Certain information and statistics presented in this section and elsewhere in this document were derived from official government publications and other publicly available sources as well as from the CIC Report, a market research report prepared by CIC, an independent market research and consulting company that was commissioned by us. We believe that the sources of the information in this section and elsewhere in this document are appropriate sources for such information and reasonable care has been taken in extracting and reproducing such information. The information from official government sources has not been independently verified by us or the Sole Sponsor, the Sole Overall Coordinator, the Joint Global Coordinators, the Joint Bookrunners, the Joint Lead Managers and the Underwriters or any of our or their respective directors, officers, or representatives, and no representation is given as to its accuracy.

SOURCES OF INFORMATION

We commissioned CIC, an independent market research and consulting company founded in Hong Kong and engaging in the provision of professional consulting services across multiple industries, to conduct an analysis of and report on the LED intelligent vision market in China. The CIC Report was prepared by CIC independent of our influence. The fee paid for the preparation of the CIC Report was RMB580,000, which we believe reflects the market rate for such reports.

The information and data collected by CIC have been analyzed, assessed and validated using CIC's in-house analysis models and techniques. Primary research was conducted via interviews with key industry experts and leading industry participants. Secondary research involved analyzing market data obtained from several publicly available data sources. The methodology used by CIC is based on analyzing information gathered from multiple levels and ensures that this information is cross-referenced for reliability and accuracy.

The market projections in the CIC Report are based on the following key assumptions: (i) the overall social, economic and political environment in China is expected to remain stable during the forecast period; (ii) the economic and industry development in China is likely to maintain a steady growth trajectory during the forecast period, accompanied by continuing urbanization; (iii) related key industry drivers are likely to propel continued growth in China's LED intelligent vision industry throughout the forecast period; and (iv) there will be no extreme force majeure event or unforeseen industry regulation that may significantly or fundamentally affect the relevant market and industry.

Our Directors confirm that after taking reasonable enquiries, there had been no material adverse change in the market information since the date of the CIC Report which may qualify, contradict or have an impact on the information set out in this section. Except as otherwise mentioned, all data and forecasts contained in this section are extracted from the CIC Report.

INDUSTRY OVERVIEW

ANALYSIS OF CHINA'S LED INTELLIGENT VISION MARKET

Definition and Categorization of the LED Intelligent Vision Market

LED intelligent vision employs LED technology to achieve intelligent lighting and display functions. "Intelligence" refers to the ability to acquire, analyze and understand information, and to use knowledge to solve complex problems, adapt to environmental changes and make effective decisions. It encompasses wide range of cognitive functions including learning, comprehension and reasoning. Based on its applications, it can be categorized into three types, including intelligent automotive vision, high-end lighting and advanced display.

- Intelligent automotive vision refers to automotive lighting systems for vehicles, encompassing interior lights and exterior lights. These include intelligent automotive lamps, automotive-grade LED devices and modules. In the scenario of intelligent automotive vision, "intelligence" refers to the automotive lamps' ability to achieve automated and adaptive lighting functions through the integration of advanced sensors, control algorithms and electronic technology. This enhances road safety and driving experience and features energy-saving and personalized settings, reflecting the high-tech nature of automotive vision.

- High-end lighting mainly comprises high-end indoor and outdoor lighting, horticultural lighting, and UV or IR special lighting, etc. High-end lighting encompasses a variety of applications, including outdoor lighting, horticultural lighting, commercial lighting, health lighting, intelligent lighting, and non-visible light applications. It excludes white LED used for general lighting with power less than 1W, color rendering index less than 90, L_{70} lifetime of at least 30,000 hours and luminous efficacy no greater than 180 lm/W. Outdoor lighting typically features power greater than or equal to 2W and an L_{70} lifetime of at least 70,000 hours. Horticultural lighting commonly has power greater than or equal to 2W, a Q_{70} lifetime of at least 100,000 hours, a photoelectric conversion efficiency of at least 80%, and includes a variety of colors such as deep red, far-red, blue and white. Commercial lighting generally has power greater than or equal to 2W and a color rendering index greater than 90.

- Advanced display refers to the application of LED technology, either as backlights or as direct view LED displays, to produce visual displays. Backlight displays are mainly used in liquid crystal display televisions (LCD TVs), personal computers (PCs), smartphones and other devices, while direct view LED display screens are mainly applied in outdoor advertising, stage display, etc.

With the advancement of LED technologies and the widespread application of LED products, the industry has witnessed a shift towards "LED+" technologies. According to the Guangdong Illuminating Engineering Society, "LED+" technologies have become the industry norm, widely

adopted by the industry and extensively cited by organizations and entities. "LED+" technologies refers to the integration of LED technologies with integrated circuits, electronic control, software, sensors, optics and other related components. LED technologies combined with sensors allow LED products to incorporate a range of sensor types, including light sensors, temperature sensors and motion sensors. This enables LED lighting to automatically adapt their brightness and turn on or off in response to changes in ambient light, fluctuations in temperature, or human activity. In addition, the integration of LED technologies with electronic control can realize sophisticated lighting scene control, dimming adjustment and color tuning, as well as energy-saving strategies. "LED+" technologies are environmentally friendly, more energy-efficient and constantly undergo rapid advancements.

The "+" represents additional value and functionality that goes beyond traditional LED lighting. It signifies the incorporation of innovative technology and intelligent design to provide more efficient, energy-saving, intelligent and interconnected lighting solutions on the basis of LED lighting. The concept of "Internet+" also applies the "+" concept, representing a new form of economy relying on internet information technology to integrate the internet with traditional industries in order to optimize production, promote economic transformation and upgrading and reconstruct business models.

Value Chain of the LED Intelligent Vision Market

The value chain of the LED intelligent vision can be categorized into three parts: (i) the upstream that includes LED chips and other raw materials; (ii) the midstream that consists of LED devices and modules; and (iii) the downstream that encompasses various application scenarios mainly including intelligent automotive vision, high-end lighting and advanced display. The following chart illustrates the value chain of the LED intelligent vision market:
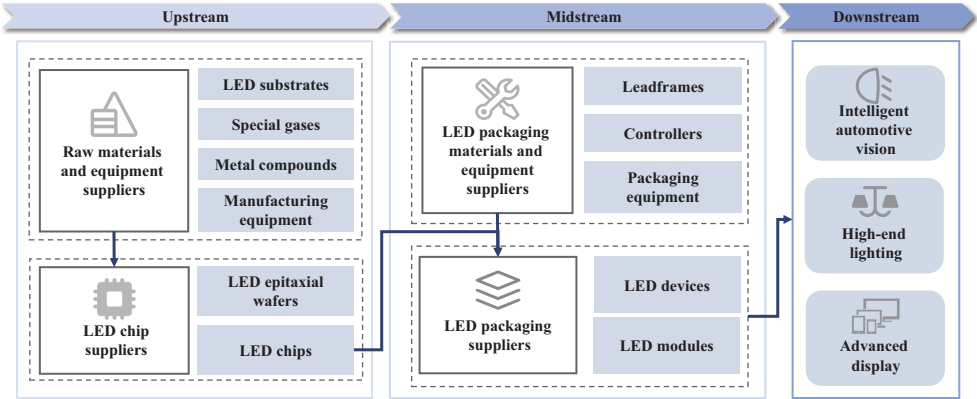
Source: CIC

