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Overview of the Global Semiconductor Industry

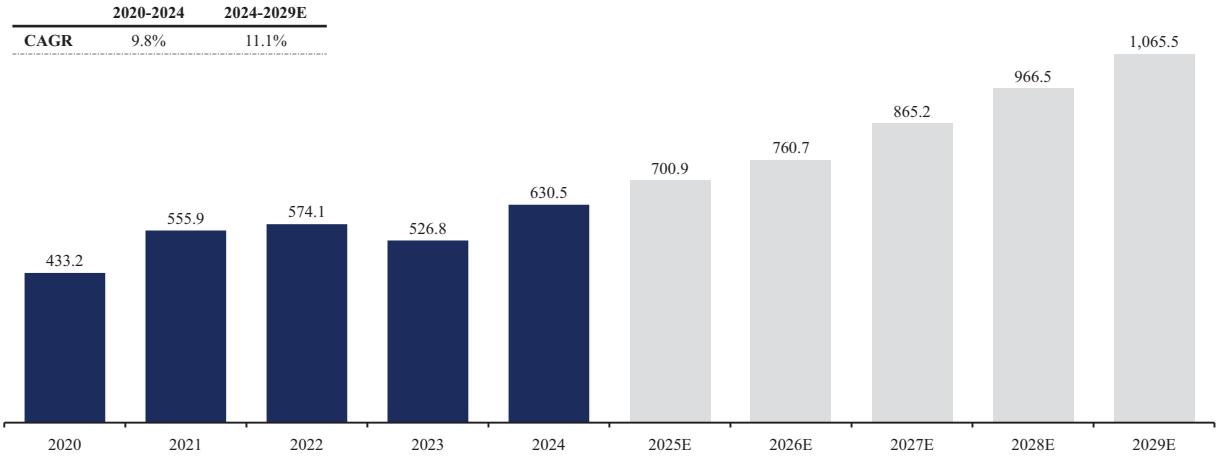
The semiconductor industry is a vital sector of the global technology ecosystem, focused on the design, manufacture, and distribution of semiconductor devices — the building blocks and foundational components that power virtually all modern electronics. Semiconductors are utilized in a wide range of applications include consumer electronics such as smartphones, tablets, PCs, smart home devices and wearable devices, as well as automobiles, wireless infrastructure, cloud data centers, data networking, robotics, and various emerging technology sectors. The development and innovation of semiconductor technologies have enabled hardware to deliver enhanced functionality, improved power efficiency, faster data transmission, greater storage capacity, stronger connectivity, and more intelligent human-device interactions.

Within the semiconductor industry, three key operational frameworks have emerged: the fabless model, the foundry model, and the IDM (Integrated Device Manufacturer) model. In the fabless model, companies focus exclusively on the design and development of semiconductors, outsourcing the fabrication process to specialized third-party manufacturers known as foundries. This allows fabless firms to remain capital-efficient, agile, and focused on innovation. In contrast, foundries are dedicated to the manufacturing of chips for other firms, offering access to advanced process technologies without requiring customers to invest in their own fabrication facilities. The IDM model, on the other hand, involves a single company managing both the design and manufacturing processes internally. While this approach provides greater control over the entire value chain, it also involves much more capital investment and operational complexity. The fabless model has been driven by its inherent advantages, including reduced capital expenditure, increased flexibility in choosing manufacturing partners, and faster time-to-market, making it particularly attractive to companies operating in fast-evolving technology sectors.

Over the past decade, the rapid development of mobile networks and the proliferation of smart devices have been major drivers of the significant innovation and growth in the semiconductor market. In particular, the rapid evolution of smart phones, from a simple communication tool to a wide selection of feature-rich devices essential to our daily life, has propelled the innovation of advanced semiconductor technologies. Together with the continued advancement of consumer electronics, next-generation automotive technologies, including EVs, smart vehicles, and autonomous driving, combined with intelligent surveillance, Edge AI, smart devices, data centers and servers, AI chips, IoT, 5G, and cloud-based AI solutions, these evolving and emerging applications are expected to further drive the growth of the global semiconductor industry over the coming decade. According to Frost & Sullivan, the market

size of the global semiconductor industry increased from US$433.2 billion in 2020 to US$630.5 billion in 2024, representing a CAGR of 9.8%, and is expected to further increase at a CAGR of 11.1% to reach US$1,065.5 billion in 2029.

Size of global semiconductor market, in terms of revenue
USD billion, 2020-2029E



Source: WSTS; Frost & Sullivan

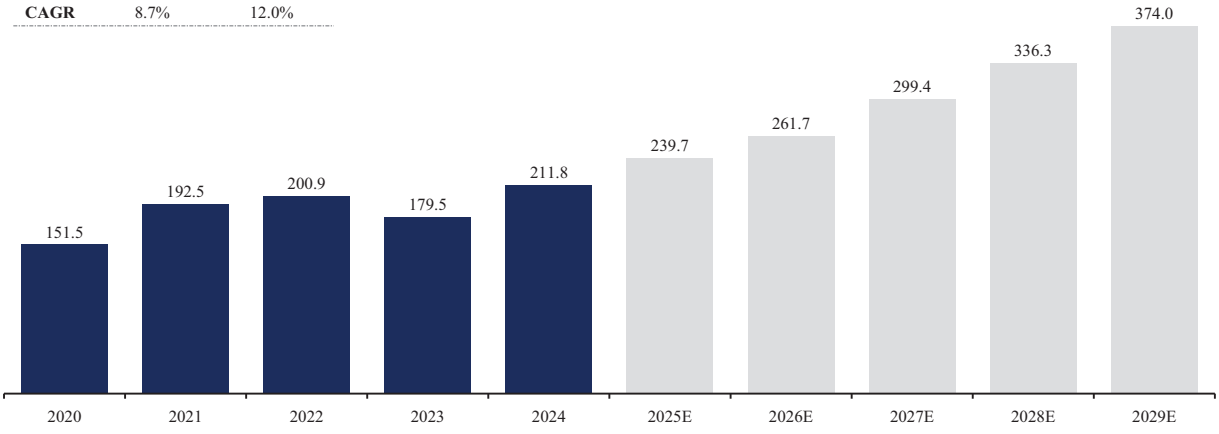
Overview of the Semiconductor Industry in China

Against the backdrop of long-term growth in the global semiconductor market, China's semiconductor industry has also experienced rapid development over the past decade. This growth has been supported by the broader shift of the global semiconductor supply chain to Asia, rising domestic demand, and increasing strategic attention from the PRC government. In recent years, the industry has seen a marked shift toward localized supply chain development, a trend often referred to as the "China for China" strategy. This transition has been largely driven by external constraints, especially U.S. export controls on advanced semiconductors and manufacturing equipment, which have limited Chinese firms' access to critical technologies. As a result, self-reliance in key technology sectors has become an increasingly urgent priority. While the semiconductor industry had already gained strategic importance, these geopolitical developments have accelerated efforts to build a fully domestic supply chain. The development of the semiconductor sector is now widely recognized as a national imperative, with various regions launching IC industry development funds to provide targeted financial support. These initiatives have created a favorable environment for companies across the semiconductor value chain.

