

INDUSTRY OVERVIEW

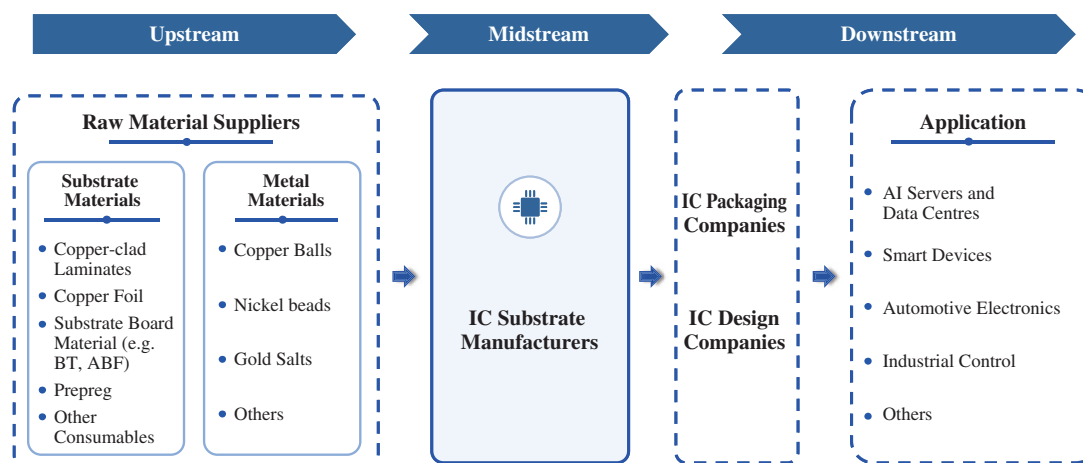
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DEFINITION OF IC SUBSTRATES

IC substrates are core materials used in the integrated circuit packaging process and serve as a key intermediate carrier connecting dies and printed circuit boards within a package. Through fine-line circuit structures, IC substrates enable electrical interconnection between chips and external circuits, while providing mechanical support, power delivery and thermal dissipation pathways, thereby supporting the development of higher performance and multi-chip integration in semiconductor packaging.

IC SUBSTRATES INDUSTRY CHAIN ANALYSIS

The IC substrate industry chain features a clear upstream, midstream and downstream structure, forming a complete value chain from the supply of upstream raw materials, to midstream IC substrate manufacturing, and further to packaging and testing as well as end-use applications. The following chart illustrates the industry chain structure of the IC substrate industry.



Source: Public information, Frost & Sullivan

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The upstream segment primarily consists of raw material suppliers, providing material foundations for IC substrate manufacturing. Raw materials for IC substrates mainly include substrate materials and metal materials. Substrate materials include copper-clad laminates, copper foil, substrate board material such as BT and ABF, prepreg and other consumables, which are core materials enabling electrical interconnection and structural support in IC substrates. Metal materials mainly include copper balls, nickel beads, gold salts and other metal consumables, which are used in manufacturing processes such as plating, circuit formation and surface treatment.

The midstream segment represents IC substrate manufacturing and is led by IC substrate manufacturers. Depending on the substrate type, manufacturers may adopt different production flows and process configurations, generally involving the formation of substrate layers and build-up layers through processes such as drilling, copper plating, tenting, lamination, circuitry formation, surface finish, testing and inspection. As the core segment of the IC substrate industry chain, IC substrate manufacturing processes upstream materials into high-density and high-precision IC substrate products and is critical to realising the technical performance and added value of IC substrate products.

The downstream segment mainly comprises IC packaging companies and IC design companies and end-use application industries. IC packaging companies undertake IC packaging and IC testing processes, assembling, interconnecting and testing chips with IC substrates to form finished IC products. IC design companies may also carry out product definition, validation and supply chain introduction, and conduct early-stage collaborative development with IC substrate manufacturers as well as IC packaging companies. IC substrate products are differentiated by product specifications such as size and thickness, design and technical complexity, relevant manufacturing processes, and required raw materials and production costs. The relevant finished IC products are ultimately widely used in end-use fields such as AI servers, high-speed computing, data centres, smart devices, automotive electronics and industrial control.