Market Size of Global and China's LED Intelligent Vision Industry

As LED intelligent vision offers higher energy efficiency and longer life span, LED products have effectively replaced traditional lighting and display products. With the rise of consumer initiatives that focused on energy-saving and environmental protection, coupled with the implementation of supportive policies and regulations, LED intelligent vision has become an emerging industry worldwide in terms of strategic importance. According to CIC, the market size of the global LED intelligent vision industry, in terms of revenue, reached USD192.0 billion in 2023 and is forecast to grow at a CAGR of 8.4% to reach USD287.2 billion by 2028.

China has the world's largest LED intelligent vision industry, accounting for 34.2% of the global market in terms of revenue in 2023. Driven by increasing consumer demand and supportive national policies, the revenue of China's LED intelligent vision market grew from RMB339.3 billion in 2019 to RMB440.2 billion in 2023, at a CAGR of 6.7%, and is expected to reach RMB679.2 billion in 2028, at a CAGR of 9.1% from 2023 to 2028.

ANALYSIS OF CHINA'S INTELLIGENT AUTOMOTIVE VISION MARKET

Overview of intelligent automotive vision market

Intelligent automotive vision is one of the key application scenarios of LED intelligent vision, and LED has emerged as the mainstream technology in the intelligent automotive vision industry. In the intelligent automotive vision sector in China, the penetration rate of LED has exceeded 90%. This is attributable to its higher light intensity, longer life span, lower energy consumption and higher color gamut, compared with traditional halogen and xenon lamps.

With the development of electric vehicles (EVs) and intelligent vehicles, intelligent automotive lamps have transitioned from being mere functional products to intelligent systems. Based on their placement within a vehicle, intelligent automotive lamps can be categorized into exterior lights and interior lights. Exterior lights can be further categorized into headlamps, rear lamps and other lamps. As headlamps play a vital role in vehicle safety, driving experience and intelligent connectivity, they command the highest price among intelligent automotive lamps. Based on the level of intelligence and the amount of pixels, LED headlamps can be categorized into three categories: ordinary LED headlamps, ADB headlamps and high-pixel LED headlamps.

- *Ordinary LED headlamps*: they mainly control the light beam through voltage or current;

- *ADB headlamps*: they adopt a cutting-edge headlamp technology that combines machine vision, precise sensing, arrayed light sources and other advanced features, with the process perceiving signals of road traffic information through sensors, and then utilizing built-in algorithms to process the data. Hence, ADB headlamps can achieve segmented brightness control and double-digit pixel level, and are expected to become the mainstream in the automotive headlamp market;

- *High-pixel headlamps*: they contain over 10,000 pixels and can incorporate innovative technology, such as DLP technology or Micro LED technology that can project navigation, interactive and other information onto the road, for improving lighting performance.

Rear lamps are also evolving with intelligent features, including automatic adjustment of brightness, color, flashing frequency, etc., based on driving situations, and interaction with surrounding vehicles or pedestrians by displaying symbols and texts. In addition, the rear lamps have been upgraded from separated-type rear lamps to continuous rear lamps on structural design, which can realize more functions in diverse scenarios to ensure driving safety and to show unique characteristics.

Interior lights include ambient lights and are vital components of smart cockpit lighting systems. These can create a more pleasant and comfortable driving environment by automatically adjusting the light beam and offer a voice control system to align with drivers' preferences.

INDUSTRY OVERVIEW

Value Chain of the Intelligent Automotive Vision Market in China

The value chain of the intelligent automotive vision market in China can be categorized into four parts: (i) the upstream that includes LED chips; (ii) the midstream that consists of automotive-grade LED devices and modules; (iii) the downstream that manufactures intelligent automotive lamps; and (iv) the end-market automotive OEMs and aftermarket. As intelligent automotive lamps are crucial in ensuring driving safety, automotive OEMs set a series of stringent assessment and audit procedures when selecting suppliers, leading to a long product entry cycle and significant entry barriers. Moreover, only few companies possess vertical integration capabilities that spans from LED chips, to automotive-grade LED devices and modules, and then to the design, development, manufacturing, and application of intelligent automotive lamps. Companies with such vertical integration capabilities are better positioned to meet the increasing demand for intelligent automotive vision, thereby holding a significant competitive edge in the market. The following chart illustrates the value chain of the intelligent automotive vision market:
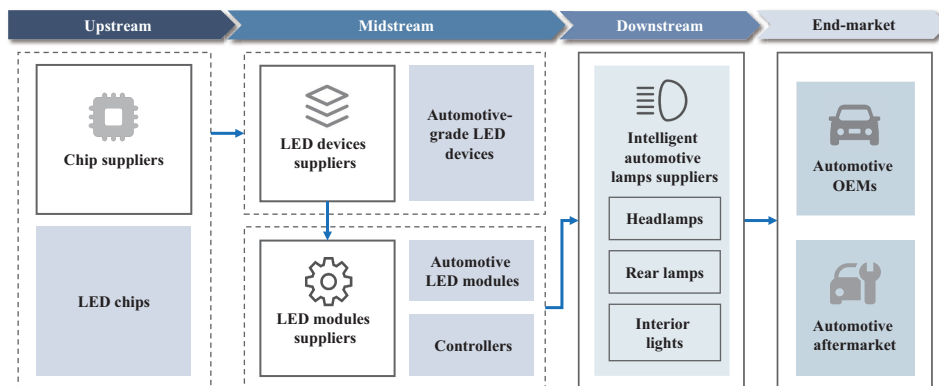
Source: CIC

Automotive-grade LED devices and modules are integral to intelligent automotive lamps, representing 10.8% and 40.6%, respectively, of the market size of China's intelligent automotive vision industry in terms of revenue in 2023. As LED lighting technology has become prevalent in the intelligent automotive vision sector, the application of automotive-grade LED devices significantly increased. The market size of the automotive-grade LED devices in China, in terms of revenue, reached RMB9.6 billion in 2023. The continual expansion of the intelligent automotive vision market presents a significant growth potential for automotive-grade LED devices. The market size of automotive-grade LED devices in China in terms of revenue is projected to achieve RMB19.3 billion by 2028, with a CAGR of 15.0% from 2023 to 2028.

