	Company Y	236.4	1.0
	Sum of the Top 10	**16,673.4**	**68.1**

Source: Annual Reports of Listed Companies, Interviews with industry experts by CIC, CIC Report

Note:

1. Company Q is a public company founded in 2005 and listed on the Shenzhen Stock Exchange, headquartered in Shandong, China, focusing on the research and development as well as manufacturing of optical transceivers.
2. Company R is a public company founded in 2008 and listed on the Shenzhen Stock Exchange, headquartered in Sichuan, China, focusing on the research and development as well as manufacturing of optical transceivers.
3. Company S is a public company founded in 1966 and listed on the New York Stock Exchange, headquartered in the United States, developing, manufacturing and selling lasers, transceivers, as well as other optical and optoelectronic devices, modules, systems and engineering materials.
4. Company T is a public company founded in 2001 and listed on the Shenzhen Stock Exchange, headquartered in Hubei, China, and mainly engaged in the research, development, manufacturing and sales of optoelectronic components and transceivers.
5. Company U is a public company founded in 2003 and listed on the Shenzhen Stock Exchange, headquartered in Shandong, China, focusing on the research, development and mass production of optical transceivers, optical chips and optical network terminal products.
6. Company V is a public company founded in 1999 and listed on the Shenzhen Stock Exchange, headquartered in Hubei, China, mainly engaged in the research, development, manufacturing and technical services of optical transceivers, laser processing equipment and sensors.
7. Company W is a public company founded in 2015 and listed on NASDAQ, headquartered in the United States, mainly engaged in the design and manufacturing of optical transceivers, optical chips and optical network terminal products.
8. Company X is a public company founded in 1995 and listed on NASDAQ, headquartered in the United States, mainly engaged in the research, development, design and supply of semiconductor chips and optical transceivers.
9. Company Y is a public company founded in 2006 and listed on the Shanghai Stock Exchange and the Stock Exchange of Hong Kong, headquartered in Shanghai, China, mainly engaged in the R&D, production and sales of optical transceivers, telecom broadband terminals, wireless networks and small cells.

Ranking of Optical Transceiver Suppliers, in Terms of Production Volume of High-Speed Optical Chips, 2025

Rank	Company Name	Shipment (thousands)	Market Share (%)
1	Company W	~74,000.0	27.7
2	Company S	~56,000.0	21.0
3	Company Z	~35,700.0	13.4
4	Company AA	~25,900.0	9.7
5	Company O	~25,450.0	9.5
6	**The Company**	**~23,000.0**	**8.6**
7	Company BB	~11,200.0	4.2
8	Company CC	~3,680.0	1.4
9	Company DD	~2,800.0	1.0
10	Company EE	~1,400.0	0.5
	Sum of the Top 10	**~259,130.0**	**97.0**

Source: Annual Reports of Listed Companies, Interviews with industry experts by CIC, CIC Report

Note:

1. Company Z is a public company founded in 1991 and listed on NASDAQ, headquartered in the United States, mainly engaged in the design, development and supply of semiconductors, enterprise software and optical chips.
2. Company AA is a public company founded in 1921 and listed on the Tokyo Stock Exchange, headquartered in Japan, mainly engaged in the research, development and manufacturing of electrical equipment, electronic components, automotive parts and optical chips.
3. Company BB is a public company founded in 1935 and listed on the Tokyo Stock Exchange, headquartered in Japan, mainly providing IT products such as servers and optical transmission systems, as well as solutions including system integration and consulting services.
4. Company CC is a public company founded in 2013 and listed on the Shanghai Stock Exchange, headquartered in Shanxi, China, mainly engaged in the research and development, design, production and sales of optical chips.
5. Company DD is a public company founded in 2012 and listed on the Shanghai Stock Exchange, headquartered in Jiangsu, China, mainly engaged in the research and development and manufacturing of high-power semiconductor laser chips, optical transceiver chips and other products.
6. Company EE is a public company founded in 2018 and listed on the Shanghai Stock Exchange, headquartered in Hubei, China, mainly engaged in the research, development and manufacturing of optical transceiver lasers, optical chips as well as packaging products.

