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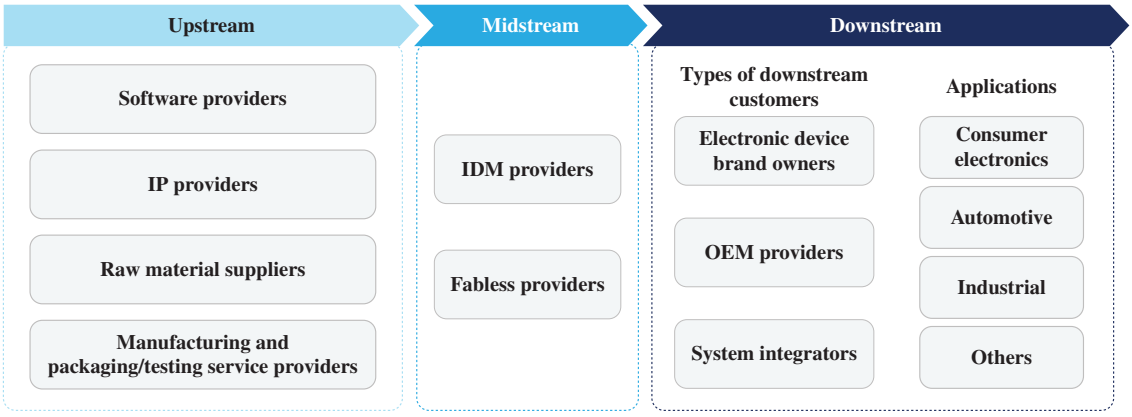
OVERVIEW OF GLOBAL AI SoC MARKET

An SoC refer to a semiconductor product which integrates the core components of a complete computer system onto a single chip. It typically includes a CPU, a GPU usually for image and video rendering, memory for storing data and instructions, input/output interfaces (such as USB, Wi-Fi, Bluetooth) for communicating with external devices, and other specialized modules (such as specialized processing modules or sensor interfaces). SoCs are compact, energy-efficient, and high-performance, and are widely used in consumer electronics, IoT devices, and embedded systems.

An AI SoC is a SoC optimized specifically for AI workloads, which usually involve matrix operations, convolutional neural networks, and other AI tasks, providing highly efficient parallel processing. Building on the traditional SoC, AI SoCs integrate modules designed for AI computation, making them particularly well suited for compute-intensive tasks like machine learning and deep learning. The AI accelerator, typically a NPU, is the key element that sets an AI SoC apart from a conventional SoC.

The key suppliers for AI SoC providers include software providers, IP providers, raw material suppliers, and manufacturing and packaging/testing service providers. IP vendors supply reusable IP blocks, such as processing cores and various interface modules. SoC providers that lack the capability of in-house IP development typically depend heavily on third-party IP suppliers. The downstream customers for AI SoC providers generally include electronic device brands, OEMs, and system integrators across multiple industries. AI SoCs are ultimately deployed widely in consumer electronics, automotive, industrial, and other application areas.

Value Chain of the Global AI SoC Market

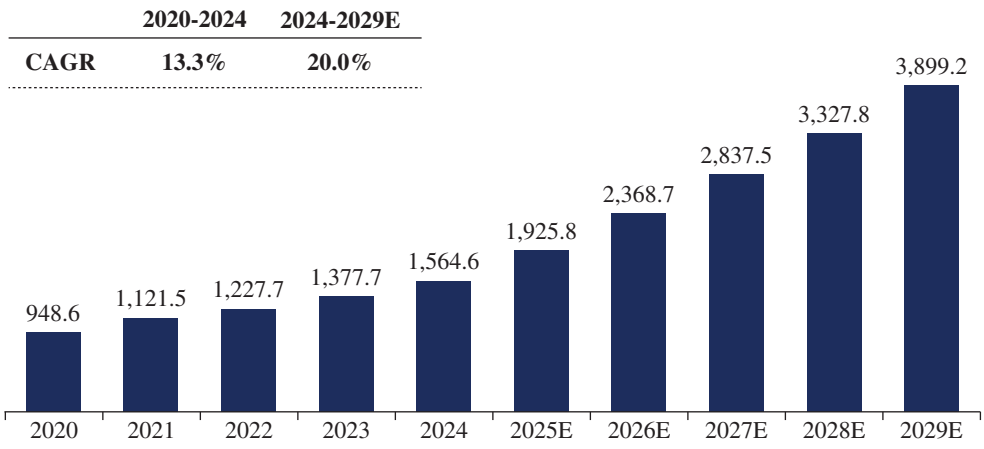


Source: Frost & Sullivan

Market Size of Global AI SoC Market

In terms of shipments, the market size of the global AI SoC market increased from 948.6 million in 2020 to 1,564.6 million in 2024, representing a CAGR of 13.3% from 2020 to 2024. It is expected that the global shipments of AI SoC market will further increase to 3,899.2 million in 2029, representing a CAGR of 20.0% from 2024 to 2029.

Global Shipments of AI SoC (in million)



Source: Omdia, Counterpoint, Frost & Sullivan

Market Drivers and Development Trends of Global AI SoC Market

Advancements of AI algorithms. Algorithmic improvements and innovations directly affect training efficiency, generalization, and adaptability. From early decision trees and support vector machines to deep neural networks and large language models (LLMs), this evolution has steadily improved AI systems' generalization and computational efficiency, enabling broader real-world adoption.

Accelerated adoption of edge AI. Progress in large-language and multimodal models has triggered explosive demand for edge inference, which in turn is increasing demand for edge AI SoCs. The number of connected IoT devices worldwide rose from about 11.7 billion in 2020 to 18.8 billion in 2024, and is projected to reach 28.8 billion by 2029. By integrating NPUs and using algorithm-and-chip co-optimization, AI SoCs overcome traditional processor efficiency limits and serving as key infrastructure for on-device AI.

Evolution toward higher performance, lower power consumption, and smaller form. Higher performance addresses the complex computation demands brought by AI, enables on-device intelligence, supports multi-function integration, and improves user experience. Lower power extends device battery life, eases thermal management, and accelerates the adoption of low-power IoT devices. Smaller size supports the miniaturization trend of edge devices, increases integration and performance density, and reduces manufacturing costs.