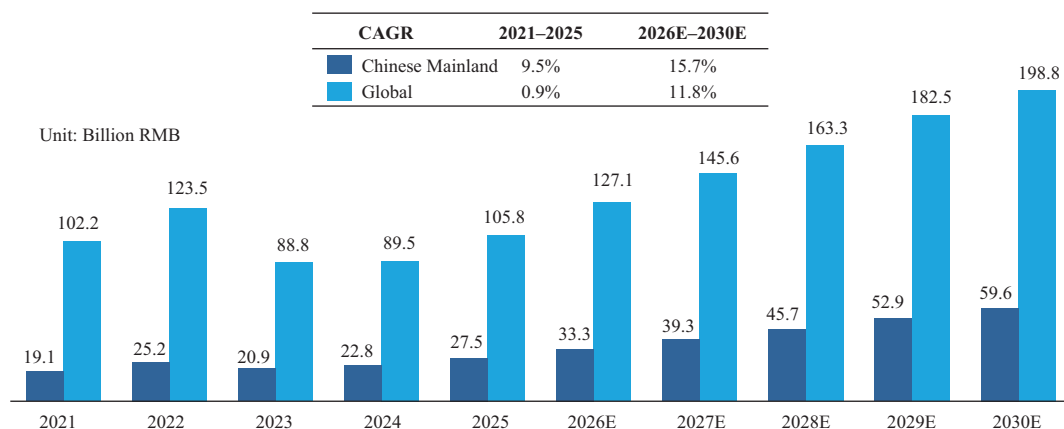
MARKET SIZE OF GLOBAL AND CHINESE MAINLAND IC SUBSTRATES, BY REGION

Driven by the rapid growth of AI computing power, the wider adoption of advanced packaging and demand from multiple end markets, the global IC substrates market has maintained growth and has become one of the faster-growing segments in the semiconductor industry. Chinese Mainland is one of the largest demand markets for IC substrates and has recorded growth above the global average. Supported by the need for supply-chain security and localisation, domestic substitution has continued to accelerate. Local manufacturers have made progress in mid-to-high-end products, with ongoing capacity expansion, technology upgrading and quality enhancement gradually strengthening their position in the global supply chain.

The global IC substrates market and the Chinese Mainland IC substrates market both expanded during the historical period. Chinese Mainland recorded a higher growth rate than the global market. The global market increased from RMB102.2 billion to RMB105.8 billion from 2021 to 2025, representing a CAGR of 0.9%. During the same period, the Chinese Mainland market increased from RMB19.1 billion to RMB27.5 billion, representing a CAGR of 9.5%. From 2026 to 2030, the global market is expected to increase from RMB127.1 billion to RMB198.8 billion, representing a CAGR of 11.8%. The Chinese Mainland market is expected to increase from RMB33.3 billion to RMB59.6 billion, representing a CAGR of 15.7%. Supported by demand expansion and the continued development of localised supply, the Chinese Mainland market is expected to continue to grow faster than the global market.

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Global and Chinese Mainland IC Substrates Market Size, 2021–2030E



Source: Prismark, Expert Interview, Frost & Sullivan

CLASSIFICATION AND FEATURES OF IC SUBSTRATES

IC substrates can be classified by major substrate type into FCBGA Substrates, FCCSP Substrates, CSP Substrates and other substrates. Different types of substrates vary in terms of material systems, interconnection methods, wiring density, product dimensions and application scenarios. FCBGA Substrates are mainly used for the packaging of high-performance and high-computing-power chips, as well as automotive-grade chips for intelligent driving and ADAS applications, and generally feature higher technical barriers and higher unit prices. FCCSP Substrates combine miniaturisation with relatively high performance, and are widely used in mobile terminals, radio frequency, communications, and certain automotive and industrial control chips. CSP Substrates are primarily used in mature wire-bonding packaging applications, with advantages in cost efficiency and mass production capability. Other substrates mainly cover module substrates, SiP substrates and other non-typical packaging products, whose applications differ from the above three substrate types and are more focused on multi-device integration, modular packaging and specific application scenarios. With the increasing demand for AI servers, high-performance computing and data centres, the importance of FCBGA Substrates has continued to increase.