China has become the manufacturing hub for consumer electronics and industrial devices as well as one of the largest markets for these applications. Growing demands from end markets, such as smartphones, automotive, Edge AI, and AI-driven data centers and servers, are further driving momentum in the sector. The semiconductor industry in China is expected to outgrow the global market. According to Frost & Sullivan, the market size of the semiconductor industry in China increased from US$151.5 billion in 2020 to US$211.8 billion in 2024, representing a CAGR of 8.7%, and is expected to further increase at a CAGR of 12.0% to reach US$374.0 billion in 2029.

Size of semiconductor market in China, in terms of revenue
USD billion, 2020-2029E

	2020-2024	2024-2029E
CAGR	8.7%	12.0%



Source: Frost & Sullivan

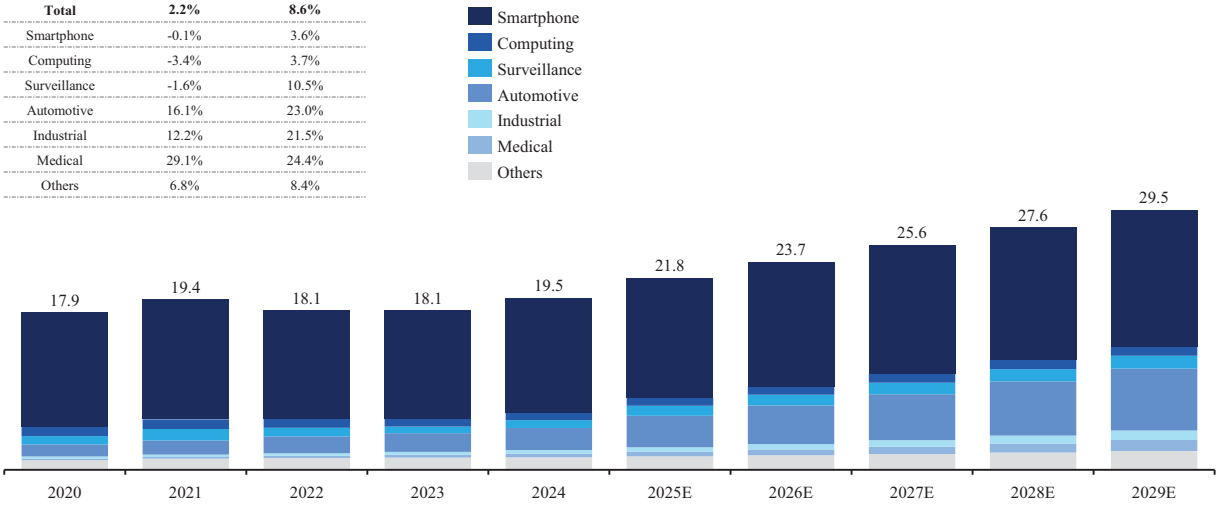
Overview of CIS Market

In the camera module, the image sensor is the most important component that determines the imaging quality of the camera as well as the structure and specifications of other components. Image sensors are sensors that detect and convert the variable attenuation of light waves into signals, which include optical information such as hue, saturation and lightness. The smallest sensing unit is a pixel. The quantity and quality of each pixel determine the image quality of a sensor. CIS and CCD image sensors are the two mainstream image sensors at present. And CIS is the most prevailing type of image sensors, and is inexpensive to produce and power-efficient, supporting HDR and providing fast readout. Thus, CISs are widely used in smartphones, consumer electronics, surveillance, automotive, and a broad array of other applications.

According to Frost & Sullivan, the global CIS market grew from US$17.9 billion 2020 to US$19.5 billion in 2024, representing a CAGR of 2.2%, and is expected to further expand at a CAGR of 8.6% to reach US$29.5 billion in 2029. The chart below sets forth the global CIS market size, including a breakdown by vertical.

Size of global CIS market, in terms of revenue
USD billion, 2020-2029E

CAGR	2020-2024	2024-2029E
Total	**2.2%**	**8.6%**
Smartphone	-0.1%	3.6%
Computing	-3.4%	3.7%
Surveillance	-1.6%	10.5%
Automotive	16.1%	23.0%
Industrial	12.2%	21.5%
Medical	29.1%	24.4%
Others	6.8%	8.4%



Source: Frost & Sullivan

Development Trends of the CIS Market

Several key development trends are shaping the competitive landscape of the industry:

- *Higher Resolution.* One of the most prominent trends in the CIS market is the continuous push toward higher resolution. From smartphones to automotive cameras and surveillance systems, there is an increasing demand for sensors exceeding 100MP. This trend enables sharper imaging, greater detail capture, and improved performance in HD applications such as 8K video recording and ultra-high-resolution photography.
- *HDR.* HDR performance has become an important feature in modern CIS designs, particularly for applications that require clear imaging in challenging lighting conditions. Enhanced HDR capabilities allow sensors to capture a wider range of brightness levels within a single frame, improving image clarity in high-contrast environments such as backlit scenes or rapidly changing outdoor lighting.
- *Improved Low-Light / All-Lighting Performance.* As image sensors are deployed in increasingly diverse environments, the ability to deliver high-quality images under all lighting conditions — especially low-light scenarios — is essential. Advances in pixel architecture, light absorption efficiency, and noise reduction algorithms have significantly improved low-light performance, enabling clearer night vision in smartphones, security cameras, and automotive vision systems.
- *Reduced Power Consumption.* Power efficiency remains a key design priority, especially for mobile and wearable devices where battery life is critical. The latest CIS technologies incorporate advanced power-saving architectures and low-power standby modes, allowing for continuous operation without compromising performance. This is particularly important for always-on applications in Edge AI, IoT, and smart sensing systems.

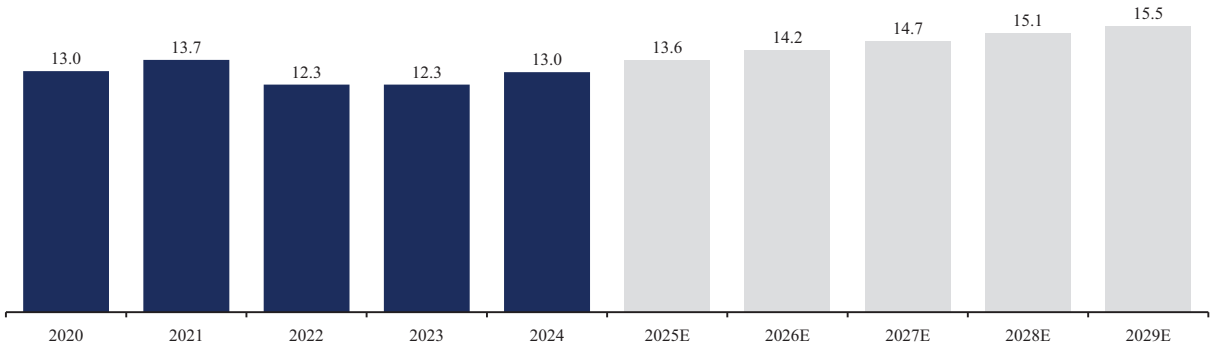
These ongoing developments reflect the broader shift toward smarter, more capable imaging solutions that support next-generation applications across multiple industries.