Increasing penetration and application of SoCs. Traditional microcontroller unit ("**MCU**") solutions have performance limitations when handling high concurrency, running deep learning models, or supporting multitasking. SoC solutions deliver clear advantages through stronger compute capability, higher system integration, and better support for complex operating systems and applications. This advantage applies not only to core intelligent functions such as image recognition, speech processing, and on-device AI inference, but also to connectivity and interoperation — high-speed interfaces, wireless links, and secure data exchange. As a result, SoCs are progressively replacing MCUs in many applications that demand greater intelligence and connectivity, and are becoming the preferred architecture for device upgrades.

Increasing number of edge devices integrating visual perception and on-device vision computing. Vision capabilities are now central to device intelligence. User and industry demands are shifting from basic functionality toward higher-level intelligent interaction and environmental understanding, making real-time visual perception, intelligent analysis, and natural interaction essential requirements for edge devices. In this context, vision AI SoCs, which are specialized in vision computing and AI inference, are showing rapid market potential. Vision AI SoCs offer superior compute density, power efficiency, task-specific optimization for vision workloads, and support for complex AI models. As more edge devices adopt vision as a core capability, vision AI SoCs are becoming a key driver of edge intelligence and a fast-growing market segment.

OVERVIEW OF GLOBAL VISION AI SoC MARKET

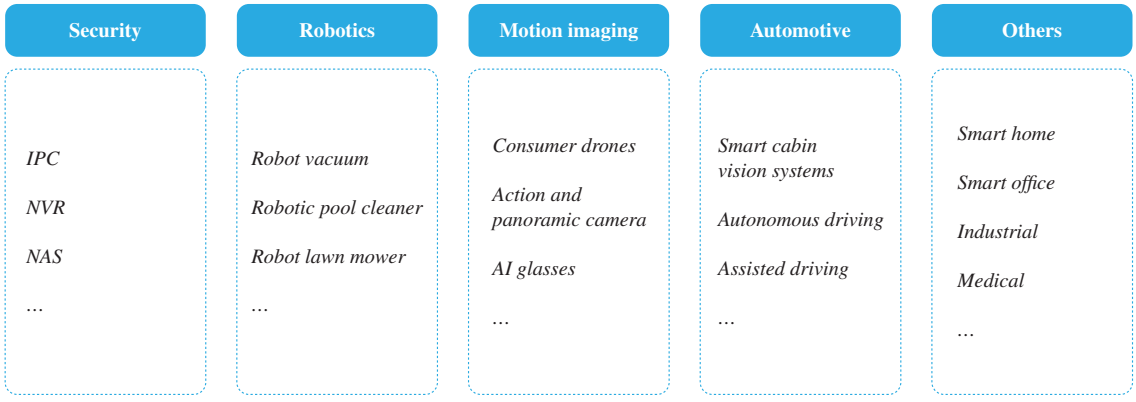
A vision SoC is a specialized type of IC designed to process visual data. It combines various components like a CPU, an ISP, and memory into a single chip. These chips are specifically engineered for tasks such as image and video processing, making them suitable for devices that require real-time visual analysis. With the rapid advancement of AI technology and the emergence of smaller, more efficient distilled AI models, edge intelligence has been increasingly adopted in a growing number of devices. The AI penetration rate of global vision SoCs, calculated by dividing the shipment volume of global vision AI SoCs by the total shipment volume of global vision SoCs, increased from 14.4% in 2020 to 39.1% in 2024 and is expected to further rise to 84.8% by 2029.

A vision AI SoC is a type of AI SoC optimized for vision-related AI tasks. It typically integrates an NPU to efficiently handle image- and video-based AI workloads. Compared with other AI SoCs, vision AI SoCs are specialized for visual data processing and are ideal for real-time, low-latency inference. They are widely used in edge devices across many scenarios, including cameras, video storage and analytics equipment (such as NVRs and NASs), robots, consumer drones, action cameras, AI glasses, and smart automotive, supporting, among others, real-time image processing, object recognition, and scene analysis.

Applications and Market Size of the Global Vision AI SoC Market

Vision AI SoCs are mainly used in applications of security, robotics, motion imaging, automotive, and others.

Applications of the Global Vision AI SoC Market

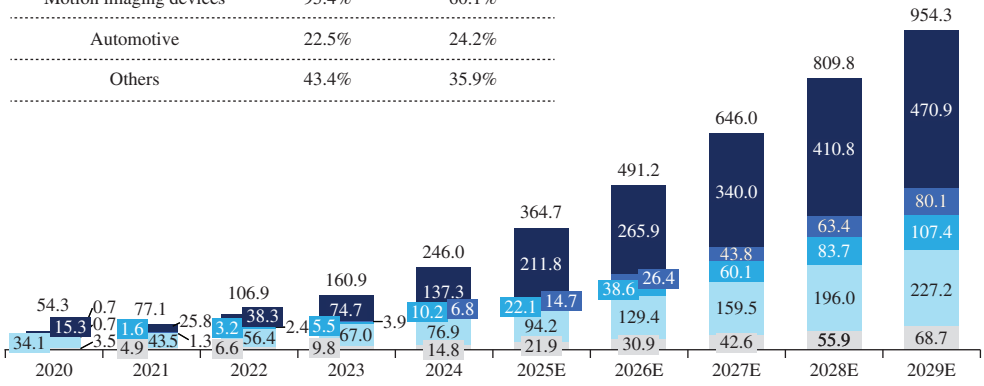


Source: Frost & Sullivan

In terms of shipment, the market size of the global vision AI SoC market increased from 54.3 million in 2020 to 246.0 million in 2024, representing a CAGR of 45.9% from 2020 to 2024. It is expected that the global shipments of vision AI SoCs will further increase to 954.3 million in 2029, representing a CAGR of 31.3% from 2024 to 2029.