Substrate Type	Core Substrate Board Material	Product Characteristics	Typical Downstream Application
FCBGA Substrates	Mainly ABF materials	Multi-layer, high-density, high I/O count, high reliability and high thermal dissipation	CPU/GPU, high performance AI computing chips, server/switch, 5G network infrastructure, ASIC, intelligent driving, ADAS etc.
FCCSP Substrates	Mainly BT materials	Miniaturised, thin-profile, high I/O density and fine-pitch interconnection	Smartphone, CPU for mobile phones (application processor) consumer electronics, mobile application processors, RF chips, power management IC, IoT device, etc.
CSP Substrates	Mainly BT material system	Miniaturised, thin-profile, high production efficiency and relatively low cost	Memory chips, analog chips, image sensors, Microcontroller unit/electronic control unit, biometrics identification and other mature-process fields.
Other substrates	BT, ABF, ceramic and other composite materials	Diverse product forms and broad application coverage	Module products, power devices, optoelectronic devices and other customised products, etc.

Source: China Semiconductor Industry Association, Frost & Sullivan

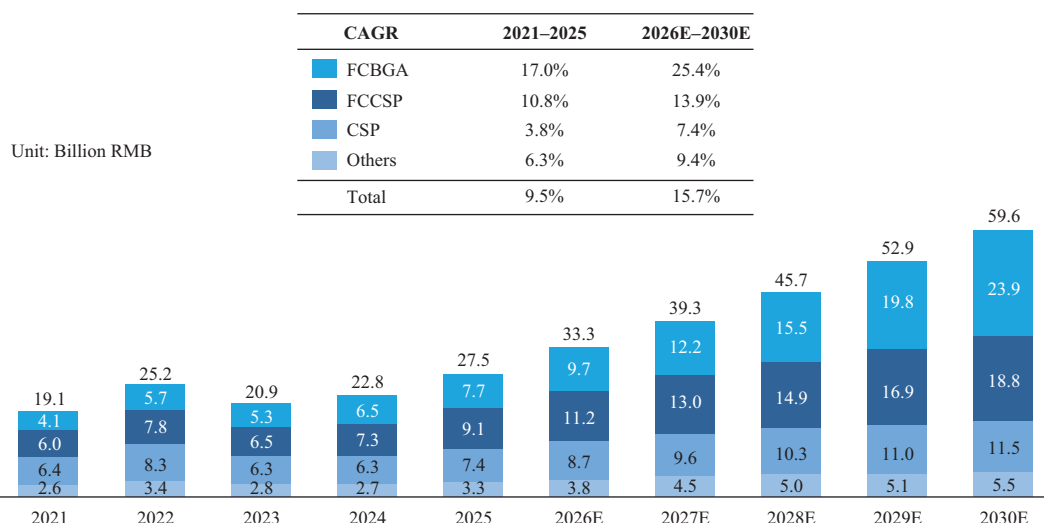
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MARKET SIZE OF CHINESE MAINLAND IC SUBSTRATES, BY SUBSTRATES TYPE

The IC substrate market in Chinese Mainland has generally maintained a growth trend, with its product structure continuing to diverge across different formats. In terms of substrate type, FCBGA Substrates recorded the fastest growth among the major substrate types, with market size increasing from RMB4.1 billion in 2021 to RMB7.7 billion in 2025, with a CAGR of 17.0%. FCBGA Substrates market size is expected to further expand to RMB23.9 billion by 2030, representing a CAGR of 25.4% from 2026 to 2030. This segment is expected to serve as a key growth driver of the overall IC substrate market.

The market size of FCCSP Substrates increased from RMB6.0 billion in 2021 to RMB9.1 billion in 2025, with a CAGR of 10.8%. It is expected to reach RMB18.8 billion by 2030, representing a CAGR of 13.9% from 2026 to 2030. The market size of CSP Substrates increased from RMB6.4 billion in 2021 to RMB7.4 billion in 2025, with a CAGR of 3.8%. It is expected to further increase to RMB11.5 billion by 2030, representing a CAGR of 7.4% from 2026 to 2030. Driven by the faster growth of FCBGA Substrates, the IC substrate market structure in Chinese Mainland is expected to further shift toward higher-end substrate formats, reflecting a continued structural upgrade of the industry.