Smartphones

Smartphones represent the largest vertical in the global CIS market, constituting over 65% of its market size in 2024, according to Frost & Sullivan. Driven by 5G penetration, proliferati1on of multi-camera devices, the pursuit for better image quality and more diversified imaging features and innovative functions, the global smartphone CIS market remained stable from US$13.0 billion in 2020 to US$13.0 billion in 2024, and is expected to expand at a CAGR of 3.6% to reach US$15.5 billion in 2029. The chart below sets forth the global smartphone CIS market size.

Size of global smartphone CIS market, in terms of revenue
USD billion, 2020-2029E

	2020-2024	2024-2029E
CAGR	-0.1%	3.6%



Source: Frost & Sullivan

The following key drivers and trends contribute to the rapid growth of the smartphone CIS market:

- *5G penetration and proliferation of multi-camera.* The global rollout of 5G networks continues to drive smartphone replacement cycles and spur demand for advanced feature upgrades. To enhance photography capabilities, modern smartphones now commonly integrate multi-camera systems that combine wide-angle, telephoto, and macro lenses. By 2024, over 65% of flagship models featured quad- or penta-camera setups, with foldable devices emphasizing ultra-thin, multi-sensor designs to optimize form factor and performance.

- *Resolution upgrade.* Smartphone CIS technologies are rapidly evolving, with a clear trend toward higher resolution enabled by larger sensor sizes and more advanced pixel architectures. Leading flagship models now feature sensors exceeding 200MP, offering image clarity that rivals traditional DSLR cameras. At the same time, 8K video recording has become a standard capability in high-end devices. These hardware advancements are complemented by AI-driven pixel binning and multi-frame fusion algorithms, which significantly improve detail capture and image quality in low-light conditions — continuously expanding the possibilities of mobile photography.

- *Miniaturization.* CIS miniaturization remains a key priority for compact smartphone designs. Advances in TSV packaging and stacked architectures — such as those seen in solutions like the OV50K — have enabled pixel sizes as small as 0.56μm, supporting the development of camera modules that are up to 20% thinner. These innovations are especially beneficial for foldable devices.
- *Diversified features.* Beyond resolution improvements, CIS innovation is shifting beyond resolution to include advanced imaging capabilities. Key trends include dual-mode visible/IR sensing for depth mapping and biometrics, enhanced NIR performance for low-light imaging, and LOFIC technology enabling ultra-wide dynamic range (up to 14 stops) with minimal motion blur. Emerging architectures like dual-layer transistor pixels and AI-ISP co-processing are also redefining autofocus speed, real-time image processing, and system responsiveness — driving smarter, more adaptive mobile and automotive vision solutions.
- *Domestic replacement trend.* The adoption of domestically produced CIS in mid-to-high-end smartphones is gaining momentum as part of China's broader push for semiconductor self-reliance.

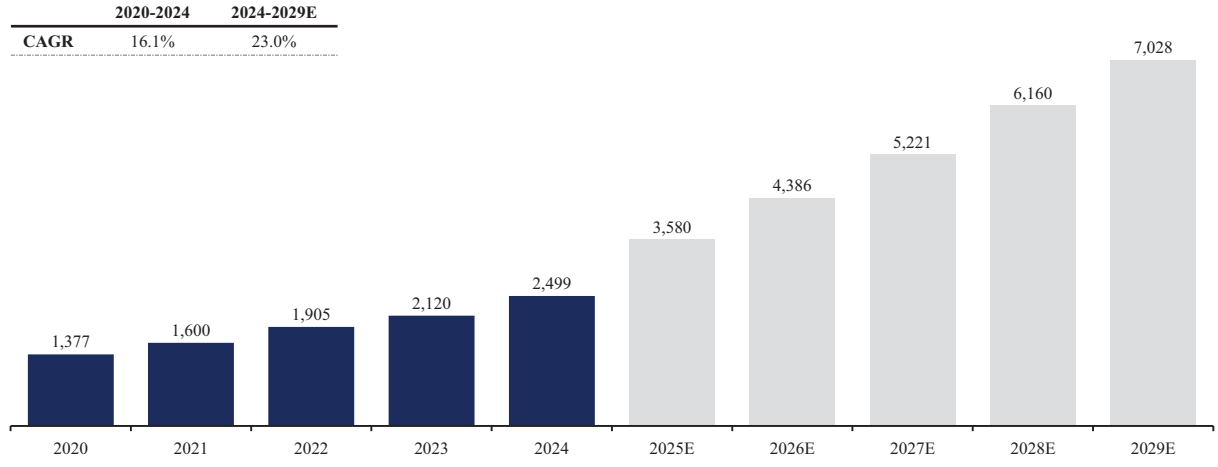
Automotive

Automotive is one of the fastest-growing vertical for CIS applications. CIS usage in vehicles is expanding rapidly, evolving from basic rear-view cameras and dashcams to advanced applications such as surround-view systems, ADAS, e-mirrors, and DMS. This growth is driven not only by an increasing number of cameras per vehicle, but also by rising average single-camera module value, fueled by the demand for higher resolution, enhanced low-light performance, and functional safety features required for high-level autonomous driving. The automotive CIS market is thus being propelled by both quantity increases across various automotive systems and feature upgrades with higher values aimed at enabling intelligent sensing and safer driving experiences. Moreover, the growing popularity of autonomous driving technologies is accelerating the attach rate of CIS sensors in vehicles.

However, the automotive CIS market is characterized by long design cycles, rigorous quality requirements, and stringent safety certifications. CIS providers must engage closely with auto manufacturers early in the development process to design sensors that meet demanding performance standards and pass a range of reliability tests — such as ISO 26262 functional safety certification, AEC-Q reliability testing, and IATF16949 quality management system certification. Due to the requirement for better reliability and the long cycle for OEM qualification, development timelines in this sector are significantly extended. It typically takes two to five years from initial design-in to volume production of an automotive image sensor. As a result, once a sensor vendor secures supplier certification, automakers are generally reluctant to switch vendors during the lifecycle of a given vehicle model.

According to Frost & Sullivan, the global automotive CIS market grew from US$1,377 million in 2020 to US$2,499 million in 2024, representing a CAGR of 16.1%, and is expected to reach US$7,028 million in 2029, representing a CAGR of 23.0% from 2024. The chart below sets forth the global automotive CIS market size.