Drivers and Future Trends of the Global Optical Transceiver Market

- **AI training requires massive collaborative computing with GPUs, and the number of optical transceivers paired with GPUs continues to rise:** The core demand for GPU collaborative computing efficiency in large AI model training has directly driven the development of the optical transceiver industry. Traditional general-purpose servers focus on single-machine computing, with a demand for only 2–4 optical transceiver ports per machine. In contrast, AI servers need to support multi-GPU parallel computing. Taking mainstream models equipped with 8 GPUs as an example, their optical transceiver port configuration has increased to 24–32 ports—representing a 6–8 times increase in port density compared to traditional models, which directly meets the high-frequency data interaction needs between multiple GPUs. As GPU computing clusters scale up to 100,000-GPU clusters, the ratio of optical transceivers to individual GPUs is evolving from 1:1 to 1:4. This means the demand for optical transceivers per cabinet will increase by 3–4 times as the ratio upgrades, becoming a core growth driver for overall optical transceiver demand.

- **AI Data Center Cluster Scale Expansion Drives Optical Transceiver Rate Iteration:** The continuous expansion of AIDC cluster scale has made optical transceiver rates a key variable determining model training efficiency, driving rapid industry development. The data interaction volume of a 100,000-GPU cluster is more than 10 times higher than that of a 10,000-GPU cluster. Traditional optical transceivers with rates of 400G and below can no longer meet the low-latency and high-bandwidth transmission requirements, making high-speed optical transceivers shift from an optional configuration to a necessity.

- **CPO Technology Unlocks Extreme Density and Business Model Innovation:** CPO technology, by deeply integrating optical transceivers with switch chips, not only reduces the package size by 50% and supports ultra-high-speed requirements of 3.2T and above, but also reshapes the business collaboration model of the electronic device industry. The traditional supply system where optical transceivers and switches are relatively independent is gradually evolving toward close strategic cooperation. Optical transceiver manufacturers need to participate in the design phase of switch chips in advance, and conduct in-depth collaborative R&D with switch manufacturers in aspects such as architecture planning, interface standards, and heat dissipation solutions to jointly optimize the performance of optoelectronic hybrid systems.

- **Vertical Integration of the Industry Chain Shapes Technical Barriers:** In recent years, leading global optical transceiver manufacturers have deepened vertical integration of the industry chain, establishing a full-industry-chain collaborative development system covering optical chips, optical transceivers, and optical network terminals. This has significantly enhanced their market competitiveness and supply chain resilience. In the field of optical chips, a number of enterprises

have achieved independent R&D and large-scale mass production of high-speed optical chips such as EML chips. Amid the surging demand for massive data transmission, they have realized a generational leap in both technology and commercialization, while also reducing reliance on imported optical chips.

OVERVIEW OF THE GLOBAL PRECISION COMPONENT INDUSTRY

The precision component industry refers to a sector that utilizes precision machining technology, rapid prototyping technology, automatic control technology, and other related technologies to design, produce, process, assemble, and market complex and high-precision structural components, functional modules, and complete machines. This industry is characterized by high precision, high efficiency, automation, and non-standard customization. From the perspective of the industrial chain structure, the upstream of the precision component industry chain covers raw material and equipment supply, mainly including raw materials such as metal materials, as well as production equipment such as cutting and forming equipment, processing equipment, and testing and inspection equipment. The midstream of the industrial chain is the precision processing and manufacturing link, where manufacturers are responsible for processing high-precision parts and components, functional modules, and providing complete machine assembly. The downstream of the industrial chain refers to the application fields of precision component products, mainly including automotive, telecommunications and other areas.

Market Size of the Global Precision Component Industry

With the continuous upgrading of downstream manufacturing industries and the accelerated rise of emerging fields such as 5G communications, AI, and new energy vehicles, the global demand for precision component products has maintained steady growth—providing broad growth space for the development of the global precision component industry.

The global market size of precision component has grown from US$420.1 billion in 2021 to US$538.1 billion in 2025, with a CAGR of 6.4%. As the global advanced manufacturing industry continues to develop, technological progress accelerates, and intelligent manufacturing becomes more widespread, this market size is projected to reach US$743.9 billion by 2030, with a CAGR of 6.7% from 2025 to 2030.