The proportion of automotive-grade LED devices in China produced by domestic enterprises is still relatively low. Continuous investment and innovation in LED packaging technology, along with continual production process optimization, highly supportive regulatory policies and effective collaboration throughout the value chain of the intelligent automotive vision industry, are
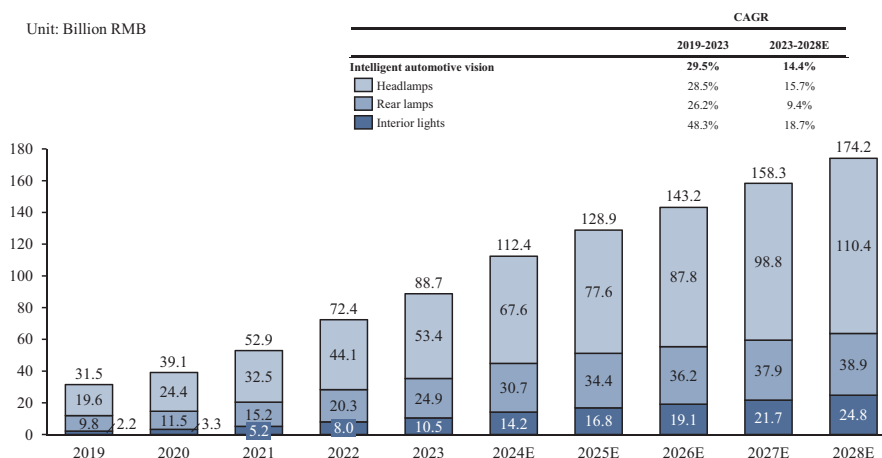
bolstering the competitiveness of domestic enterprises in the global market. Domestic manufacturers are expected to secure a more substantial market share in the automotive-grade LED device sector in China.

Market Size of China's Intelligent Automotive Vision Industry

China, being the world's largest passenger vehicle market and the leading manufacturer of EVs, has also become the largest intelligent automotive vision market globally. At present, LED is the mainstream technology of automotive lighting systems because of its superiority in terms of energy efficiency, longevity, flexibility, as well as high brightness and visibility. According to CIC, the penetration rate of LED in China's automotive lamps sector experienced a significant increase, rising from 67.3% in 2019 to 93.0% in 2023. This rapid growth marks a significant development in China's intelligent automotive vision industry. The market size of China's intelligent automotive vision industry in terms of revenue was RMB88.7 billion in 2023, and the value of intelligent automotive vision system per vehicle in China amounted to approximately RMB3,600. Factors such as the rising adoption of intelligent automotive vision, advancements in light source technology and lamp designs, along with growing consumer demand for customized functions, are expected to drive the value of intelligent automotive vision system per vehicle in China to over RMB4,700 by 2028. This surge is projected to further stimulate the revenue growth of China's intelligent automotive vision market, which is expected to reach RMB174.2 billion by 2028 with a CAGR of 14.4% from 2023 to 2028. Among the several product categories of the intelligent automotive vision market, headlamps take up the largest market portion in China in terms of revenue, accounting for 60.1% of the total market size in 2023. Meanwhile, rear lamps and interior lights each accounted for 28.0% and 11.8% of the market in terms of revenue in 2023. The following chart sets forth the market size of China's intelligent automotive vision industry, in terms of revenue:

Market Size of China's Intelligent Automotive Vision Industry, in Terms of Revenue, 2019-2028E

Unit: Billion RMB

	CAGR	
	2019-2023	**2023-2028E**
Intelligent automotive vision	**29.5%**	**14.4%**
Headlamps	28.5%	15.7%
Rear lamps	26.2%	9.4%
Interior lights	48.3%	18.7%

Year	Total	Headlamps	Rear lamps	Interior lights
2019	31.5	19.6	9.8	2.2
2020	39.1	24.4	11.5	3.3
2021	52.9	32.5	15.2	5.2
2022	72.4	44.1	20.3	8.0
2023	88.7	53.4	24.9	10.5
2024E	112.4	67.6	30.7	14.2
2025E	128.9	77.6	34.4	16.8
2026E	143.2	87.8	36.2	19.1
2027E	158.3	98.8	37.9	21.7
2028E	174.2	110.4	38.9	24.8

Notes:

1   The market size here focuses on the analysis of automotive lighting systems equipped with LED technology.

2   The market size here refers to the total revenue from the intelligent automotive vision products manufactured in China.
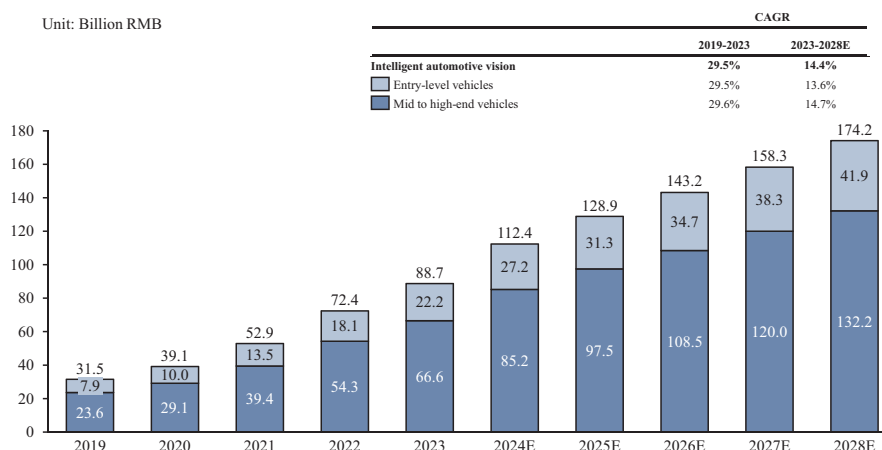
Source: CPCA, CIC

The growing adoption of intelligent automotive lamps will lead to a higher valuation of the automotive lighting systems per vehicle. With the increase of the penetration rate of LED in the automotive lamps sector in China, the value of the automotive lighting systems per vehicle in China is projected to grow from RMB3,184.8 in 2023 to RMB4,679.4 in 2028.