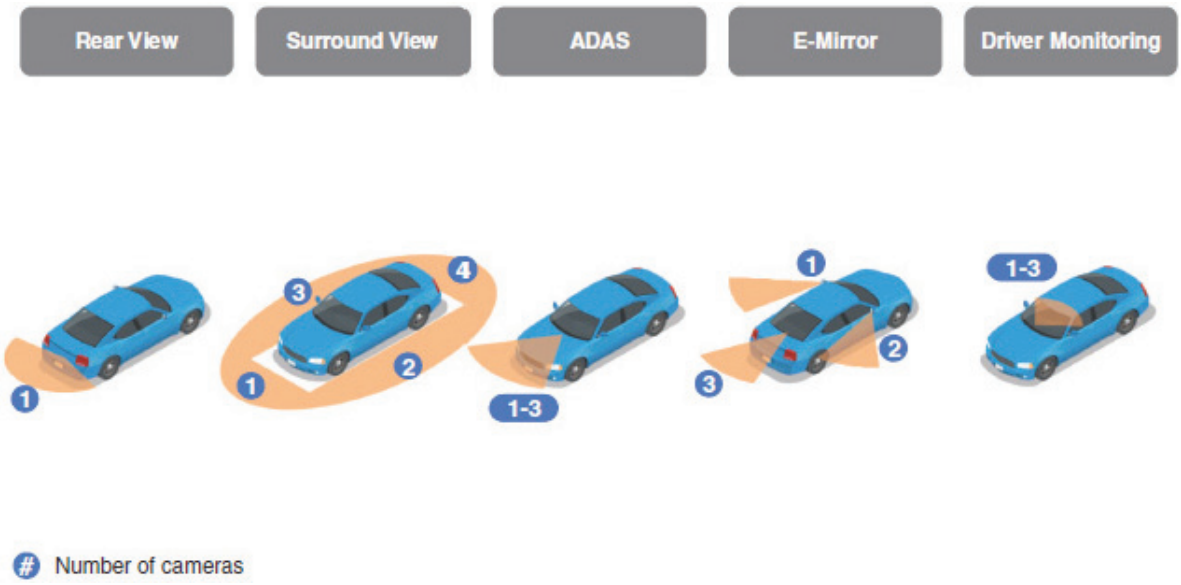
Size of global automotive CIS market, in terms of revenue
USD million, 2020-2029E



Source: Frost & Sullivan

The following key trends and drivers contribute to the rapid growth of the automotive CIS market:

- *Growing demand for ADAS and autonomous driving.* The growing adoption of ADAS and the push toward autonomous driving have significantly increased demand for automotive CIS. Driven by both consumer safety expectations and regulatory requirements, Level 2+ autonomous features, such as lane-keeping assist, automated parking, and traffic jam pilots, are now standard in premium vehicle segments. These systems rely on multi-sensor fusion, including cameras, radar, and LiDAR, to enable real-time environmental perception. As a result, flagship models now integrate 10–14 automotive cameras, supporting functions such as 360° surround view, DMS, and occupant safety systems. The integration of AI-powered vision processing enables real-time hazard detection, while OTA updates ensure continuous performance improvement and compliance with evolving standards like Euro NCAP 2025.



- *Resolution upgrade.* Automotive CIS technology has seen a significant resolution upgrade, with 8MP+ sensors becoming increasingly common. These high-resolution sensors enable advanced applications such as 4K surround-view systems and license plate recognition at distances exceeding 150 meters. This evolution supports higher fidelity imaging, which is critical for object identification and situational awareness in autonomous and semi-autonomous driving environments.
- *Differentiated requirements for other technologies.* Automotive CIS are increasingly differentiated by advanced capabilities beyond resolution. These include HDR, LFM, and ultra-low-light performance to ensure clarity in challenging conditions. Global shutter designs reduce motion artifacts, while ASIL-B/C functional safety compliance guarantees reliability under extreme environments. Features like occupant monitoring and AI-enhanced processing are also driving higher sensor value and enabling smarter automotive vision systems.
- *Favorable policies to promote EVs*. Compared to ICE vehicles, EVs typically have more advanced intelligent features, such as sophisticated ADAS and smart cockpits. Global support for EVs has intensified as major markets expand regulatory frameworks and fiscal incentives to accelerate adoption. The European Union's Euro 7 emissions standards, effective from 2025, impose stricter CO_2 limits for cars and vans, pushing automakers toward electrification. Meanwhile, China's updated New Energy Vehicle Industrial Development Plan (2025–2035) sets a target of achieving 40% zero-emission vehicle sales by 2030 — more than double its previous goal. In the United States, federal tax credits under the Inflation Reduction Act prioritize domestically manufactured EVs, complementing California's mandate to phase out internal combustion engine (ICE) vehicle sales by 2035. China continues to lead with aggressive policy measures, including extended purchase subsidies, license plate exemptions in major cities, and significant investments in ultra-fast charging infrastructure. These initiatives have driven EV sales to account for over 40% of China's total auto market in 2024. According to the International Energy Agency (IEA), global EV penetration is expected to surpass 20% by 2025, reflecting the growing momentum of electrification worldwide. These enhanced intelligent functionalities usually rely on a greater number of cameras, which in turn drives an increase in demand for CISs within the automotive sector, propelled by the growth in EV sales.

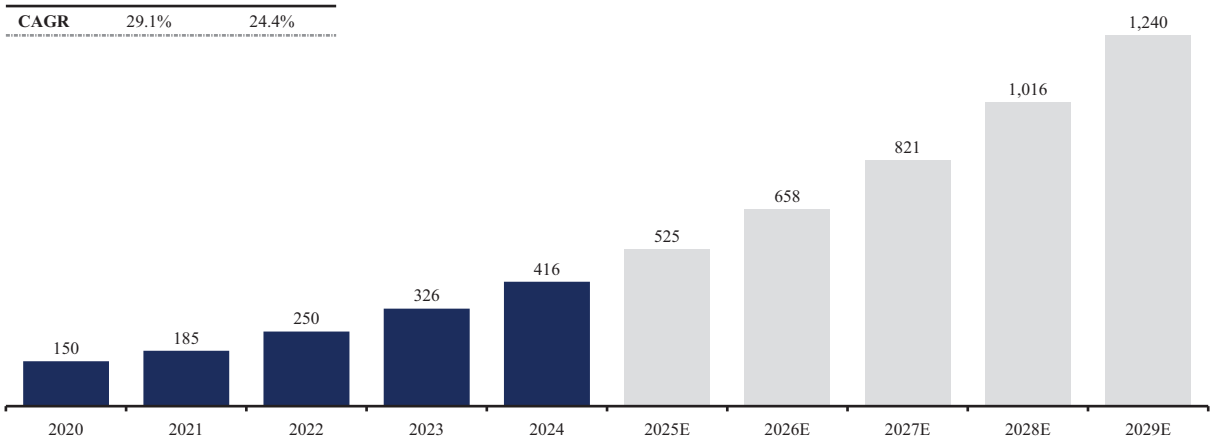
Medical

The medical sector is a rising vertical for CIS applications. This growth is driven by the rising number of surgical procedures, increasing preference for minimally invasive techniques, and the growing prevalence of chronic conditions such as digestive disorders. Heightened concerns around cross-contamination are also shaping market dynamics. Endoscopes represent the primary application for medical cameras and CIS, where image quality, size, and reliability are critical. As demand for minimally invasive procedures expands, so does the need for smaller, higher-resolution image sensors with enhanced performance capabilities. At the same time, concerns over infection risks from improperly sterilized reusable devices are accelerating the adoption of single-use endoscopes and catheters, which offer clear advantages in terms of safety, convenience, and cost-effectiveness — further driving demand for compact, high-performance CIS solutions.