Global Shipments of Vision AI SoCs (in million)

CAGR	2020-2024	2024-2029E
Total	**45.9%**	**31.1%**
Security	73.1%	28.0%
Robotics	76.5%	63.8%
Motion imaging devices	95.4%	60.1%
Automotive	22.5%	24.2%
Others	43.4%	35.9%



Source: IDC, Omdia, Public filings of market players, Frost & Sullivan

Specific Applications of Vision AI SoCs

Security

In the security sector, edge devices mainly consist of front-end cameras (primarily IP cameras) and back-end image and video storage and analytics equipment, such as NVRs and NASs. As cameras have evolved from higher resolution and digital formats to smart devices, both front-end and back-end systems in the security industry have been continuously upgraded. Next-generation AI technology is advancing from basic recognition to deep cognition, with large model applications serving as the key driver. Large models leverage their powerful semantic understanding and cross-scenario transfer capabilities to empower security systems with more precise risk prediction and decision-making abilities. Furthermore, lightweight AI models enable edge devices to perform real-time inference in low-power states, achieving quick responses without frequent cloud uploads. These innovations are propelling security systems to evolve from event recognition to risk prediction, driving rapid increases in the penetration rate of smart security devices equipped with AI SoCs. AI SoCs in front-end cameras enables structured processing of video data, shifting video security from passive monitoring to active recognition. On the back end, using AI SoCs and application software for image and video analysis strengthens the computing and analytics capabilities of storage systems.

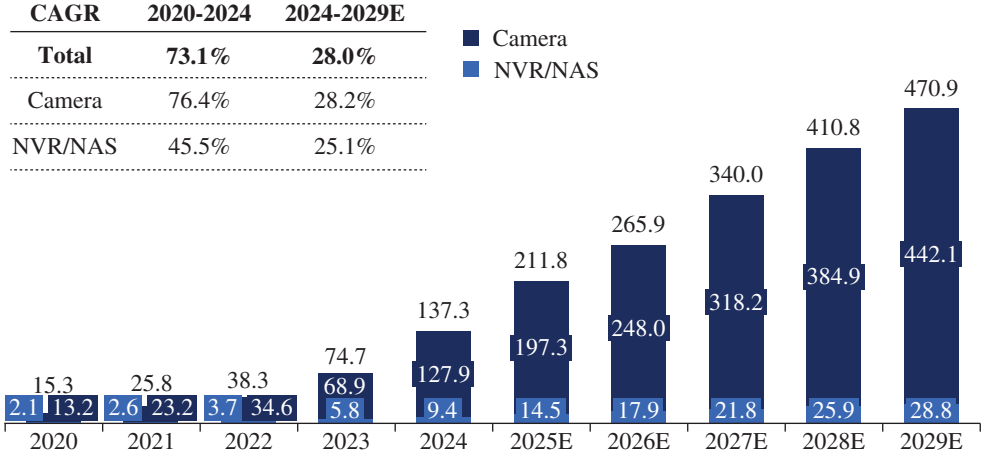
The shipments of the global IP cameras increased from 185.2 million in 2020 to 289.6 million in 2024, and is projected to reach 452.8 million by 2029, representing a CAGR of 9.4% from 2024 to 2029. In particular, the shipment volume of the global consumer smart camera has shown a faster growth rate, as the global shipment increased from 76.4 million in 2020 to 158.0 million in 2024, and is expected to reach 301.3 million by 2029, with a CAGR of 13.8% from 2024 to 2029.

The shipments of the global NVR/NAS device increased from 16.5 million in 2020 to 20.6 million in 2024 and is expected to reach 28.8 million by 2029, representing a CAGR of 6.9% from 2024 to 2029.

The global shipments of vision AI SoC for security grew from 15.3 million in 2020 to 137.3 million in 2024, representing a CAGR of 73.1% from 2020 to 2024. It is projected to further expand to 470.9 million by 2029, representing a CAGR of 28.0% from 2024 to 2029. In particular, the shipment volume of camera AI SoCs reached 127.9 million in 2024 and is projected to grow further to 442.1 million by 2029, representing a CAGR of 28.2% from 2024 to 2029. The shipment volume of NVR/NAS AI SoCs reached 9.4 million in 2024 and is projected to grow to 28.8 million by 2029, representing a CAGR of 25.1% from 2024 to 2029.

Global Shipments of Vision AI SoC for Security (in million)

CAGR	2020-2024	2024-2029E
Total	**73.1%**	**28.0%**
Camera	76.4%	28.2%
NVR/NAS	45.5%	25.1%



Source: IDC, Omdia, Public filings of market players, Frost & Sullivan

Market Drivers and Development Trends of the Global Vision AI SoC for Security Market

Increasing number of smart devices driven by AI advances. Rapid progress in computer vision, deep learning, and edge computing has significantly boosted the processing capabilities of vision AI SoCs. These chips support real-time object detection, behavior analysis, and anomaly alerts, meeting both household needs for smart home security and professional requirements for accurate analysis of complex scenes. Breakthroughs in AI have also lowered algorithm development costs, accelerating SoC adoption in front-end smart devices.

Growing demand for ultra-high definition and integrated functionality. Demand for 4K/8K video security is rising: consumers want clearer footage, while professional users need high resolution to capture fine details. Vision AI SoCs combine image signal processing (ISP), video encoding/decoding, and AI accelerator to deliver both high-definition and intelligent capabilities, increasing the chip's overall value.

Broader application scenarios enabled by power advances. Continued improvements and cost declines in lithium-ion batteries and photovoltaic technology are key enablers for expanding smart camera deployments. Higher battery energy density and lower prices improve device autonomy and affordability, while efficient, low-cost solar panels allow long-term operation from small solar systems. Together, these trends reduce dependence on wiring and fixed power infrastructure, enabling large-scale deployment in traditionally power-constrained locations, such as roads, industrial parks, construction sites, and agricultural settings, thereby extending the industry's application boundaries.

Rising demands from emerging regions. In Southeast Asia, the Middle East, Africa and Latin America, urbanization rates continue rising. The urbanization rate in Latin America has surpassed 80%, while in Southeast Asia the rate has generally exceeded 50%. Additionally, the mobile internet penetration rate in Southeast Asia, the Middle East, and Latin America has exceeded 70%. However, the security facility coverage remains relatively low, creating

substantial supply-demand gaps. Compared to the developed countries such as the US or the UK, where the average number of security surveillance cameras per thousand people is around 100, the coverage rate of security surveillance cameras in emerging regions is only about 10 per thousand people. These regions are experiencing surging demand for security devices with AI edge computing capabilities that can adapt to high-temperature, high-humidity environments, with products featuring new energy adaptation capabilities representing a meaningful proportion.