Meanwhile, in the foreseeable future, with the advances of automotive intelligence and the integration of software and hardware, the integration of external sensors and lighting systems will be a potential development trend in the intelligent vehicles industry. This integration aims to enhance vehicle safety and augment the practicality and reliability of autonomous driving technologies. Integrated lighting systems can enhance sensor performance by adjusting brightness or direction, for instance, improving the image quality of visual sensors such as cameras, radars and LiDAR during adverse weather conditions or nighttime driving. However, the realization of this integration still depends on further technological advancements, such as development of sensor fusion technology.

The intelligent automotive vision market is showing a trend toward high-end products. As consumers increasingly seek quality and intelligent features in their vehicles, mid- to high-end vehicles[1] become predominantly equipped with relatively advanced automotive lighting systems. Therefore, the market share of intelligent automotive vision equipped on mid- to high-end vehicles in the intelligent automotive vision market in China gradually increased. According to CIC, the market size of China's intelligent automotive vision equipped on mid- to high-end vehicles reached RMB66.6 billion in 2023, accounting for 75.0% of the entire intelligent automotive vision market in China. With the ongoing growth of the high-end vehicle sector, the market size of China's intelligent automotive vision equipped on mid- to high-end vehicles, in terms of revenue, is expected to reach RMB132.2 billion by 2028, accounting for 75.9% of the entire intelligent automotive vision market, with a CAGR of 14.7% from 2023 to 2028. The chart below sets forth the market size of China's intelligent automotive vision industry, by price range of vehicle, in terms of revenue:

Market Size of China's Intelligent Automotive Vision Industry, by Price Range of Vehicle, in Terms of Revenue, 2019-2028E

Unit: Billion RMB

	CAGR	
	2019-2023	2023-2028E
Intelligent automotive vision	**29.5%**	**14.4%**
Entry-level vehicles	29.5%	13.6%
Mid to high-end vehicles	29.6%	14.7%

Year	Mid to high-end	Entry-level	Total
2019	23.6	7.9	31.5
2020	29.1	10.0	39.1
2021	39.4	13.5	52.9
2022	54.3	18.1	72.4
2023	66.6	22.2	88.7
2024E	85.2	27.2	112.4
2025E	97.5	31.3	128.9
2026E	108.5	34.7	143.2
2027E	120.0	38.3	158.3
2028E	132.2	41.9	174.2

Notes:

1   Mid- to high-end vehicles refer to vehicles with an average MSRP higher than RMB150,000.

2   The market size here refers to the total revenue from the intelligent automotive vision products manufactured in China.

Source: CPCA, CIC

Market Drivers and Future Trends of the Intelligent Automotive Vision Market in China

•   **Rapid development of China's passenger vehicle market:** according to CIC, China has the world's largest passenger vehicle market, and the sales volume of passenger vehicles (including EVs and ICEs) in China reached 26.4 million in 2023, accounting for 34.9% of the global market, and the sales volume is expected to reach 30.0 million in 2028 at a CAGR of 2.5% from 2023 to 2028. The sales volume of EVs and ICEs in China reached 8.9 million

and 16.6 million, respectively in 2023, and is expected to reach 22.8 million and 6.0 million, respectively in 2028. This vast market size lays a solid foundation for the expansion of the intelligent automotive vision market. Furthermore, China's passenger vehicle market is characterized by trends towards electrification, intelligence and connectivity. In particular, EVs have higher requirements for the intelligence and connectivity of lighting systems, which has facilitated the upgrading and replacement of automotive lighting systems. Despite the increase in U.S. tariffs on Chinese EVs and the provisional countervailing duties pre-disclosed by the European Commission on imports of BEVs, the total volume of EVs exported from China to overseas market is expected to increase from 0.6 million in 2023 to 4.5 million in 2028, representing a CAGR of 48.9% during the period. The sales volume of Chinese EVs exported to the Europe market is expected to increase from 0.4 million in 2023 to 1.8 million in 2028, while its share in the total export volume to overseas market will decrease from 62.3% to 41.0%. The sales volume of Chinese EVs exported to the U.S. market is expected to increase from 48.5 thousand in 2023 to 176.4 thousand in 2028, while its share in the total export volume to overseas market will decrease from 7.9% to 3.9%. The significant growth of EVs in China has propelled the intelligent advancement and development of intelligent automotive vision. Regarding the effect of EVs on the Company's performance, the fluctuation in the demand for and price of EVs would not have a significant impact on the Company's operational and financial performance. The Company has already established a broad customer base, covering various vehicle manufacturers and catering to all types of vehicles, including EVs and ICEs. By addressing the needs of all types of vehicles, the Company demonstrates its versatility and adaptability. With a solid position in the market, the Company has been able to adapt to the evolving landscape of the automotive industry. Therefore, while future price trends of EVs may influence the overall industry to some extent, they are not critical factors for the Company's operational and financial performance.

- **Continual upgrades of lighting technology, intelligent configurations and structural design:** all vehicles are progressing towards intelligence, leading to a rise in the penetration rate of intelligent automotive lamps. In response to the growing demand for intelligent features in vehicles, OEMs are increasingly seeking intelligence features for vehicles. As a result, OEMs are recognizing the need to integrate advanced technological capabilities into automotive intelligent lamps to align with the broader trend in the automotive industry. Automotive OEMs are continually enhancing the intelligent features of automotive lamps to cater to consumer demands and comply with safety regulations. The headlamps have experienced upgrades in light source technology and intelligent functions, enabling automatic and precise control of various lighting parameters to enhance safety across different driving scenarios. Similarly, rear lamps have also seen advances in light source technology and structural design, capable of interaction and information exchange with other vehicles. Additionally, the penetration rate of interior lights has significantly increased, driven by the advances in vehicles' entertainment features. Moreover, the rising competition among OEMs

further pushes the integration of intelligent features in automotive lamps, as it becomes a way for manufacturers to differentiate their products and enhance their competitiveness. Thus, the penetration rate of intelligent automotive lamps is expected to continue rising as OEMs prioritize and invest in incorporating intelligent features into automotive lamps.

- **Increasing penetration rate of intelligent automotive vision:** Intelligent automotive lamps offer superior performance than traditional automotive lamps, leading to an increase in the usage of intelligent automotive lamps. Intelligent automotive lamps are more energy-efficient, offering longer lifespan, reduced power consumption and higher color gamut, compared to traditional automotive lamps. Moreover, intelligent automotive lamps may be equipped with advanced technologies such as adaptive lighting and automatic high beam control, which enhance visibility and safety on the road. The integration of intelligent automotive lamps with vehicle communication systems and autonomous driving technologies has further propelled the adoption of intelligent automotive lamps. These lamps play a crucial role in enhancing the interaction between vehicles and their surroundings, ultimately contributing to the advancement of smart and autonomous driving capabilities. Intelligent automotive lamps are becoming increasingly popular due to their advanced features and technological capabilities. The penetration rate of intelligent automotive lamps is expected to rise, which can further increase the value of the automotive lighting systems per vehicle. As the expenses on intelligent lighting system are relatively higher than that of the traditional lighting system, the development of intelligent automotive lighting systems will bring positive impacts on enterprises' operations.