According to Frost & Sullivan, the global medical CIS market grew from US$150 million in 2020 to US$416 million in 2024, representing a CAGR of 29.1%, and is expected to reach US$1,240 million in 2029, representing a CAGR of 24.4%. The chart below sets forth the global medical CIS market size.

Size of global medical CIS market, in terms of revenue
USD million, 2020-2029E

	2020-2024	2024-2029E
CAGR	29.1%	24.4%



Source: Frost & Sullivan

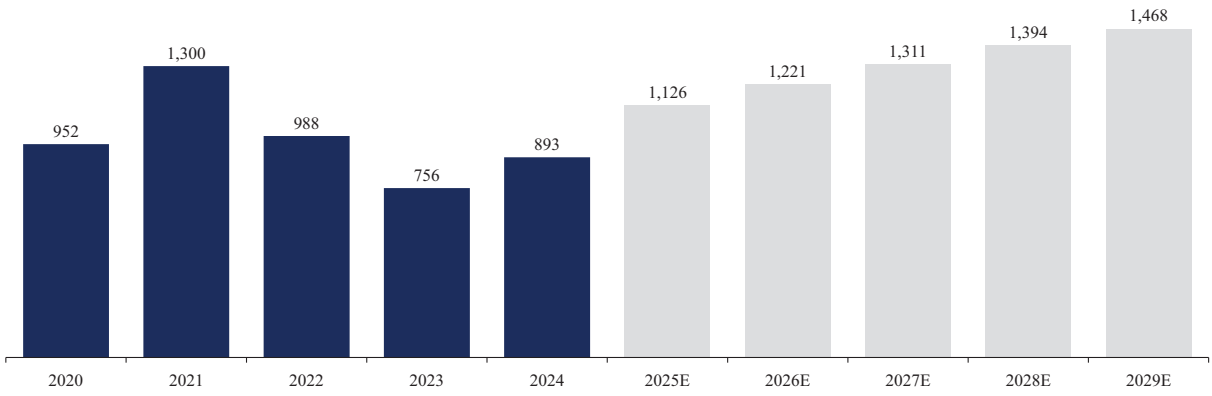
Surveillance

Surveillance represents a broadly utilized vertical for CIS applications, driven by the proliferation of intelligent ecosystems such as smart homes, smart communities, and smart manufacturing. CISs are deployed across both consumer-grade applications, including home security systems, doorbell cameras, and motion-activated devices, as well as large-scale deployments in public transportation hubs, office buildings, and industrial facilities. With the gradual increase in the complexity of video surveillance systems, the performance requirements for CIS have also intensified. Sensors are now expected to deliver superior performance in low-light imaging, HDR, HD/Ultra HD resolution, and intelligent identification capabilities. In response, CIS technologies are advancing rapidly — from HD to FHD — featuring higher sensitivity, lower power consumption, and built-in AI functions tailored to meet the specific demands of each application scenario. CIS vendors offering such tailor-made features are well positioned to gain share in the market.

According to Frost & Sullivan, the global surveillance CIS market fluctuated from US$952 million in 2020 to US$893 million in 2024, and is expected to further expand at a CAGR of 10.5% to reach US$1,468 million in 2029. The chart below sets forth the global surveillance CIS market size.

Size of global surveillance CIS market, in terms of revenue
USD million, 2020-2029E

	2020-2024	2024-2029E
CAGR	-1.6%	10.5%



Source: Frost & Sullivan

Other Emerging Markets

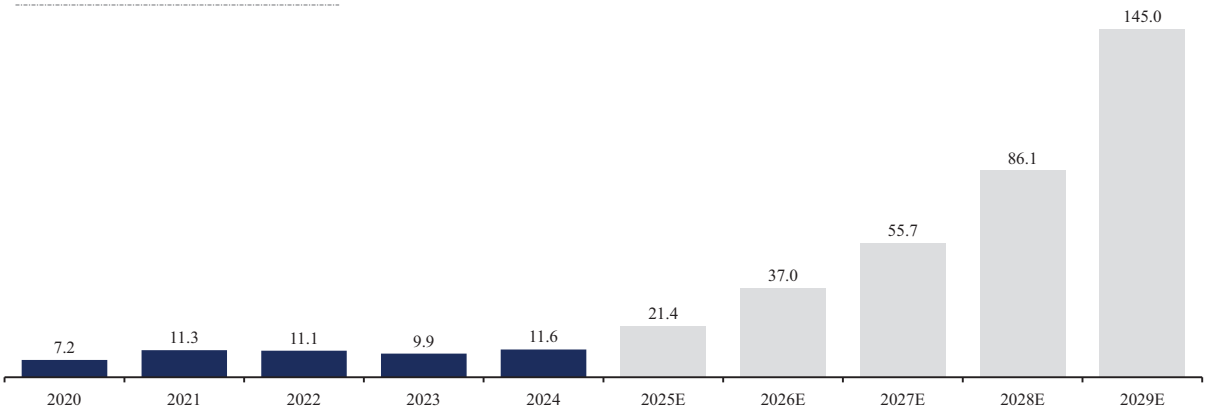
CIS are increasingly being adopted across emerging markets — represented by machine vision, smart glasses and Edge AI, among others — to enable advanced photography and sensing functionalities. These fast-growing segments are expected to create continuous market opportunities, driving both innovation and demand for next-generation sensor technologies.

Notably, smart glasses is emerging as the next digital frontier for CIS applications, fueled by global trends in smart technology adoption and AI integration. Global technology leaders are making significant investments across the smart glasses value chain, spanning hardware, software, content, and applications. Modern smart glasses incorporate multiple CIS units to support critical features such as gesture detection, depth and motion sensing, and head and eye tracking.

According to Frost & Sullivan, the shipment of global smart glasses market increased from 7 million in 2020 to 12 million in 2024, representing a CAGR of 12.6%, and expects to reach 145 million in 2029, representing a CAGR of 65.8%.