Drivers and Future Trends of the Global Precision Component Industry

- **Intelligent Collaboration System:** Driven by the macro trends of digital transformation and intelligent manufacturing development, the precision component industry is accelerating its evolution toward a full-process intelligent collaborative manufacturing system. This is specifically reflected in two aspects: First, the in-depth integrated application of artificial intelligence (AI) algorithms and digital twin technology. By building high-precision virtual simulation models to systematically optimize process parameters, the machining accuracy of complex precision structural components can be improved to the nanometer level, while significantly shortening the product R&D cycle. Second, the widespread deployment of the Internet of Things (IoT) technology and edge computing architecture has promoted the intelligent upgrading of production workshop equipment, forming an intelligent terminal network with autonomous perception and decision-making capabilities. This further builds a closed-loop intelligent manufacturing ecosystem covering demand forecasting, flexible production, and full-lifecycle quality traceability.

- **In the Consumer Electronics Sector, the Precision Component Field Shows Trends of Digitalization, Refinement, and Customization:** As the consumer electronics industry pursues thinness, lightness, high performance, and multi-functionality, the precision component industry presents three core trends: As the consumer electronics industry pursues thinner, lighter, and higher-performance products with multifunctional designs, the precision component industry is

showing clear trends of digitalization, refinement, and customization. The demand for ultra-high precision continues to grow as smartphones and wearable devices evolve toward greater integration, requiring tighter tolerances and finer surface finishes, driving manufacturers to upgrade machining and testing technologies. Meanwhile, shorter product cycles have made customization and flexible production essential, with enterprises adopting modular design and parametric programming to enable rapid product switching. In addition, policies such as the EU's Circular Economy Action Plan are accelerating the shift toward green manufacturing, increasing the use of bio-based and recyclable materials while emphasizing energy efficiency and wastewater control as key competitiveness indicators.

- **The Trends of Automotive Electrification, Intelligence, and Modularization Are Reshaping the Technical Paths and Business Models of Precision Component:** Amid the trend of automotive intelligence, the application of large AI models is reshaping the decision-making logic of the entire vehicle, making software-defined vehicles a core direction. This not only places higher requirements on the real-time performance, in-vehicle data interaction, and automotive communications but also drives the demand for more high-performance data connectivity components, communication modules, and intelligent parts, greatly promoting the development of the industry. The development of the automotive industry is accelerating, and modularization and customization will become important trends in automotive precision intelligent manufacturing. Modularization can improve efficiency and expand functions, promoting the vertical integration of the module supply chain through hardware atomization splitting, standardized interfaces, and software definition. Customization meets personalized needs through the Consumer-to-Manufacturer model, flexible production, and additive manufacturing. These two trends form an elastic synergy in the supply chain. The focus of competition lies in the scalability of modular platforms, the degree of segmentation of customized services, and data-driven capabilities. Enterprises need to establish advantages through pre-embedded hardware, software definition, and ecological synergy.

OVERVIEW OF THE GLOBAL OPTOELECTRONIC DISPLAY INDUSTRY

The optoelectronic display industry focuses on display devices that convert electrical signals into visible images. These devices serve as core components for electronic equipment to present visual content and enable information and sensory interaction. Currently, with the global popularization of consumer electronics, the accelerated development of internet communication technologies, and the penetration of AI hardware and software terminals, human demand for information interaction has surged. As a core carrier, optoelectronic display devices are widely used in fields such as automotive and consumer electronics. Driven by innovations in display technologies, the expansion of application fields, and the penetration of smart devices, the global optoelectronic display industry is expected to achieve rapid development. From the perspective of technical routes, the global optoelectronic display industry is mainly divided into two major technical routes, LCD and OLED.

Market Size of the Global Optoelectronic Display Industry

With the continuous iteration of optoelectronic display technologies and the ongoing empowerment of optoelectronic display modules by technologies such as AI and the Internet of Things (IoT), the market size of the global optoelectronic display industry has grown from US $164.2 billion in 2021 to US$200.3 billion in 2025, representing a CAGR of 5.0%. It is projected that by 2030, the size of the global optoelectronic display industry will further increase to US$264.3 billion, with a CAGR of 5.7% from 2025 to 2030.