Chinese Mainland IC Substrates Market Size, by Substrate Type



Source: Prismark, Expert Interview, Frost & Sullivan

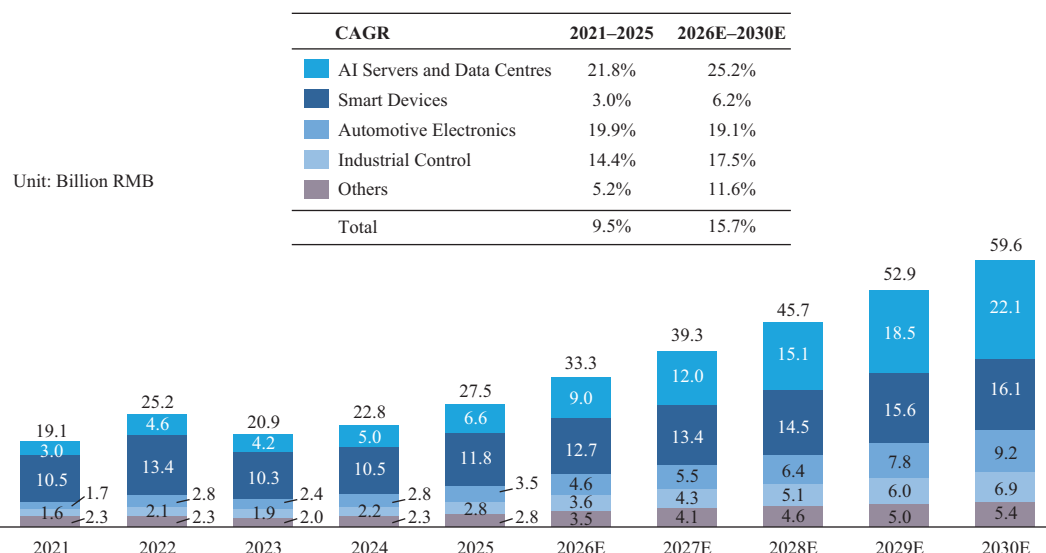
MARKET SIZE OF CHINESE MAINLAND IC SUBSTRATES, BY APPLICATION

With growing demand from AI servers and data centres, the IC substrate market in Chinese Mainland has demonstrated a trend of structural upgrade. From 2021 to 2025, the market size of IC substrates used in AI servers and data centres increased from RMB3.0 billion to RMB6.6 billion, with a CAGR of 21.8%. The market size of IC substrates used in smart devices increased from RMB10.5 billion in 2021 to RMB11.8 billion in 2025, representing a CAGR of 3.0%. The market size of IC substrates used in automotive electronics increased from RMB1.7 billion in 2021 to RMB3.5 billion in 2025, with a CAGR of 19.9%. The market size of IC substrates used in industrial control increased from RMB1.6 billion in 2021 to RMB2.8 billion in 2025, representing a CAGR of 14.4%.

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From 2026 to 2030, the market size of IC substrates used in AI servers and data centres is expected to further increase from RMB9.0 billion to RMB22.1 billion, with a CAGR of 25.2%, and is expected to remain a major incremental source of market growth and structural upgrade. The market size of IC substrates used in smart devices is expected to increase from RMB12.7 billion in 2026 to RMB16.1 billion in 2030, representing a CAGR of 6.2%. The market size of IC substrates used in automotive electronics is expected to increase from RMB4.6 billion in 2026 to RMB9.2 billion in 2030, with a CAGR of 19.1%. The market size of IC substrates used in industrial control is expected to increase from RMB14.4 billion in 2026 to RMB17.5 billion in 2030, representing a CAGR of 17.5%. The demand structure of IC substrates in Chinese Mainland is expected to further shift toward high-performance applications such as AI servers and data centres, indicating a more pronounced trend of structural upgrade.

Chinese Mainland IC Substrates Market Size, by Application



Source: Prismark, Expert Interview, Frost & Sullivan

MARKET DRIVERS OF IC SUBSTRATES INDUSTRY

• High-Performance Computing And AI Server Demand Driving The Upgrade Of IC Substrates

With the accelerated development of artificial intelligence, the continued advancement of AI servers, high-performance computing infrastructure and data centres has driven sustained growth in global computing power demand. CPUs, GPUs and AI accelerator chips are evolving toward larger package sizes and higher I/O density, leading to increasing packaging complexity and creating additional growth opportunities for advanced packaging, assembly and testing. Driven by such trends, IC substrates, as important foundational materials for chip packaging, are subject to increasingly stringent requirements in terms of layer count, line width/spacing and thermal dissipation performance. In particular, products used in high-performance computing applications have gradually entered a high-multilayer stage. The rapid growth in demand from data centres and high-performance computing is driving the demand structure of IC substrates toward FCBGA Substrates. Demand for FCBGA Substrates has gradually exceeded that for FCCSP Substrates, making FCBGA Substrates a core incremental source of growth in the IC substrate market in Chinese Mainland. This trend is reflected in the increasing value of individual FCBGA Substrates and the growing number of IC substrates required in AI servers. The typical AI server contains multiple CPUs, GPUs and AI accelerator chips, each of which requires a