Robotics

The smart robot industry demonstrates clear trends of technology iteration and application expansion, extending from specific scenarios to diversified fields and evolving from simple functions to complex tasks. In the household scenario, rising living standards and demographic shifts have put domestic service robots in the spotlight. Use cases such as household cleaning and eldercare are driving both latent and immediate demand for domestic service robots. In manufacturing and commercial settings, digitization and intelligent transformation are accelerating, prompting greater investment in automation. Aging populations are raising labor costs and creating structural labor shortages, further increasing demand for robots as supplements to human labor. Meanwhile, the maturation of AI, IoT, and 5G provides the technical foundation that empowers smart robots. Together, these forces are fueling faster growth in the smart robotics market. Unlike traditional robots, smart robots not only perform repetitive tasks but also offer environment perception, data analysis, and autonomous decision-making, rapidly increasing their value and market demand.

With ongoing innovations in AI and robotics, the household scenario has emerged as one of the most significant application areas for smart robots and one of the largest contributors to shipment volumes. The product portfolio of smart domestic service robots continues to expand, extending beyond the original category of robot vacuums to include robotic pool cleaners, robot lawn mowers, companion robots, and humanoid robots with general-purpose AI capabilities. Of which, the global shipments of robotic vacuum cleaners have increased from 14.3 million in 2020 to 20.6 million in 2024, and are projected to further increase to 44.3 million by 2029, representing a CAGR of 16.5% from 2024 to 2029. The global shipments of smart robot lawn mowers reached 0.4 million in 2024 and are projected to grow to 25.8 million by 2029, representing a CAGR of 130.1% from 2024 to 2029. The global shipments of robotic pool cleaners increased from 1.0 million in 2020 to 1.6 million in 2024 and are projected to reach 6.5 million by 2029, representing a CAGR of 32.4% from 2024 to 2029.

Vision systems determine a robot's ability to recognize and understand its environment and are critical to precise manipulation and complex task execution. From household cleaning to industrial quality inspection and warehouse sorting, high-performance vision is the foundation for high-precision, reliable robot operation. As more smart robots adopt vision perception and computing, the market for vision AI SoCs in robotics is entering a period of rapid growth.

The global shipment of vision AI SoC for robotics has grown from 0.7 million in 2020 to 6.8 million in 2024, representing a CAGR of 76.5% from 2020 to 2024. It is projected to further expand to 80.1 million by 2029, representing a CAGR of 63.8% from 2024 to 2029.

Market Drivers and Development Trends of the Global Vision AI SoC for Robotics Market

Diversified products and increasing intelligent capabilities. The home service robot market is expanding rapidly — moving beyond vacuum cleaners to pool cleaners, lawn mowers, and more — leading to a wider variety of device types. Vision AI SoCs must support diverse navigation methods, robust object recognition, and low-power operation to meet the convenience and intelligence demands of home scenarios. Going forward, SoCs will further integrate low-cost, high-performance vision modules to accommodate more emerging household use cases.

Surging demands for vision AI SoCs driven by growth of high-end robots. Home service robots are upgrading from simple cleaning to smart devices with multi-function such as object recognition and voice interaction. Professional service robots, such as inspection, medical, and logistics robots, have a strong demand for real-time vision processing and multimodal perception where SoCs offer clear advantages. For example, inspection robots processing high-resolution images and complex scene analysis benefit from NPU and GPU acceleration. MCUs remain common for low-level control, such as sensor triggers, motor control, but the shift toward SoCs is evident.

Industrial upgrade and rising demand for vision intelligence. In industrial automation, industrial HMI systems serving as core hubs for human-machine interaction are undergoing intelligent upgrades. Next-generation industrial HMI systems must not only achieve traditional data display and equipment control but also integrate machine vision, edge computing and AI analysis capabilities to deliver more intuitive operational experiences, more efficient equipment monitoring and diagnostics and more flexible production process management. This requires industrial HMI systems to possess powerful graphics processing, real-time data analysis and multi-protocol compatibility capabilities.

Long-term growth potential in the humanoid robot market. With advances in AI, materials, and control technologies, humanoid robots show promising applications in commercial services, manufacturing, medical rehabilitation, and home companionship. To enable natural human-robot interaction and autonomous operation in complex environments, humanoids must have advanced vision intelligence for environment perception, target recognition, and motion decision-making. Consequently, the future development of humanoid robots will generate sustained, strong demand for high-performance vision AI SoCs, making this segment an important long-term growth engine for the market.

Motion Imaging

Consumer drones, action and panoramic cameras, and AI glasses are the primary motion imaging smart products.

Action and panoramic cameras leverage intelligent algorithms to optimize shooting experiences, while outdoor sports and short video social demands drive product evolution from professional equipment to mass creation tools. The integration of panoramic technology, image stabilization technology and AI imaging technology further expands application boundaries for both daily recording and extreme scenarios. The global shipment of action and panoramic cameras has increased from 7.7 million in 2020 to 15.1 million in 2024, and is expected to further grow to 26.2 million by 2029, with a CAGR of 11.7% from 2024 to 2029.

Consumer drones continue achieving breakthroughs in core functions including navigation obstacle avoidance, target tracking and mapping modeling. Deep learning-driven autonomous flight and real-time image analysis capabilities are propelling consumer drones evolution from aerial photography tools toward more intelligent, user-friendly mass imaging creation and entertainment devices. The global shipment of consumer drones has increased from 5.1 million in 2020 to 9.0 million in 2024 and is projected to reach 15.6 million by 2029, with a CAGR of 11.6% from 2024 to 2029.

As multi-modal AI models accelerate deployment, virtual reality technology applications advance, and core components including AI SoCs, storage, and displays continue upgrading, the application scenarios of AI glasses are expected to continue expanding while user experiences rapidly optimize. AI glasses are positioned to become one of the critical mobile terminals. The global shipment of AI glasses is projected to grow from 2.3 million in 2024 to 68.6 million by 2029, representing a CAGR of 97.2%.