- **Acceleration of domestic substitution trend:** domestic manufacturers of intelligent automotive lamps possess a deeper understanding of the local market and are better positioned to serve automotive OEMs in China. They can rapidly respond to the innovative demands required of intelligent automotive vision. Moreover, the emergence of domestic automotive OEMs has been creating more opportunities for their upstream suppliers in China. By collaborating with these domestic automotive OEMs, the market share of domestic companies is predicted to further expand from over 60% in 2023 to over 70% in 2028.

- **Supportive policies and regulations:** in recent years, the Chinese government has implemented a range of policies and industrial planning standards related to vehicle safety, intelligent automotive lamps and maintaining the stability of supply chain, such as the "*14th Five-Year National Road Traffic Safety Plan*" (《"十四五"全國道路交通安全規劃》), the "*Strategy for Innovative Development of Intelligent Vehicles*" (《智能汽車創新發展戰略》) and the "*Standards of National Supply Chain Innovation and Creation of Application Examples*" (《全國供應鏈創新與應用示範創建工作規範》), etc. These policies aim to create a favorable environment for industrial development, facilitate independent innovation in technology R&D, as well as promote the localization of supply chains to reduce reliance on imported automotive-grade parts.

INDUSTRY OVERVIEW

Competitive Landscape of the Intelligent Automotive Vision Market in China

The competitive landscape of China's intelligent automotive vision market is relatively concentrated, with the top five manufacturers taking up an aggregated market share of 49.2% in terms of revenue in 2023. The revenue from our intelligent automotive vision segment amounted to RMB771.0 million and accounting for 0.9% of the total market in terms of revenue in 2023. The table below sets forth the top five manufacturers of China's intelligent automotive vision market and their revenue from intelligent automotive vision for the year 2023:

Ranking of Top Five Manufacturers in China's in Intelligent Automotive Vision Market in Terms of Revenue, 2023

Ranking	Manufacturers of intelligent automotive vision	Revenue from intelligent automotive vision, 2023 (RMB million)	Market share[1], 2023
1	Company A	16,198.3	18.3%
2	Company B	9,760.9	11.0%
3	Company C	6,670.1	7.5%
4	Company D	6,000.0	6.8%
5	Company E	5,000.0	5.6%
	Subtotal	**43,629.3**	**49.2%**

Note: 1   Revenue from intelligent automotive vision products manufactured in China as a percentage of the total market size of China's intelligent automotive vision industry in 2023.

Company A: A non-listed company founded in 1989 and headquartered in Shanghai, it's mainly engaged in the development of visual technology and the production and sales of automotive lighting system components.

Company B: A company listed on the SSE, founded in 1993 and headquartered in Jiangsu Province, it's mainly engaged in the R&D, design, manufacturing and sales of automotive lamps.

Company C: A company listed on the FWB and LuxSE, founded in 1899 and headquartered in Germany, it's mainly engaged in development, production and the marketing of lighting and electronic components and systems for vehicle manufacturers.

Company D: A non-listed company founded in 1919 and headquartered in Italy, it's mainly engaged in the field of electronics and powertrain, automotive lighting and motorsport.

Company E: A company listed on the Euronext-Paris, founded in 1923 and headquartered in France, it's mainly engaged in the areas of electrification, advanced driving assistance systems (ADAS), reinvention of the interior experience and lighting of vehicles.

The domestic manufacturers of intelligent automotive vision achieved a market share of more than 60% in China's intelligent automotive vision market as of 2023, so they play an important role in the industry, and the top five domestic manufacturers took up an aggregated market share of 41.0% in terms of revenue in 2023. The table below sets forth the top five Chinese manufacturers of China's intelligent automotive vision market and their revenue from intelligent automotive vision for the year 2023:

Ranking of Top Five Chinese Manufacturers in China's Intelligent Automotive Vision Market in Terms of Revenue, 2023

Ranking	Manufacturers of intelligent automotive vision	Revenue from intelligent automotive vision, 2023 (RMB million)	Market share[1], 2023
1	Company A	16,198.3	18.3%
2	Company B	9,760.9	11.0%
3	Company F	4,370.2	4.9%
4	Company G	3,638.0	4.1%
5	Company H	2,371.6	2.7%
	Subtotal	**36,339.0**	**41.0%**

Note: 1   Revenue from intelligent automotive vision as a percentage of the total market size of China's intelligent automotive vision industry in 2023.

Company F: A non-listed company founded in 1998 and headquartered in Hebei Province, it's mainly engaged in the business of automotive lighting, thermal management systems, electrical systems, and smart mobility.

Company G: A non-listed company founded in 1987 and headquartered in Zhejiang Province, it's mainly engaged in the design, development and manufacturing of automotive lighting.

Company H: A non-listed company founded in 2010 and headquartered in Anhui Province, it's mainly engaged in the business of LED light sources and automotive lighting systems.

Source: CIC

Meanwhile, the mid- to high-end intelligent automotive vision market is an important segment of the automotive intelligent vision market, with the top five manufacturers tanking up an aggregated market share of 49.8% in terms of revenue in 2023. The revenue from our intelligent automotive vision products equipped on mid- to high-end vehicles amounted to RMB363.2 million and accounting for 0.5% of the total market in terms of revenue in 2023. The table below sets forth the top five manufacturers of China's mid- to high-end intelligent automotive vision market and their revenue from intelligent automotive vision products equipped on mid- to high-end vehicles for the year 2023:

Ranking of Top Five Manufacturers in China's Mid- to High-end Intelligent Automotive Vision Market[1] in Terms of Revenue, 2023

Ranking	Manufacturers of intelligent automotive vision	Revenue from intelligent automotive vision equipped on mid- to high-end vehicles, 2023 (RMB million)	Market share[2], 2023
1	Company A	11,819.1	17.8%
2	Company B	7,181.2	10.8%
3	Company C	5,336.1	8.0%
4	Company D	4,800.0	7.2%
5	Company E	4,000.0	6.0%
	Subtotal	**33,136.4**	**49.8%**

Notes:

1   Mid- to high-end intelligent automotive vision market refers to the market of intelligent automotive vision products for vehicles with an average MSRP higher than RMB150,000.

2   Revenue from intelligent automotive vision products that are equipped on mid- to high-end vehicles and manufactured in China as a percentage of the total market size of China's intelligent automotive vision products equipped on mid- to high-end vehicle models in 2023.