Size of global smart glasses market, in terms of shipment
Million, 2020-2029E

	2020-2024	2024-2029E
CAGR	12.6%	65.8%



Source: Frost & Sullivan

Overview of the Display IC Market

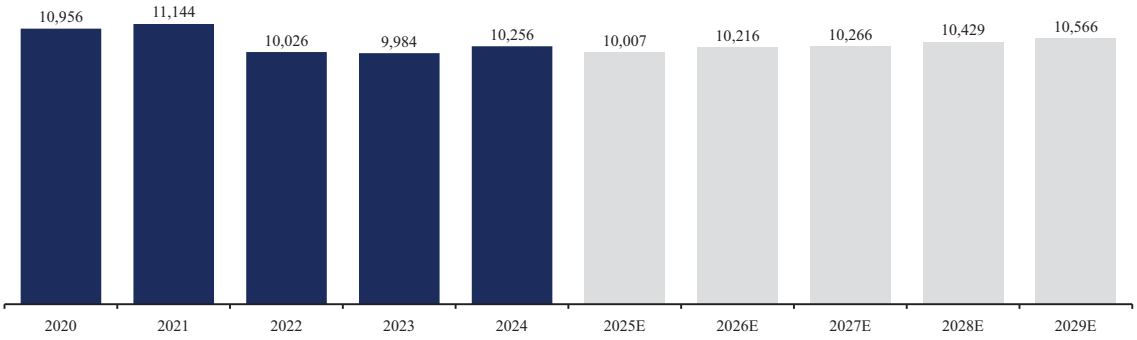
Display Driver IC ("DDIC") Market

DDICs are semiconductor IC which provide the interface between processors and display devices, such as cathode ray tubes, LCD panels and OLED panels, LED, ePaper, and others. DDICs accept commands and data via industry-standard interfaces — such as TTL, CMOS, RS232, SPI, or I2C — and generate output signals with appropriate voltage, current, timing, and demultiplexing characteristics to render the desired text or image on the screen. In many cases, display driver ICs function as application-specific microcontrollers, often integrating memory components such as RAM, Flash, EEPROM, or ROM. Embedded firmware and display fonts stored in fixed ROM enable efficient control of display content and formatting. Today, LCD and OLED technologies dominate the market, both requiring advanced DDICs to manage panel operations while enabling displays to be more dynamic, design-friendly, and power-efficient.

According to Frost & Sullivan, the global DDIC market is expected to grow from US$10,256 million in 2024 to US$10,566 million in 2029, representing a CAGR of 0.6%. The chart below sets forth the global DDIC market size.

Size of global display driver IC market, in terms of revenue
USD million, 2020-2029E

	2020-2024	2024-2029E
CAGR	-1.6%	0.6%



Source: Frost & Sullivan

Compared to LCD, each pixel on an OLED display is able to provide its own illumination so there is no need for separate backlight. Therefore, OLED displays offer improved image quality with lower power consumption, and enable ultra-thin, foldable and transparent designs with better durability. With the growing popularity of OLED displays, the OLED DDIC market is expected to grow at a faster pace than the overall DDIC market. According to Frost & Sullivan, the market size of OLED DDIC increased from US$2,225 million in 2020 to US$4,941 million in 2024, representing a CAGR of 22.1%, and is expected to further increase at a CAGR of 5.9% and reach US$6,585 million in 2029.

China has the largest end markets for smartphones and televisions, which are the main demand drivers of display panels. Moreover, these applications are also predominantly manufactured and assembled in China. As a result, China has become the largest DDIC market, accounting for more than 55.9% of global shipment in 2024, according to Frost & Sullivan.

Micro LED has emerged as a next-generation display technology with key advantages over OLED. Unlike OLED, which uses organic materials that degrade over time, Micro LED uses inorganic emitters that offer higher brightness, longer lifespan, and better stability. As a result, it is gaining traction in smart devices such as AR headsets. In AR, Micro LED is often paired with waveguide technology to deliver high-quality visuals. It is also seen as a strong candidate for future micro-display systems. While adoption is still limited, growth is expected to accelerate in the coming years.

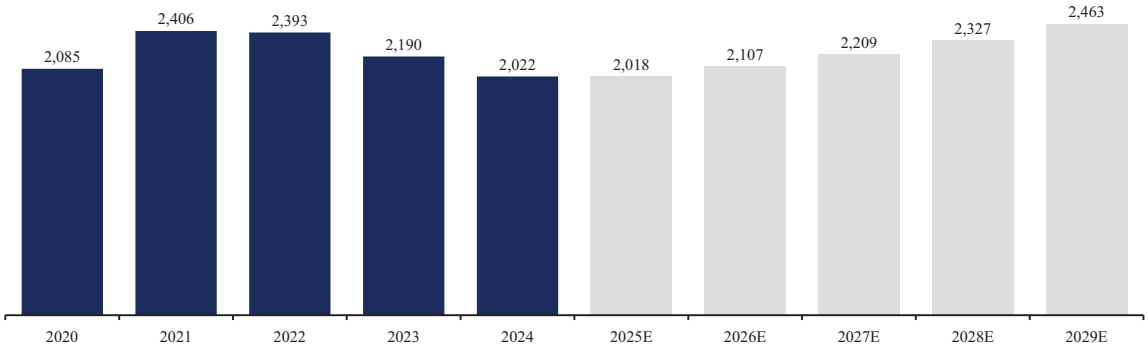
TDDI Market

TDDI combines the functions of a display driver IC and a touch controller into a single chip, significantly enhancing system integration. This integration enables thinner, lighter, and more cost-effective mobile devices with improved display performance. TDDI receives data from the mainboard, processes it through analog-to-digital conversion and algorithmic optimization, and then adjusts the deflection of liquid crystal molecules by controlling output voltage — thereby precisely managing screen display effects. Compared to traditional architectures where display and touch functions are handled separately, TDDI offers superior noise management through unified control, resulting in cleaner signal transmission and enhanced overall display quality.

The TDDI technology has become a widely adopted solution. This is particularly the case in the smartphone vertical, given that TDDI enables higher screen-to-body ratios and thinner designs. Larger screens such as tablets, computers and automotive displays are increasingly adopting the TDDI technology as well. According to Frost & Sullivan, the global TDDI market is expected to grow from US$2,022 million in 2024 to US$2,463 million by 2029, representing a CAGR of 4.0%. The chart below sets forth the global TDDI market size.

Size of global TDDI market, in terms of revenue
USD million, 2020-2029E

	2020-2024	2024-2029E
CAGR	-0.8%	4.0%



Source: Frost & Sullivan

- As an innovative DDIC solution, the TDDI technology, which combines touch and display chips into one, have become a widely adopted solution. This is particularly the case in the smartphone vertical, given that TDDI enables higher screen-to-body ratios and thinner designs. Larger screens such as tablets, computers and automotive displays are increasingly adopting the TDDI technology as well.