Upgrade demands for intelligent imaging experiences including AI composition, scene optimization, automatic tracking and real-time effects generation are driving edge SoCs integrated with powerful ISPs and dedicated AI imaging processing engines to become key enablers for motion imaging devices to achieve differentiated and intelligent experiences while

enabling high-quality, low-latency intelligent processing at the device level. The global shipment of vision AI SoC for motion imaging devices has grown from 0.7 million in 2020 to 10.2 million in 2024, representing a CAGR of 95.4% from 2020 to 2024. It is projected to further expand to 107.4 million by 2029, representing a CAGR of 60.1% from 2024 to 2029.

Market Drivers and Development Trends of Global Vision AI SoC for Motion Imaging Devices Market

Rising demand for immersive experiences. Growing appetite for high-quality, immersive content and social media sharing is fueling the motion imaging market. Vision AI SoCs, by integrating high-performance ISPs, video encoding, and AI algorithms, can not only meet consumers' needs for high-quality visuals and intelligent interaction, but can also allow users to effortlessly produce creative content optimized for social media.

Large-model breakthroughs accelerate on-device AI adoption. Breakthroughs in large-scale AI models, are accelerating on-device AI adoption in motion imaging products. At the application level, AI enables more accurate object recognition, scene understanding, and real-time tracking, while generative AI enhances image enhancement, automatic editing, content creation, and human-machine interaction — greatly enriching user experience and product value. As users increasingly demand smarter interaction and higher content-creation efficiency, motion imaging devices are becoming more reliant on high-compute, low-power, highly integrated vision AI SoCs.

AI glasses are among the fastest-growing product categories. The rise of large models has significantly spurred innovation in the AI glasses industry. With stronger reasoning and generalization, large models expand AI glasses' functionality and application scope, boosting product value. The commercial successes of large-model — based AI glasses have also made the market potential and business opportunities for AI glasses widely.

Automotive

Electrification, connectivity, and vehicle intelligence are driving rapid growth in the global automotive electronics market. Smart vehicle sales rose from 41.2 million in 2020 to 65.7 million in 2024, and are projected to reach 95.8 million by 2029, representing a CAGR of 7.8% from 2024 to 2029. This creates new opportunities for the vision AI SoC market as smart cars demand greater compute and data-processing capacity, especially for video-related workloads.

Vision AI SoCs are mainly used in cockpit (in-vehicle) systems where they enable driver monitoring, such as drowsiness detection, attention tracking, identity recognition, and occupant state recognition, such as gesture control, facial-expression analysis, behavior detection, to improve safety and interaction. They also support multimodal perception and fusion across interior and exterior sensors, processing in-cab and external camera data in real time to enable more natural HMI and personalized services. Integrated NPUs significantly boost the efficiency of vision processing, object recognition, and path planning.

The global shipment of vision AI SoC for automotive has grown from 34.1 million in 2020 to 76.9 million in 2024, representing a CAGR of 22.5% from 2020 to 2024. It is projected to further expand to 227.2 million by 2029, representing a CAGR of 24.2% from 2024 to 2029.

Market Drivers and Development Trends of the Global Vision AI SoC for Automotive Market

Increasing proportion of intelligent vehicles. Smart car functionalities are rapidly expanding from high-end models to the mass market. Ongoing innovation — including algorithm optimization and system architecture upgrades — has significantly lowered the cost of these systems. Simultaneously, improved mass production capabilities and better value chain collaboration have fostered a virtuous cycle for the entire industry. These favorable factors are accelerating the adoption of smart features, laying a solid foundation for deeper market penetration and long-term industry growth.

Automotive intelligence drives the growth of smart car SoCs. As the automotive industry shifts towards electrification and intelligence, traditional MCUs face challenges they cannot effectively handle, such as complex electronic and electrical architectures and the processing of massive amounts of data. Given their superior computing power, enhanced data transmission efficiency, reduced chip count, and more flexible software updates, SoCs have emerged as the leading trend for automotive chips.

Deeper integration of AI applications and rising per-vehicle SoC value. The widespread use of AI in vehicle interiors is driving a rapid increase in demand for SoCs with robust AI computing power. The per-vehicle SoC value continues to rise as well. Since autonomous driving features can be expanded through remote software updates, the computing power of an autonomous driving SoC determines the maximum extent to which a vehicle's functions can be upgraded throughout its lifespan. For this reason, automakers often deploy high-performance SoCs to support future upgrades. Because these high-performance SoCs are more expensive, the average value of the SoC as a percentage of the total cost of a smart car is expected to increase in the coming years.

Cost Structure of Vision AI SoCs

The major costs of vision AI SoCs primarily consist of raw material costs and processing fees. Generally, the raw material costs account for 70% to 80% of the total costs for vision AI SoCs, while the processing fees account for 20% to 30% of the total costs. The major raw material that a fabless vision AI SoC company procure is processed wafers provided by foundries. The price of a processed wafer for vision AI SoCs usually depends on multiple factors including the size of wafers, the process node used for wafer fabrication, the production capacity of foundries and the demands for semiconductor products from end markets within a specific period. Historically, from 2020 to 2024, the average price of processed wafers for vision AI SoCs witnessed an increasing trend in 2021 and 2022 jointly due to a short-term supply shortage of processed wafers globally, while the average price began to decrease in 2023 and 2024 as a result of the recovery of the overall production capacity of foundries. Going forward, the average price of processed wafers for vision AI SoCs is expected to reach a stable level in 2025 due to the strong demands from downstream applications and the increasing proportion of processed wafers based on advanced process nodes. Moreover, the processing fees primarily refer to the costs paid to semiconductor assembly and test service providers for packaging and testing services, which cover the transformation of processed wafers into final SoC products. The price of the processing fee for vision AI SoCs is typically determined by multiple factors, including wafer size, the processes employed for packaging and testing, and demand from downstream end markets. Historically, the average price of the processing fee for vision AI SoCs has shown a steady upward trend from 2020 to 2024. In 2023, the average price experienced a slight decrease, driven by the decline in market demand and inventory adjustments among enterprises in the downstream markets such as consumer electronics. The average price returned to growth and became relatively stable in 2024. Looking ahead, as packaging and testing technologies for vision AI SoCs continue to evolve toward higher interconnect density system integration and high-performance computing, significant technological advancements and innovative transformations will drive the average price of the processing fees for vision AI SoCs to maintain a steady upward trend.