In China's mid- to high-end intelligent automotive vision market, the market share of top five domestic manufacturers accounted for 33.6%. And we were the fifth largest mid- to high-end Chinese intelligent automotive vision manufacturer in 2023. The table below sets forth the top five Chinese manufacturers of China's mid- to high-end intelligent automotive vision market and their revenue from intelligent automotive vision products equipped on mid- to high-end vehicles for the year 2023:

Ranking of Top Five Chinese Manufacturers in China's Mid- to High-end Intelligent Automotive Vision Market in Terms of Revenue, 2023

Ranking	Manufacturers of intelligent automotive vision	Revenue from intelligent automotive vision equipped on mid- to high-end vehicles[1], 2023 (RMB million)	Market share[2], 2023
1	Company A	11,819.1	17.8%
2	Company B	7,181.2	10.8%
3	Company F	1,676.3	2.5%
4	Company G	1,309.7	2.0%
5	**The Company**	**363.2**	**0.5%**
	Subtotal	**22,349.5**	**33.6%**

Notes:

1 Mid- to high-end vehicles refer to vehicles with an average MSRP higher than RMB150,000;

2 Revenue from intelligent automotive vision equipped on mid- to high-end vehicles as a percentage of the total market size of China's intelligent automotive vision products equipped on mid- to high-end vehicle models in 2023.

Entry Barriers and Key Success Factors of the Intelligent Automotive Vision Market in China

• **Technological advantage:** as intelligent automotive vision technology advances, intelligent automotive vision manufacturers must diversify and enhance their technical capabilities with respect to automotive electronics and electrical technology, as well as optoelectronic semiconductor technology. Developing proficiency in these areas requires extensive expertise and qualified R&D teams. Furthermore, it is crucial for these manufacturers to consistently innovate, iterate and upgrade their technologies and products to satisfy the changing demands and developing performance standards in the intelligent automotive vision market, and thus maintain a leading position in the industry.

- **Advanced large-scale mass production and quality control capabilities:** intelligent automotive vision manufacturers are required to have advanced large-scale mass production capabilities that enable them to meet market demands and deliver products in a timely manner. Furthermore, given the stringent safety and reliability standards set by automotive OEMs for auto parts, including intelligent automotive vision, it is crucial for intelligent automotive vision manufacturers to maintain a robust quality control system. This system shall effectively comply with relevant standards and meet the requirements of automotive OEMs.

- **Stable customer relationships:** stable and long-term customer relationship with automotive OEMs is vital for intelligent automotive vision suppliers as it ensures the sustainability of purchase orders. Automotive OEMs can also provide valuable market insights and timely feedback, enabling intelligent automotive vision manufacturers to develop products which respond the market demand better.

- **Vertical integration capabilities within the industry value chain:** companies with vertical integration capabilities are able to collaborate with automotive OEMs across different stages of product development, such as R&D, product design and production. This collaboration results in a shorter R&D cycle and quicker response to market demand. Meanwhile, effective management of the entire supply chain is crucial for companies to ensure a steady supply of raw materials and key components. In addition, the vertical integration within the industry value chain enables companies to quickly grasp new technology development trends and apply them to product R&D and improvements to meet the needs for upgrades of product and technology.

- **Abundant capital resources:** in order to enter the intelligent automotive vision sector, market participants need to make substantial initial investments in purchasing production equipment and bear high costs associated with R&D and mold development. Intelligent automotive vision manufacturers with abundant capital resources are better positioned to engage in R&D activities, increase production capacity and broaden their market reach. These investments enable the intelligent automotive vision suppliers to achieve economies of scale and secure a competitive edge in this highly competitive market.

ANALYSIS OF CHINA'S HIGH-END LIGHTING AND LCD TV BACKLIGHT DISPLAY INDUSTRIES

Overview of High-end Lighting and LCD TV Backlight Display Industries

Along with the development of LED technology, high-end LED products are superseding the traditional lighting and display products. High-end LED products, including high-end lighting products and LCD TV backlight displays, offer higher CRI, higher power, higher luminous efficacy and more intelligent features, compared with low-power LED products. Hence, from the

perspective of performance, life span, reliability, price and other parameters, high-end LED products have a promising market potential. The high-end lighting and LCD TV backlight display in the following sections refer to their corresponding devices and modules.

LCD TV backlight display is a pivotal component of the advanced display market. The adoption of LED technology in LCD TV backlight displays has led to significant improvements in uniformity of brightness, energy efficiency and slim designs. As the industry matures, it is common for manufacturers of LCD TV backlight display devices to deliver products to TV companies in the form of display modules.

LED packaging lies in the middle of the value chain of the high-end lighting and advanced backlight display industries. It refers to the process of assembling LED chips, leadframes and other components to form LED devices for various applications, which provides LED chips with physical support and protects the chips from the external environment. As a crucial process in the LED value chain, LED packaging primarily enhances the reliability, performance, life span and power supply control of LEDs. It also determines the cost and final performance of LED products.

Analysis and Categorization of LED Packaging Technologies

Categorization of LED packaging technologies by the structure of LED chips

Based on the structure of LED chips, LED packaging technologies can be categorized into flip-chip LED technology, lateral chip LED technology and vertical LED technology. The table below sets forth the categorization of LED packaging technologies by the structure of LED chips:
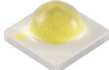

Category	Structure	Key features
Flip-Chip LED	Silicone mixed with phosphor / Reflective cup / Leadframe / Flip-chip LED chip / Eutectic bonding layer	• Flip-chip LED technology has a different structure from the lateral chip packaging technology, offering high reliability, heat dissipation efficiency and luminous efficacy. With the development of high-end lighting, backlight display and other sectors, flip-chip LED technology is expected to be widely adopted in high-end scenarios, such as Mini LED, outdoor light and automotive headlamps.
Lateral Chip	Silicone mixed with phosphor / Reflective cup / Leadframe / Gold wire / Lateral LED chip / Die attach material	• Lateral chip technology is relatively mature with low cost, but faces challenges related to poor heat dissipation and current block phenomenon. It occupies the mainstream position in the low-power LED devices.
Vertical LED	Silicone mixed with phosphor / Reflective cup / Leadframe / Gold wire / Vertical LED chip / Conductive adhesive material	• Vertical LED technology is not the predominant technology for LED packaging, due to its high cost. It transfers heat efficiently for better heat dissipation and is mainly applied in high-power LED devices.