Global display driver IC shipments have grown steadily alongside expanding display panel production, with LCD panels maintaining a dominant share and OLED adoption gradually rising. Consumer demand for superior viewing experiences is pushing display drivers to support higher resolution, faster frame rates, and lower power consumption. The direction of IC development varies by panel size: small consumer electronics require highly integrated chips to enable slim, power-efficient designs, while large-size devices emphasize high-resolution performance to meet premium display expectations.

Overview of the Analog IC Market

Analog semiconductors devices used to process analog signals such as temperature, speed, sound and electrical current. An IC is classified as analog if at least 50% of its chip area is occupied by analog circuitry. These semiconductors encompass a wide range of product categories and are essential for bridging the gap between physical inputs and digital processing in electronic systems. A key type of analog IC is the PMIC, including LDOs and DC-DC converters, which provide critical power regulation and efficiency functions. These components are vital in battery-operated systems such as smartphones, PCs, earbuds, and other portable electronics — as well as in automotive and industrial applications.

Analog ICs are broadly categorized into general-purpose analog chips, which serve universal functions across industries, and application-specific analog chips, tailored for specialized performance in targeted fields. PMICs and analog signal processing ICs also play important roles in managing energy flow and handling tasks like sensing, transmitting, and reproducing real-world signals with high fidelity.

General-Purpose Analog ICs

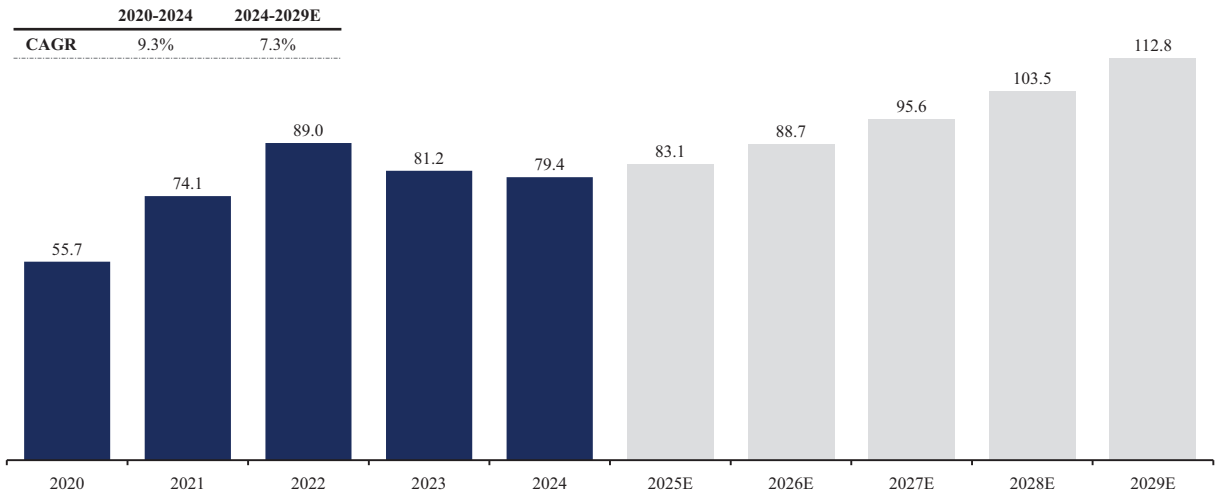
- *Amplifiers and Comparators*: Used for signal conditioning, including amplification, filtering, buffering, and comparison (e.g., current sense amplifiers, transimpedance amplifiers).
- *Signal Conversion ICs*: Convert signals between analog and digital domains (ADCs, DACs) or between voltage and frequency forms.
- *Interface ICs*: Ensure signal integrity during transmission across physical media such as cables or PCB traces.
- *PMICs*: Regulate, convert, and distribute DC power for system efficiency and stability.

Application-Specific Analog Circuits

- *Consumer*: Designed for personal electronics such as smartphones, wearables, and home appliances.
- *Computer*: Includes ICs used in computing systems, storage devices, and peripherals.
- *Communications*: Supports voice and data infrastructure and end-equipment applications outside military use.
- *Automotive*: Powers infotainment, ADAS, and other automotive electronic systems.
- *Industrial and Others*: Deployed across industrial automation, medical diagnostics, and aerospace.

According to Frost & Sullivan, the global analog IC market grew from US$55.7 billion in 2020 to US$79.4 billion in 2024, representing a CAGR of 9.3%, and is expected to further expand at a CAGR of 7.3% and reach US$112.8 billion in 2029. The chart below sets forth the global analog IC market size.

Size of global analog IC market, in terms of revenue
USD billion, 2020-2029E



Source: WSTS; Frost & Sullivan

The shift from traditional ICE vehicles to EVs is significantly boosting demand for analog ICs, as EVs rely entirely on electricity and require extensive power management ICs across various systems. The rise of electrification, coupled with advancements in autonomous driving, is increasing the need for sensors like millimeter-wave radar, with higher autonomy levels requiring more analog chips. As autonomous technology matures, EVs will demand even greater power efficiency and conversion capabilities, further elevating the value of analog ICs. In parallel, 5G infrastructure development — particularly base station construction — is driving growth in analog IC demand due to the need for high-frequency components such as amplifiers and converters. Additionally, the rollout of 5G has accelerated smartphone upgrades, with 5G devices requiring more analog ICs than their 4G counterparts due to increased system complexity and power consumption. Stricter performance requirements and emerging trends in AI-enabled smartphones and PCs — such as larger battery capacities — are further contributing to rising analog IC content and value in consumer electronics.

The key development trends include in analog ICs are high integration and low power consumption. Driven by rapid growth in emerging applications such as IoT, AI, EVs, cloud computing, and 5G, the global analog IC industry is expected to maintain strong momentum over the medium to long term. Automotive electrification and industrial energy efficiency demands are pushing analog chips toward higher performance and integration. In consumer electronics, compact and low-power designs remain critical for enhancing user experience, while the automotive sector emphasizes energy-saving capabilities. Diverse industry needs are fueling demand for analog ICs that are smaller, more integrated, and energy-efficient.

Riding on the large end-market demand and the trends of supply chain localization, China's analog IC market is growing rapidly and Chinese companies are catching up on high-end analog ICs through technology innovations in recent years. According to Frost & Sullivan, China is the largest market for analog ICs and the market size in China contributes to approximately 35% of the global analog IC market in 2024 and is expected to increase to 42% in 2029.