Price Analysis of Vision AI SoCs

The prices of vision AI SoCs are mainly affected by multiple factors such as specifications, functionalities, process node, market demand, supply-chain events, and market competition. The price fluctuation of major sub-segments of the global vision AI SoC market showed a relatively similar pattern in the historical period. In 2020 and 2021, due to the increasing downstream demands and semiconductor supply-chain constraints brought by the COVID-19, the prices of vision AI SoCs witnessed increases across major sub-segments of the global market. Since 2022, with the diminishing effects of the COVID-19, the supply of vision AI SoCs for segments such as security, robotics, and motion imaging returned to normal, and the prices of vision AI SoCs for those segments started to decline. In 2022, the automotive

segment still faced the global supply chain challenge and the overall prices of vision AI SoCs increased further in the same year. From 2023, with the normalization of global semiconductor supply chain, the overall prices of vision AI SoCs for the automotive segment began to stabilize as well. Since 2023, the prices of vision AI SoCs showed a split between mature products and premium products. Mature products saw steady price decline due to the sufficient market supply and intense competition. On the other hand, premium products with higher edge AI capabilities, such as higher NPU computing power, maintained stable-to-modest premium prices as market players bundled more features. From a sub-market perspective, the average selling prices (ASPs) vision AI SoCs within the security, robotics, motion imaging, and automotive sectors are projected to exhibit varying degrees of upward momentum throughout the 2024–2029 forecast period. Notably, the automotive segment is expected to witness the most substantial price appreciation, underpinned by the structural migration toward higher-tier autonomous driving specifications. Meanwhile, the robotics sector, following a period of prior volatility, is anticipated to maintain a relatively stable ASP profile over the forecasted horizon. This price pattern is expected to continue in the period from 2025 to 2029. Mature products are expected to face continued price compression due to the intense market competition, while premium products will sustain higher prices with more AI capabilities integrated.

Impact of Tariffs and Export Controls for Global Vision AI SoC Market

Tariffs primarily impact the cost structure and market dynamics of the downstream finished products, indirectly affecting the revenue and profit margins of vision AI SoC providers. Tariffs imposed on finished goods like security cameras, motion imaging devices, or automotive electronic modules raise the overall procurement cost for the clients of vision AI SoC providers. The financial pressure is probably transferred upstream, leading to intense price negotiations and demands for cost reductions on the SoC components, thereby eroding SoC providers' gross profit margins. Moreover, tariffs accelerate the global trend of supply chain de-risking and regionalization, prompting customers to relocate assembly and production to tariff-free zones. As a result, vision AI SoC providers must adjust their logistics and technical support resources to serve these new geographic hubs, increasing operational complexity and the need for geographically diversified sales and technical teams to maintain competitiveness and market presence.

Export controls present the most significant existential threat to a vision AI SoC company, primarily targeting the foundational elements of design and manufacturing. These controls, often imposed on advanced semiconductor technology, impose strict limitations on the access to EDA tools and key third-party IP cores. This directly hampers the ability to develop cutting-edge products required for some applications such as autonomous driving and complex real-time processing in advanced robotics. Furthermore, controls on Advanced Process Nodes at leading foundries create supply chain bottlenecks, potentially forcing design companies to regress to less efficient manufacturing nodes.

COMPETITIVE LANDSCAPE OF GLOBAL VISION AI SoC MARKET

Overview of Competitive Landscape

Given the diverse downstream applications of vision AI SoCs, the global vision AI SoC market is characterized by numerous participants. Different enterprises leverage their technological capabilities and product portfolios to provide various solutions tailored to specific applications. Leading enterprises have pioneered diversified product portfolios across multiple applications and gained scale advantages.

Market Rankings

By shipment volume, the top five global vision AI SoC vendors collectively held a market share of 70.3% in 2024. Based on 2024 shipments, our Company ranked first among all global vision AI SoC vendors with a market share of 26.7%. Based on 2024 revenue, our Company ranked fifth among all global vision AI SoC vendors with a market share of 6.9%.

Ranking of Top Five Global Vision AI SoC Providers, in terms of Shipment and Revenue in 2024

Ranking	Providers	Shipments of vision AI SoC	Market share	Ranking	Providers	Revenue of vision AI SoC	Market share
		(Million, 2024)	*(%, 2024)*			*(USD million, 2024)*	*(%, 2024)*
1	**Our Company**	**65.8**	**26.7%**	1	Company B	523.8	19.4%
2	Company A	40.0	16.3%	2	Company F	512.3	19.0%
3	Company B	29.1	11.8%	3	Company G	255.1	9.4%
4	Company C	25.0	10.2%	4	Company H	224.0	8.3%
5	Company D	13.0	5.3%	5	**Our Company**	**186.7**	**6.9%**

Source: Public fillings, websites of market players, expert interview, Frost & Sullivan

Notes:

(1) Company A is a public company founded in 2004 and listed on the Shanghai Stock Exchange, headquartered in Shanghai, China. It primarily engages in the development, production, and sales of vision SoCs for IPC and NVR.

(2) Company B is a public company founded in 1999 and listed on the Nasdaq Stock Market LLC, headquartered in Jerusalem. It primarily engages in the development, production, and sale of SoCs for autonomous driving and assisted driving systems.

(3) Company C is a public company founded in 1997 and listed on the Taiwan Stock Exchange Corporation, headquartered in Taiwan, China. It primarily engages in the design, R&D, manufacturing, and sales of SoCs, which are widely used in consumer electronics.

(4) Company D is a public company founded in 2001 and listed on the Shanghai Stock Exchange, headquartered in Fujian, China. It primarily engages in the development and sale of chips such as SoCs, and provides related application solutions and technical services.

(5) Company F is a public company founded in 1993 and listed on the Nasdaq Stock Market LLC, headquartered in USA. It primarily engages in the design and sales of GPUs and accelerated computing platforms.

(6) Company G is a public company founded in 1985 and listed on the Nasdaq Stock Market LLC, headquartered in USA. It primarily engages in the development and sales of wireless telecommunications products and SoCs.

(7) Company H is a public company founded in 1930 and listed on the Nasdaq Stock Market LLC, headquartered in USA. It primarily engages in the design and manufacturing of analog and embedded processing chips.