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corresponding IC substrate. The number of IC substrates required per server can exceed ten pieces. In addition, high-performance chips generally adopt advanced packaging formats, which also significantly increases the value content of FCBGA Substrates.

- **Automotive Electronics And High-Reliability Applications Expanding The Demand Potential For IC Substrates**

The development of new energy vehicles, intelligent driving and in-vehicle computing platforms has driven demand growth for high-computing-power chips, automotive-grade MCUs, power devices and imposing higher requirements on IC substrates in terms of high-temperature resistance, vibration resistance and long-term reliability. As automotive-grade chips are increasingly used in intelligent driving, cockpit domain control and in-vehicle computing applications, FCBGA Substrates are expected to see broader adoption in related high-performance automotive semiconductor products. Industrial control, communication infrastructure and other high-reliability application scenarios continue to place higher requirements on device stability, product life cycle and environmental adaptability, further expanding the application boundaries of IC substrates. The continuous expansion of high-reliability applications such as automotive electronics and industrial control is driving IC substrate products toward higher reliability, greater stability and more customised specifications.

- **Continued Evolution Of Emerging Smart Devices And Intelligent Terminal Applications Supporting IC Substrate Demand**

Emerging smart devices products, such as AI PCs, wearable devices, smart home products and AR/VR devices, continue to undergo product upgrades, driving continuous upgrades in the application processing (APs), functional integration, computing capability and power management requirements of chips used in terminal devices. This provides a stable and scalable application foundation for IC substrates. With the gradual advancement of next-generation communication technologies such as 6G, terminal devices are expected to impose higher requirements on high-speed connectivity, low-latency transmission and radio frequency performance, thereby driving demand growth for the packaging of related communication and RF chips. Although smart devices products may be affected by periodic market fluctuations, their broad application scenarios and relatively stable product iteration cycles, together with continued chip performance upgrades and higher functional integration, are expected to continue driving packaging demand and support stable demand growth for smart devices IC substrates.

MARKET TRENDS OF IC SUBSTRATES INDUSTRY

- **Continued Policy Support Driving The Further Localisation Of IC Substrates**

Against the backdrop of growing emphasis on industrial chain self-reliance and supply chain security, the government issued the *Action Plan for Stable Growth of the Electronic Information Manufacturing Industry (2025–2026)* (《電子信息製造業2025–2026年穩增長行動方案》), which supports technological innovation in integrated circuits and advanced computing, strengthens the development of critical technologies, and promotes coordination across upstream and downstream segments. This provides clear policy guidance for the industrial upgrading and self-reliant development of IC substrates as an essential material for advanced packaging. *The Notice on Preparing the List of Integrated Circuit Enterprises or Projects and Software Enterprises Eligible for Preferential Tax Policies in 2025* (《國家發展改革委等部門關於做好2025年享受稅收優惠政策的集成電路企業或項目、軟件企業清單製定工作的通知》) includes IC substrates as key raw materials for integrated circuits, supporting technological breakthroughs and domestic substitution in the IC substrates industry.

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- **Continued Evolution of New Substrate Materials and Structural Solutions Expanding the Performance Enhancement Potential of IC Substrates**

With the continuous upgrading of demand for high-frequency and high-speed transmission, highly integrated packaging and high-computing-power chip packaging, traditional organic substrates are facing higher requirements in terms of size compatibility, stability and overall performance. This has driven the continued development of new substrate materials and related structural solutions, such as glass substrate technologies, which are gradually entering the stage of industrialization exploration. Looking ahead, with the continuous optimisation of material systems and structural design, IC substrates are expected to achieve further improvements in interconnection density, signal transmission performance and overall packaging capability.