Overview of the Discrete Semiconductors Market

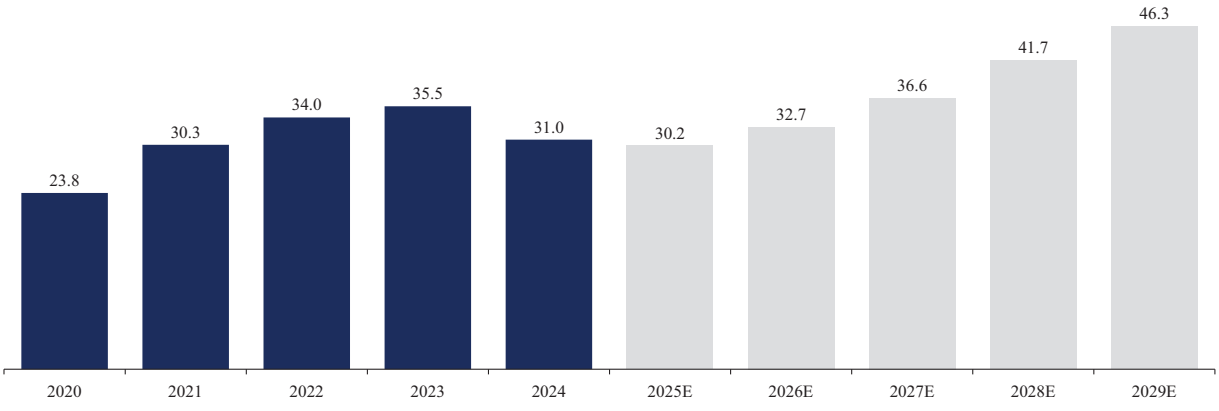
Discrete semiconductors include components such as TVS diodes, MOSFETs, Schottky diodes, and a variety of other singular-function devices. These components typically perform individual electronic functions such as voltage regulation, surge protection, power conversion, rectification, switching, mixing, and amplification. They are widely used across applications in computers, tablets, smartphones, telecommunications equipment, transportation systems — including EVs — as well as portable medical electronics. Discrete devices refer to electronic components with independent, non-integrated functions that cannot be separated from their core purpose. As one of the foundational and core areas of the semiconductor industry, discrete semiconductors play a critical role in enabling the operation of diverse electronic systems. From a technological perspective, the discrete semiconductor market is driven by the increasing demand for miniaturization and efficient power management in increasingly complex electronic applications. From a market demand standpoint, the growing electronic content across consumer, industrial, and automotive systems is fueling the need for high-energy, power-efficient devices — particularly MOSFETs and IGBTs in automotive applications.

The global discrete semiconductor market is relatively fragmented, with a large number of companies offering various product categories. Supply is largely influenced by upstream production capacity, while demand is pulled by growth in downstream end-markets across the value chain.

According to Frost & Sullivan, the global discrete semiconductor market grew from US$23.8 billion in 2020 to US$31.0 billion in 2024, representing a CAGR of 6.8%, and is expected to further expand at a CAGR of 8.4% to reach US$46.3 billion in 2029. The chart below sets forth the global discrete semiconductor market size.

Size of global discrete semiconductor market, in terms of revenue
USD billion, 2020-2029E

	2020-2024	2024-2029E
CAGR	6.8%	8.4%



Source: WSTS; Frost & Sullivan

Competitive Landscape of the CIS Market

The global CIS market is highly concentrated and the top five players had a combined market share of 84.1% in 2024, in terms of revenue, according to Frost & Sullivan. We have been consistently ranked as one of the top three players in the global CIS market and our market share reached 13.7% in 2024.

The following table set forth the competitive landscape of the global CIS market.

Top Five Players in Global CIS market, in terms of revenue (2024)

Ranking	Players	Relevant Revenue (USD billion)	Market Share
1	Company A	8.6	44.0%
2	Company B	3.2	16.4%
3	The Group	2.7	13.7%
4	Company C	1.1	5.8%
5	Company D	0.8	4.3%

Notes:

1. *Company A is one of the leading global players in the image sensor market, renowned for its innovative technology in CMOS sensors used in mobile devices, cameras, and automotive systems.*
2. *Company B is a major player in the CIS market, providing high-performance sensors for smartphones, automotive applications, and security surveillance.*
3. *Company C is a leading semiconductor company, providing a wide range of image sensors and solutions for automotive, industrial, and consumer applications.*
4. *Company D is a prominent player in the CIS industry, focusing on the development of sensors for applications such as mobile, automotive, and security systems.*

Source: Frost & Sullivan Report

We have maintained leadership across major verticals. According to Frost & Sullivan, in 2024, we are the world's third largest smartphone CIS provider with a market share of 10.5% and the largest automotive CIS provider with a market share of 32.9%.

The following tables set forth the competitive landscape of the CIS market by industry sector.

Top Five Players in Global Smartphone CIS market, in terms of revenue (2024)

Ranking	Players	Relevant Revenue (USD billion)	Market Share
1	Company A	6.0	46.4%
2	Company B	2.8	21.6%
3	The Group	1.4	10.5%
4	Company E	0.5	4.0%
5	Company F	0.5	3.9%

Note:

1. *Company E is a leading global semiconductor company, specializing in DRAM, NAND flash memory, and image sensors for various applications, including smartphones, computing, and automotive systems.*
2. *Company F is a prominent Chinese company focused on the design and manufacturing of image sensors, providing solutions for mobile devices, security cameras, and automotive applications.*

Source: Frost & Sullivan Report

Top Five Players in Global Automotive CIS market, in terms of revenue (2024)

Ranking	Players	Relevant Revenue (USD billion)	Market Share
1	The Group	0.8	32.9%
2	Company C	0.8	30.4%
3	Company A	0.4	17.6%
4	Company B	0.1	3.2%
5	Company D	0.1	2.8%

Source: Frost & Sullivan Report

SOURCES OF INFORMATION

We commissioned Frost & Sullivan, an independent global consulting firm that offers industry research and market strategies and provides growth consulting and corporate training to conduct a detailed research on and analysis of the global semiconductor market. We have agreed to pay a fee of RMB550,000 to Frost & Sullivan in connection with the preparation of the Frost & Sullivan Report. We have extracted certain information from the Frost & Sullivan Report in this section, as well as in "Summary," "Risk Factors," "Business," "Financial Information," and elsewhere in this document to provide our potential **[REDACTED]** with a more comprehensive presentation of the industries where we operate.

During the preparation of the Frost & Sullivan Report, Frost & Sullivan performed both primary and secondary research, and obtained knowledge, statistics, information, and industry insights on the industry trends of the target research markets. Primary research involved discussing the status of the market with leading industry participants and industry experts. Secondary research involved reviewing company reports, independent research reports and data based on Frost & Sullivan's own database. Frost & Sullivan has independently verified the information, but the accuracy of the conclusions of its review largely relies on the accuracy of the information collected. Frost & Sullivan's research may be affected by the accuracy of assumptions used and the choice of primary and secondary sources.

The Frost & Sullivan Report was compiled based on the following assumptions: (i) the economy of Mainland China and the global economy are likely to maintain steady growth in the near future; and (ii) the social, economic, and political environment of Mainland China and the world is likely to remain stable from 2024 to 2029.

Our Directors confirm that, after making reasonable enquiries, there is no adverse change in the market information since the date of the Frost & Sullivan Report that may qualify, contradict or have a material impact on the information.