In terms of the shipments of vision AI SoCs for security in 2024, our Company ranked the first among global vision AI SoC providers with a market share of 41.2%. In particular, in terms of the shipments in 2024, our Company is also the largest provider of vision AI SoCs for security cameras and NVRs/NASs globally, with market shares of 41.4% and 37.2%, respectively. In terms of the revenue of vision AI SoCs for security in 2024, our Company ranked the first among global vision AI SoC providers with a market share of 42.2%. In particular, in terms of the revenue in 2024, our Company is also the largest provider of vision AI SoCs for security cameras and NVRs/NASs globally, with market shares of 42.5% and 39.4%, respectively.

Ranking of Top Five Global Vision AI SoC for Security Providers, in terms of Shipments in 2024

Ranking	Providers	Shipments of vision AI SoCs for security	Market share	Shipments of vision AI SoCs for security camera	Market share	Shipments of vision AI SoCs for NVRs/NASs	Market share
		(Million, 2024)	*(%, 2024)*	*(Million, 2024)*	*(%, 2024)*	*(Million, 2024)*	*(%, 2024)*
1	**Our Company**	**56.5**	**41.2%**	**53.0**	**41.4%**	**3.5**	**37.2%**
2	Company A	34.9	25.4%	32.4	25.3%	2.5	26.6%
3	Company C	19.9	14.5%	18.9	14.8%	1.0	10.6%
4	Company D	6.0	4.4%	6.0	4.7%	/	/
5	Company E	5.0	3.6%	5.0	3.9%	/	/

Ranking of Top Five Global Vision AI SoC for Security Providers, in terms of Revenue in 2024

Ranking	Providers	Revenue of vision AI SoC for security	Market share	Revenue of vision AI SoC for security camera	Market share	Revenue of vision AI SoC for NVRs/NASs	Market share
		(USD million, 2024)	*(%, 2024)*	*(USD million, 2024)*	*(%, 2024)*	*(USD million, 2024)*	*(%, 2024)*
1	**Our Company**	**145.4**	**42.2%**	**133.4**	**42.5%**	**11.9**	**39.4%**
2	Company A	90.1	26.2%	81.6	26.0%	8.5	28.2%
3	Company C	54.1	15.7%	50.0	15.9%	4.1	13.5%
4	Company D	15.1	4.4%	15.1	4.8%	/	/
5	Company E	12.6	3.7%	12.6	4.0%	/	/

Source: Public fillings, websites of market players, expert interview, Frost & Sullivan

Notes:
(1) Company E is a public company founded in 2007 and listed on the Shenzhen Stock Exchange, headquartered in Zhuhai, China. It primarily engages in the design, development, manufacturing, and sales of SoCs, which are widely applied in security, robotics, automotive, and other applications.

Based on the shipment volume of vision AI SoCs in the field of robotics during the first half of 2025, our Company ranked second among global vision AI SoC manufacturers, capturing a market share of 23.0%. Based on the revenue of vision AI SoCs in the field of robotics during the first half of 2025, our Company ranked fourth among global vision AI SoC manufacturers, capturing a market share of 5.6%.

Ranking of Top Three Global Vision AI SoC for Robotics Providers, in terms of Shipments and Revenue in 2025H1

Ranking	Providers	Shipments of vision AI SoC for robotics	Market share
		(Million, 2025H1)	*(%, 2025H1)*
1	Company E	2.2	29.7%
2	**Our Company**	**1.7**	**23.0%**
3	Company D	1.2	16.2%

Ranking	Providers	Revenue of vision AI SoC for robotics	Market share
		(USD million, 2025H1)	*(%, 2025H1)*
1	Company G	10.8	16.2%
2	Company E	7.3	10.9%
3	Company D	4.8	7.2%
4	**Our Company**	**3.7**	**5.6%**

Source: Public fillings, websites of market players, expert interview, Frost & Sullivan

Key Success Factors and Entry Barriers of Global Vision AI SoC Market

Leading technology R&D and innovation capabilities. Through years of investment in R&D, leading companies have built up extensive patent portfolios and proprietary technologies, covering areas like IP, architecture optimization, and AI algorithm integration. This creates a significant technological barrier to entry. SoC manufacturers with their own self-developed IPs are at a first-mover and a leading advantage in the explosive growth of AI edge-side applications and will be the first to capture growth opportunities. Furthermore, leading vision AI SoC vendors have a diverse portfolio of IP assets, including processor cores, AI accelerators, connectivity modules, and power management units, which allows them to quickly and flexibly combine these assets to meet the diverse and ever-evolving demands of smart devices.

Comprehensive product portfolio and forward-thinking product strategy. Competition in the vision AI SoC market has shifted from individual products to full-stack solutions and product ecosystems. A comprehensive product matrix allows companies to cover a wider range of market segments and reuse technology and resources across different product lines, creating economies of scale that help offset high R&D costs. A forward-thinking product strategy is key to navigating a fast-changing market. As AI technology and applications evolve at a rapid pace, a proactive approach allows companies to invest in R&D ahead of time, positioning themselves for the next generation of technology and products to gain a first-mover advantage when new markets emerge.

Global marketing network. Leading market players have established global marketing networks through long-term development and continuous investment. This global presence allows them to quickly capture and respond to the needs of customers in different regions, providing tailored products and solutions. By leveraging efficient supply chain management and localized service support, they ensure high product availability and customer satisfaction. Building such a network requires a significant long-term investment of resources, deep market insights, and strong relationships with global partners, creating a high-cost and high-time barrier for new entrants.

Long-term customer relationships. Vision AI SoCs require deep integration into a customer's system design and involve extensive software and hardware co-optimization. Once a customer adopts a vendor's SoC solution, switching to another provider is costly due to the significant amount of software development, algorithm migration, and system validation work involved. Therefore, it is crucial for vendors to establish long-term, stable partnerships with top-tier smart device manufacturers. New entrants find it difficult to gain the trust and secure orders from these top-tier customers in the short term, and even with a technological breakthrough, they face a lengthy customer qualification and integration cycle.

Supply chain management and flexibility. Building a diversified supply chain, especially by partnering with multiple wafer foundries, significantly reduces the risk of production fluctuations from a single supplier. Additionally, since different foundries have their own advantages in technology and cost, SoC vendors can choose the most suitable production partner based on product positioning and customer needs. This supply chain flexibility not only helps vendors optimize their cost structure but also ensures their product portfolio can cover the entire market, from high-end to low-end, meeting diverse customer demands.