Source: CIC

Categorization of LED packaging technologies by device form

Based on device forms, LED packaging technologies can be categorized into SMD package, COB package, high-power LED package and pin-type package. The table below sets forth the categorization of LED packaging solution by device form:
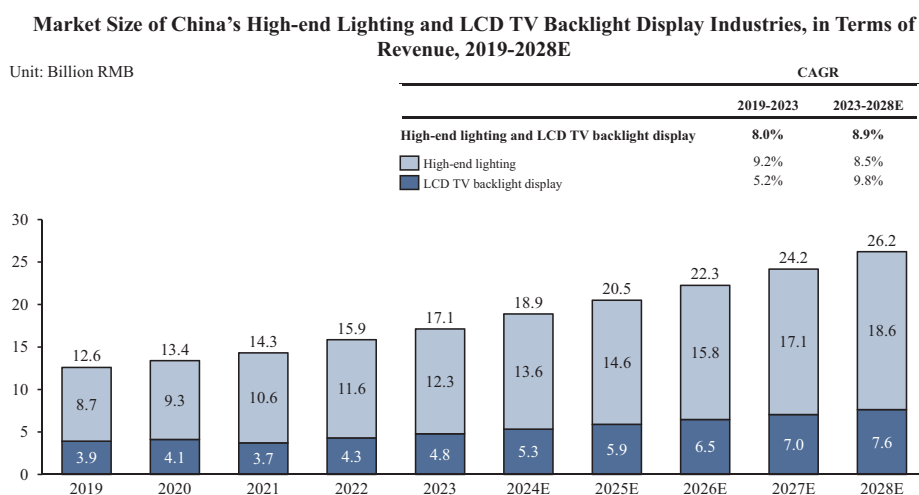
Category	Key features
Surface mounted devices (SMD) LED packaging	• SMD LED packaging is a packaging technology that LED chips are mounted on the designated position on the leadframe. Bonding wires are required for electrical connection, then silicone covers the upper portion to protect the chips. It is mainly used for the packaging of low- to mid-power LED devices.
Chip-on-board (COB) LED packaging	• COB LED packaging is a packaging technology that multiple LED chips are directly attached onto the PCB or ceramic board and wire bonding or flip-chip bonding technology is utilized to realize the electrical connection between the chip and the board, followed by covering the chips and bonding wires to protect them using phosphor-mixed silicone. It serves as the major packaging solution for high-end commercial lighting.
High-power LED packaging	• High-power LED packaging is designed for high-power LED products, encompassing leadframe-type packaging and ceramic-based high-power LED packages, etc. In particular, the ceramic-based high-power LED package has become the mainstream solution for outdoor lighting, horticultural lighting and smartphone flashlights, etc.
Pin-type packaging	• Pin-type packaging is considered to be the earliest form of all LED packages, with a structure comprising two or more leads. It is commonly used in low-power LED devices and applied in the instrument display.

Source: CIC

INDUSTRY OVERVIEW

Market Size of China's High-end Lighting and LCD TV Backlight Display Industries

According to CIC, China is the largest LED packaging market in the world. The market size of devices and modules for China's high-end lighting and LCD TV backlight display industries in terms of revenue reached RMB17.1 billion in 2023, which is attributed to the iteration of LED packaging technologies, increasing environment protection requirements and the expansion of application scenarios. The market size of devices and modules for China's high-end lighting and LCD TV backlight display industries in terms of revenue is expected to reach RMB26.2 billion in 2028, at a CAGR of 8.9% from 2023 to 2028. The following chart sets forth the market size of devices and modules for China's high-end lighting and LCD TV backlight display industries, in terms of revenue:

Market Size of China's High-end Lighting and LCD TV Backlight Display Industries, in Terms of Revenue, 2019-2028E

Unit: Billion RMB

	CAGR	
	2019-2023	2023-2028E
High-end lighting and LCD TV backlight display	8.0%	8.9%
High-end lighting	9.2%	8.5%
LCD TV backlight display	5.2%	9.8%

Note:

1   The market size here refers to the total revenue of devices and modules from the high-end lighting and LCD TV backlight display products manufactured in China.

Source: NBS, CSA, CIC

Market Drivers of the High-end Lighting and LCD TV Backlight Display Market in China

*   **Technology innovation:** the continuous enhancements in LED chip technologies, packaging structures and advanced materials have significantly improved the performance of high-end lighting and LCD TV backlight display devices with respect to color performance, reliability and light efficiency, etc. These improvements have been crucial in providing more development opportunities and application scenarios for high-end lighting and LCD TV backlight displays, resulting in a notable increase of demand for high-end LED devices and modules.

- **Energy efficiency and environmental protection:** compared to traditional lighting technologies, the energy efficiency of LED technologies is more closely aligned with the requirements of environmental protection policies. Government policies and regulations promoting energy conservation and environmental protection, coupled with increasing societal awareness, have driven the adoption of high-performance, high CRI LED devices and modules. These devices and modules have become the mainstream choice in the high-end lighting and LCD TV backlight display industries.

- **Accelerated expansion of downstream application scenarios:** with the rapid development and expansion of downstream application scenarios such as indoor and outdoor lighting, horticultural lighting, intelligent lighting, special lighting, backlight display, commercial display, etc., the demand for diverse and customized lighting and display systems is surging. LED technology, with its advantages of high luminous efficacy and long life span, has become the mainstream lighting technology in the high-end lighting and LCD TV backlight display industries.

Future Trends in the High-end Lighting and LCD TV Backlight Display Market in China

- **Miniaturization and high-power of LED devices and modules:** the advances in electronic products towards being lightweight, slim and compact in design has correspondingly led to the miniaturization of LED devices and modules. This trend poses greater challenges on LED device and module manufacturers in terms of their technical capabilities. Additionally, the rising demand for high-power LED devices and modules has prompted such manufacturers to refine their product designs and adopt high-quality and high-performance materials to meet the market's requirements.

- **Increasing demand of products with higher performance:** with the rapid expansion of LED application scenarios, the consumers' demand for LED products with enhanced performance with respect to CRI, luminous efficacy and power output is increasing. This is particularly evident in emerging application scenarios such as horticultural lighting and intelligent lighting. Consequently, high-end lighting and LCD TV backlight display products are expected to witness a higher growth rate in these application scenarios and secure an increasing market share in the coming years.

- **Development of Mini/Micro LED technologies:** the emergence of Mini/Micro LED technologies represents the future development trend in high-end LED products. These technologies enable higher definition, increased brightness, higher color saturation, higher power efficiency and longer life span for high-end LED products. Notably, with the abilities of conducting precise and dynamic control of light and accurate color reproduction, Mini LED light sources effectively improve the image quality of TVs. This has led to an accelerated application of Mini LED technology in TVs.