- **Accelerated Capacity Expansion of FCBGA Substrates Driving the Upgrade of the IC Substrate Industry**

As the product structure of IC substrates continues to upgrade, the development focus of the IC substrate industry in Chinese Mainland is gradually expanding from FCCSP and CSP Substrates to FCBGA Substrates. Capacity expansion, process validation and customer introduction for FCBGA Substrates are expected to become important directions for industry development. In the future, as newly built IC substrate production capacity in Chinese Mainland is gradually released after 2027, the supply capability of local manufacturers in the FCBGA Substrate segment is expected to further improve, while yield ramp-up and customer qualification for related products are expected to accelerate. The industry is expected to continue upgrading in terms of capacity structure, product grade and customer coverage, further enhancing supply chain capabilities for IC substrates.

COMPETITIVE LANDSCAPE OF IC SUBSTRATES MARKET

- **Overview**

The global IC substrate market is generally characterised by a highly concentrated competitive landscape, with production capacity and technical capabilities primarily concentrated in regions such as Chinese Taiwan, Japan and South Korea. By comparison, market demand for IC substrates in Chinese Mainland has grown rapidly, supporting local manufacturers in continuing to expand production capacity and upgrade technologies.

From the perspective of competitive structure, the IC substrate market in Chinese Mainland also demonstrates a relatively high level of concentration. In particular, the FCBGA Substrate segment is characterised by a limited number of players with scaled mass production capabilities, resulting in more pronounced advantages among leading players. In relatively mature segments such as FCCSP and CSP Substrates, the market generally involves a broader range of players, resulting in a more diversified competitive landscape. Overall, the IC substrate market in Chinese Mainland demonstrates a competitive landscape broadly consistent with the global market, with a relatively high level of market concentration and clear advantages maintained by leading players in high-end segments, while local demand and production capacity continue to expand.

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● Ranking of Companies in Chinese Mainland IC Substrates Market

In 2025, the market size of Chinese Mainland IC substrates reached RMB27.5 billion. The Company ranked 2nd in the market, with a market share of 12.5%. The following table presents the ranking of companies in Chinese Mainland IC substrates market, as measured by revenue in 2025.

Ranking	Company	Market Share
1	Company A ⁽¹⁾	15.1%
2	The Company	12.5%
3	Company B ⁽²⁾	10.3%
	Others	62.1%
	Total	100.0%

Source: Company Report, Expert Interview, Frost & Sullivan

● Ranking of Companies in Chinese Mainland FCBGA Substrates Market

In 2025, the market size of Chinese Mainland FCBGA Substrates reached RMB7.7 billion. The Company ranked 1st in the market, with a market share of 25.3%. The following table presents the ranking of companies in Chinese Mainland FCBGA substrates market, as measured by revenue in 2025.

Ranking	Company	Market Share
1	The Company	25.3%
2	Company C ⁽³⁾	20.9%
3	Company B	12.5%
	Others	41.3%
	Total	100.0%

Source: Company Report, Expert Interview, Frost & Sullivan

1. A publicly listed electronic circuit company founded in 1984, headquartered in China and listed on the Shenzhen Stock Exchange, primarily engaged in printed circuit boards, IC substrates and electronic assembly, with product coverage across communications, data centres, automotive electronics, industrial control.
2. A subsidiary of a publicly listed electronic circuit company founded in 2019, headquartered in China, primarily focused on IC substrates, providing substrate solutions for communications, data centres, automotive electronics applications.
3. A subsidiary of a publicly listed electronic interconnect solutions company founded in 1987 and listed on the Vienna Stock Exchange, headquartered in China, primarily engaged in high-end printed circuit boards and IC substrates, serving applications including mobile devices, automotive, industrial, data centres and high-performance computing.

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● Ranking of Companies in Chinese Mainland FCCSP Substrates Market

In 2025, the market size of Chinese Mainland FCCSP Substrates reached RMB9.1 billion. The Company ranked 1st in the market, with a market share of 13.4%. The following table presents the ranking of companies in Chinese Mainland FCCSP Substrates market, as measured by revenue in 2025.

Ranking	Company	Market Share
1	The Company	13.4%
2	Company C	12.9%
3	Company B	11.9%
	Others	61.8%
	Total	100.0%

Source: Company Report, Expert Interview, Frost & Sullivan

ENTRY BARRIERS OF IC SUBSTRATES INDUSTRY

● Technical and Process Barriers

The production of IC substrates, particularly FCBGA Substrates, requires advanced process capabilities to meet demanding specifications for fine line width/spacing, multi-layer structures, impedance control and reliability performance. It involves the formation of substrate layers and build-up layers through a series of core processes, including drilling, copper plating, lamination, circuitry formation, surface finish, testing and inspection. These technologies require continuous iteration and optimisation through long-term R&D investment and mass production validation. New entrants generally face difficulties in establishing mature and stable process capabilities and yield control within a short period of time.