OVERVIEW OF GLOBAL SPAD SoC MARKET

LiDAR is a crucial perception sensor for vehicles and systems which require autonomous mobility. Unlike other sensors such as cameras, LiDAR acquires depth information by emitting pulsed lasers and detecting the reflected light, providing 3D imaging capabilities, higher detection accuracy, and a longer range. It also performs well in low-light, strong-light, and tunnel environments, giving it a significant advantage for complex environment. As

autonomous driving, assisted driving and other advanced technologies are increasingly adopted, LiDAR is becoming a critical component across diverse applications, including smart automotive, smart robots, and consumer drones.

There are three major types of photodetectors in LiDAR, namely APD (Avalanche Photo Diode), SiPM (Silicon Photo Multiplier), and SPAD (Single Photon Avalanche Diode). A SPAD SoC is a SoC that adopts an advanced architecture that integrates key modules, such as a SPAD array, an active quench circuit, a time-to-digital converter ("**TDC**"), and a digital signal processing unit or algorithm accelerator, onto a single chip. Compared to traditional LiDAR architectures based on SiPM or APD, a single SPAD SoC integrates many discrete components previously used for the photoelectric front end, amplification, analog-to-digital conversion, and digital signal processing, which greatly simplifies the architecture and reduces the size. At the same time, a SPAD SoC enables direct digital signal processing, offering higher anti-interference capabilities and processing efficiency. Furthermore, as the collection of core distance information is processes on the SPAD SoC, the back end only needs a processor with less computing power to meet the requirements of signal processing for LiDAR. It leads to a significant reduction in both the complexity of the development of LiDAR units.

Market Size of Global SPAD SoC Market

SPAD SoCs commenced mass production in 2023 and the shipments of SPAD SoCs rapidly increased from 2023 due to the increasing penetration of SPAD based LiDAR systems. In terms of shipments, the global shipments of SPAD SoCs reached 0.4 million in 2024, and it is projected that the global shipments of SPAD SoCs will further increase to 12.3 million in 2029, representing a CAGR of 98.4% from 2024 to 2029. The primary reason for the projected significant increase in global SPAD SoC shipments is that, on one hand, SPAD SoCs enable higher-quality point cloud data acquisition by significantly reducing noise, improving time resolution, and enhancing sensitivity, while also substantially shortening data acquisition time. Simultaneously, the low power consumption and miniaturization enabled by their highly integrated nature make SPAD SoCs the preferred choice for LiDAR systems requiring solid-state, compact, and cost-effective solutions — such as those used in autonomous driving. Driven by these performance enhancements and cost efficiencies, applications for SPAD-based LiDARs are expanding beyond the automotive sector into broader markets like mobile robotics and industrial automation, collectively fueling this explosive growth in shipments.

Market Drivers and Development Trends of Global SPAD SoC Market

Unique advantages of SPAD SoCs for LiDAR. (i) *Reduced Noise and Signal Distortion*: SPAD SoCs significantly shorten the signal transmission distance, which greatly reduces noise interference and signal distortion, resulting in a cleaner and more reliable signal. (ii) *Improved Time Resolution*: On-chip integration of the TDC and SPAD enables higher-precision time measurements, generating more accurate distance data and high-quality point clouds. (iii) *Enhanced Sensitivity*: The low-noise characteristics of SPAD SoCs improve the sensitivity of the LiDAR system, allowing it to detect fainter light signals. (iv) *Accelerated Data Acquisition*: The integrated signal processing unit efficiently handles real-time data, reducing system response time. (v) *Lower Power Consumption*: The multi-functional, single-chip design reduces the power consumption of discrete components, leading to a significant drop in overall power use. (vi) *Miniaturization and System Integration*: The highly integrated SPAD SoC significantly reduces the physical size of LiDAR units, making them more suitable for space-constrained applications like vehicles.

Increasing shipments of automotive LiDARs. Due to its outstanding performance in intelligent driving and the benefits of falling costs, the global shipments of LiDARs grew from approximately 30,000 units in 2020 to 1.6 million units in 2024, representing a CAGR of 58.4%. This figure is projected to reach 17 million units by 2029. As LiDAR becomes more solid-state, compact, and affordable, SPAD SoCs are poised to become the optimal choice due to their high sensitivity, low power consumption, and low cost.

Diversified applications of SPAD-based LiDARs. With falling costs and the mature experience gained from automotive applications, SPAD SoCs are expected to be used in more fields. In robotics, for example, they can be applied in mobile robots, home service robots, and quadrupedal and humanoid robots to detect objects, enabling an upgrade in robot perception. In industrial settings, SPAD SoCs can be used in goods-to-person systems, safety fences for machine tools, and logistics parcel measurement, helping to ensure the safe operation of intelligent factories.

SOURCES OF INFORMATION

In connection with the [**REDACTED**], we have engaged Frost & Sullivan to conduct a detailed analysis and prepare an industry report on the markets in which we operate. Services provided by Frost & Sullivan, which is an independent global consulting firm founded in 1961, include market assessments, competitive benchmarking, and strategic and market planning for a variety of industries. Apart from the Frost & Sullivan Report, we have not commissioned any other industry report in connection with the [**REDACTED**].

Frost & Sullivan prepared its report based on its in-house database, independent third-party reports and publicly available data from reputable industry organizations. Where necessary, Frost & Sullivan contacts companies operating in the industry to gather and synthesise information in relation to the market, prices and other relevant information. The market projections in the Frost & Sullivan Report are mainly based on the assumption that the social, economic, and political environments in the PRC and globally will remain stable throughout the forecast period. Frost & Sullivan believes that the basic assumptions used in preparing the Frost & Sullivan Report, including those used to make future projections, are factual, correct and not misleading. Frost & Sullivan has independently analysed 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 these assumptions and the choice of these primary and secondary sources.

Our Directors have confirmed that Frost & Sullivan has exercised reasonable care in selecting and identifying the sources of information used in this section (which are extracted from the Frost & Sullivan Report), compiling, extracting and reproducing the information, and ensuring no material omission of the information. Our Directors confirm that, after making reasonable enquiries, there is no material adverse change in the market information since the date of the Frost & Sullivan Report which may qualify, contradict or have an impact on the information in this section.