- **Increasing concentration of industry landscape:** as technologies continue to advance and market demands evolve, leading companies in the high-end lighting and LCD TV backlight display industries are expected to increase their market share through continual technological innovations. Consequently, some small and mid-size manufacturers are likely to be phased out due to a lack of scale effect.

Competitive Landscape of the High-end Lighting and LCD TV Backlight Display Market in China

The competitive landscape of China's high-end lighting market is relatively fragmented, with the top five manufacturers taking up an aggregated market share of 39.3% in terms of revenue in 2023. Our revenue from high-end lighting segment amounted to RMB650.8 million for the year 2023, with a market share of 5.3%, ranking fifth in the industry during the period. The table below sets forth the top five manufacturers of China's high-end lighting and their relevant revenue for the year 2023:

Ranking of Top Five Manufacturers in China's High-end Lighting Market in Terms of Revenue, 2023

Ranking	Manufacturers of high-end lighting	Revenue from high-end lighting, 2023 (RMB million)	Market share[1], 2023
1	Company I	1,512.8	12.3%
2	Company J	1,200.0	9.7%
3	Company K	816.7	6.6%
4	Company L	665.0	5.4%
5	**The Company**	**650.8**	**5.3%**
	Subtotal	**4,845.3**	**39.3%**

Note: 1   Revenue from LED devices and modules manufactured in China for high-end lighting applications as a percentage of the total market size of devices and modules for China's high-end lighting industry in 2023.

Company I: A company listed on the SZSE, founded in 2004 and headquartered in Guangdong Province, it mainly focuses on semiconductor packaging, LED automotive lighting etc.

Company J: A non-listed company founded in 2004 and headquartered in Fujian Province, it mainly focuses on manufacturing of LED professional lighting and semiconductors package devices.

Company K: A non-listed company founded in 1999 and headquartered in the U.S., it mainly focuses on the delivery of differentiated lighting solutions.

Company L: A non-listed company founded in 2002 and headquartered in the U.S., it mainly focuses on solid-state lighting solutions.

The domestic manufacturers of high-end lighting achieved a market share of more than 50% in China's high-end lighting market as of 2023, so they play an important role in the industry, and the top five domestic manufacturers took up an aggregated market share of 37.4% in terms of revenue in 2023. And we were the third largest domestic manufacturer of high-end lighting market in 2023. The table below sets forth the top five Chinese manufacturers of China's high-end lighting and their relevant revenue for the year 2023:

Ranking of Top Five Chinese Manufacturers in China's High-end Lighting Market in Terms of Revenue, 2023

Ranking	Manufacturers of high-end lighting	Revenue from high-end lighting, 2023 (RMB million)	Market share[1], 2023
1	Company I	1,512.8	12.3%
2	Company J	1,200.0	9.7%
3	**The Company**	**650.8**	**5.3%**
4	Company M	634.5	5.1%
5	Company N	619.1	5.0%
	Subtotal	**4,617.2**	**37.4%**

Note: 1   Revenue from LED devices and modules for high-end lighting applications as a percentage of the total market size of devices and modules for China's high-end lighting industry in 2023.

Company M: A company listed on the SZSE, founded in 1997 and headquartered in Guangdong Province, it mainly focuses on LED packaging and LED application products.

Company N: A company listed on the SZSE, founded in 1969, and headquartered in Guangdong Province, it mainly focuses on manufacturing LED packaging devices and LED application products.

Source: CIC

The competitive landscape of China's LCD TV backlight display market is relatively concentrated, with the top five manufacturers taking up an aggregated market share of 66.6% in terms of revenue in 2023, and they were all domestic manufacturers. Our revenue from LCD TV backlight display (i.e. revenue from our advanced display business) segment amounted to RMB436.2 million for the year 2023, with a market share of 9.1%, ranking fourth in the industry during the period. The table below sets forth the top five manufacturers of China's LCD TV backlight display and their revenue for the year 2023:

Ranking of Top Five Manufacturers in China's LCD TV Backlight Display Market in Terms of Revenue, 2023

Ranking	Manufacturers of LCD TV backlight display	Revenue from LCD TV backlight display[1], 2023 (RMB million)	Market share[2], 2023
1	Company O	955.0	20.0%
2	Company P	907.5	19.0%
3	Company Q	514.0	10.7%
4	**The Company**	**436.2**	**9.1%**
5	Company R	373.1	7.8%
	Subtotal	**3,185.8**	**66.6%**

Notes:

1   Only includes revenue from LED devices and modules for LCD TV backlight display applications, excluding small and mid-size LED advanced backlight display applications;

2   Revenue from LED devices and modules for LCD TV backlight display applications as a percentage of the total market size of devices and modules for China's LCD TV backlight display industry in 2023.

Company O: A company listed on the SZSE, founded in 2005 and headquartered in Guangdong Province, it mainly focuses on R&D, manufacturing and marketing of LED devices, optical devices, optical films and invisible light products.

Company P: A non-listed company founded in 2011 and headquartered in Jiangxi Province, it mainly focuses on research, production and sales of LED devices and modules.

Company Q: A company listed on the SZSE, founded in 2012 and headquartered in Anhui Province, it mainly focuses on the R&D, production and sales of semiconductor devices, LED display devices and LED lighting.

Company R: A company listed on the SZSE, founded in 2000 and headquartered in Guangdong Province, it mainly focuses on R&D, production and sales of LED and LED application.

Source: CIC

Entry Barriers and Key Success Factors of the High-end Lighting and LCD TV Backlight Display Market in China

- **Advanced technology R&D capabilities and talent team:** LED packaging technologies involve multiple disciplines, including material science, thermal science and optoelectronics. To enhance the performance of LED devices, manufacturers must conduct comprehensive studies on materials selection, optical structures and so forth. Additionally, given the rapid evolution of production processes and technologies, it is crucial for manufacturers to maintain a robust R&D team dedicated to the continual development of innovative technology and products.

- **Strong quality control:** the packaging process for high-end LED products necessitates stringent quality control measures. Companies need to have a stable and comprehensive quality control system to ensure high yield rate, luminous efficacy and quality consistency of LED products. In addition, LED product manufacturers with strong manufacturing process control and quality control capabilities are in better position to improve product performance and reduce costs.

- **Stable customer relationships:** establishing stable cooperative relationships with top-tier customers requires years of development and accumulation for LED product manufacturers. To address the varied demands of consumers, manufacturers of devices and modules for high-end lighting and LCD TV backlight need collaborate closely with their customers to periodically upgrade their products. In turn, the manufacturers can also obtain valuable market feedback to optimize product design and introduce competitive solutions. These can effectively help establish their leading positions in the market.