Optoelectronic display modules are mainly applied in the automotive and consumer electronics sectors. In the automotive sector, as the automotive industry completes its strategic transformation from functional mobility tools to intelligent interactive terminals, smart cockpits—serving as the core scenario for human-vehicle interaction—are witnessing an accelerated rise in market penetration. The global adoption rate of

smart cockpits is projected to exceed 80%, with a penetration rate of over 82% by 2030 in EV segment. Against this backdrop, in-vehicle display devices have evolved from traditional information presentation carriers to core media for human-vehicle interaction, enabling connectivity and communication between humans and vehicles. In the context of consumer electronics applications, the evolving demand for optoelectronic display modules in the consumer electronics industry has gradually reshaped human-machine connectivity. Driven by the dual forces of continuously improving display technology maturity and the in-depth penetration of 5G and AI technologies, optoelectronic display modules have evolved from simple image output windows to human-machine interaction hubs.

Drivers and Future Trends of the Global Optoelectronic Display Market

- **Integration of Display Forms:** In-vehicle displays are evolving from scattered functional screens to integrated central hubs, with core manifestations in the dual upgrading of form integration and computing power collaboration. At the form level, large-size and irregular-shaped displays have become standard configurations in high-end vehicle models. At the functional level, the "one-chip multi-screen" architecture is accelerating its implementation, and the popularization of domain controllers is driving the in-depth integration of display systems with ADAS and connected vehicles. This integration not only optimizes the space utilization of the cockpit but also upgrades the display system from an information presentation terminal to an intelligent interactive hub—with the value of display modules per vehicle increasing by approximately 2x compared to that of fuel-powered vehicles.

- **High-Definition Display:** With the rising penetration rate of intelligent vehicle cockpits, meeting passengers' personalized driving and entertainment needs has become a key focus in the development of in-vehicle displays. To enhance the driving and riding experience, in-vehicle displays continue to move toward high definition: their resolution is evolving from the previous 800×400 to 1920×1080 or even higher, while emerging display technologies such as flexible screens, seamless connected screens, OLED screens, and Mini LED are gradually being applied. The entertainment experience and human-machine interaction demands of intelligent cockpits are driving the high-definition development of in-vehicle displays.

- **Upgraded Interactive Experience:** Display interaction is shifting from one-way visual output to multi-modal collaboration, with AR-HUD emerging as a key driver of intelligent transformation. Currently, W-HUD solutions are the mainstream HUD solutions. However, in the future, as cockpit visualization and interaction become fully intelligent, the market share of AR-HUD solutions will continue to rise and surpass that of W-HUD solutions.

SOURCE OF INFORMATION

We engaged CIC, an independent market research and consulting company that provides industry consulting services, commercial due diligence and strategic consulting, to conduct detailed research on and analysis of Global PCB, FPC, optical transceiver, precision component, optoelectronic display industries. We have agreed to pay a fee of RMB0.5 million to CIC in connection with the preparation of the CIC Report. We have incorporated certain information from the CIC Report into this section, as well as into the "Summary", "Business", "Financial Information" sections and elsewhere in this document to provide potential investors with a comprehensive presentation of the industries where we operate.

During the preparation of the CIC Report, CIC conducted both primary and secondary research, and gathered knowledge, statistics, information and insights on industry trends within the target research markets. The primary research involved interviews with key industry experts and leading industry participants. The secondary research consisted of analyzing data from various publicly available sources, such as the National Bureau of Statistics.

The CIC Report was compiled based on the following assumptions: (i) the overall social, economic and political environment in China is expected to remain stable during the forecast period; (ii) related key industry drivers are likely to propel continued growth in Global PCB, FPC, optical transceiver, precision component, optoelectronic display industries throughout the forecast period, including favorable policies and wider acceptance of different levels of autonomous driving features in vehicles; and (iii) there will be no extreme force majeure or unforeseen industry regulations through which the market may be affected in either a dramatic or fundamental way during the forecast period.