● Customer Qualification Barriers

As core base materials for chip packaging, IC substrates require early-stage collaborative development with IC design companies and IC packaging companies, and must undergo stringent and relatively long validation procedures. The overall qualification cycle for IC substrates is typically around two years. In particular, for FCBGA Substrates used in high-performance computing chips such as CPUs and GPUs, the qualification cycle typically takes two to four years due to higher technical complexity and more stringent customer validation requirements. Such process generally covers the full validation cycle from sample development and performance testing to small-batch trial production and stable mass production. Once a supplier enters the supply chain of mainstream customers and achieves mass production, customers generally face high switching costs due to stability and risk control considerations, resulting in strong customer stickiness.

● Capital Barriers

The construction of IC substrate production lines requires substantial capital investment, high-precision equipment, cleanroom facilities, automation systems and yield ramp-up capabilities. In addition, enterprises are required to maintain continuous capacity expansion capabilities and a global service network to meet the delivery requirements of major semiconductor customers. Such requirements for substantial capital investment and scaled production capabilities create high entry barriers for new market entrants.

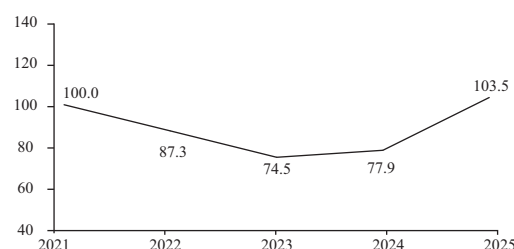
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COST ANALYSIS OF IC SUBSTRATES

The production of IC substrates involves various raw materials, and fluctuations in upstream material prices may have certain impacts on the industry’s cost structure and profitability. Raw materials for IC substrates mainly include substrate materials such as copper-clad laminates, copper foil, substrate board materials such as BT and ABF, prepreg and other consumables, as well as metal materials such as copper balls, nickel beads, gold salts and other metal consumables. Substrate materials are mainly used to form conductive layers, insulating layers and basic supporting structures, and have an important impact on the electrical performance, structural stability and process consistency of IC substrates. Metal materials are mainly used in manufacturing processes such as plating, circuit formation and surface treatment, and play an important role in processing precision and product reliability.

Copper-clad laminates is one of the important foundational materials used in IC substrate manufacturing. Driven by strong downstream electronics demand and rising upstream raw material prices, the copper-clad laminates price index remained at a relatively high level in 2021. As downstream demand weakened, inventories along the PCB industry chain underwent adjustment and industry sentiment declined from 2022 to 2023, the copper-clad laminates price index decreased notably and reached a periodic low in 2023. Supported by demand recovery from AI servers from 2024 to 2025, high-speed communications and smart devices, together with a rebound in prices of certain upstream raw materials, the copper-clad laminates price index gradually recovered and exceeded the 2021 level in 2025. The following chart illustrates the historical trend of the copper-clad laminates price index from 2021 to 2025.

Price Index of Copper-clad Laminates, 2021–2025



Source: GAC, Expert Interview, Frost & Sullivan

SOURCES OF INFORMATION AND RESEARCH METHODOLOGY

We engaged Frost & Sullivan for preparing an independent industry report in respect of the [REDACTED]. The information from Frost & Sullivan disclosed in the Document is extracted from the Frost & Sullivan Report, a report commissioned by us for a fee of RMB600,000, and is disclosed with the consent of Frost & Sullivan. The Frost & Sullivan Report has been prepared by Frost & Sullivan independently without any influence from us or other interested parties. Frost & Sullivan is an independent global consulting firm founded in 1961 in New York. Its services include, among others, industry consulting, market strategic consulting and corporate training. Frost & Sullivan conducted (i) primary research, which involved discussing the status of the industry with certain leading industry participants, and interviews with industry experts on a best-effort basis to collect information in aiding in-depth analysis; and (ii) secondary research, which involved reviewing government statistics, industry association publication, company reports, independent research reports and data based on its own research database.