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# Global and China Automotive Lighting Industry Report, 2021

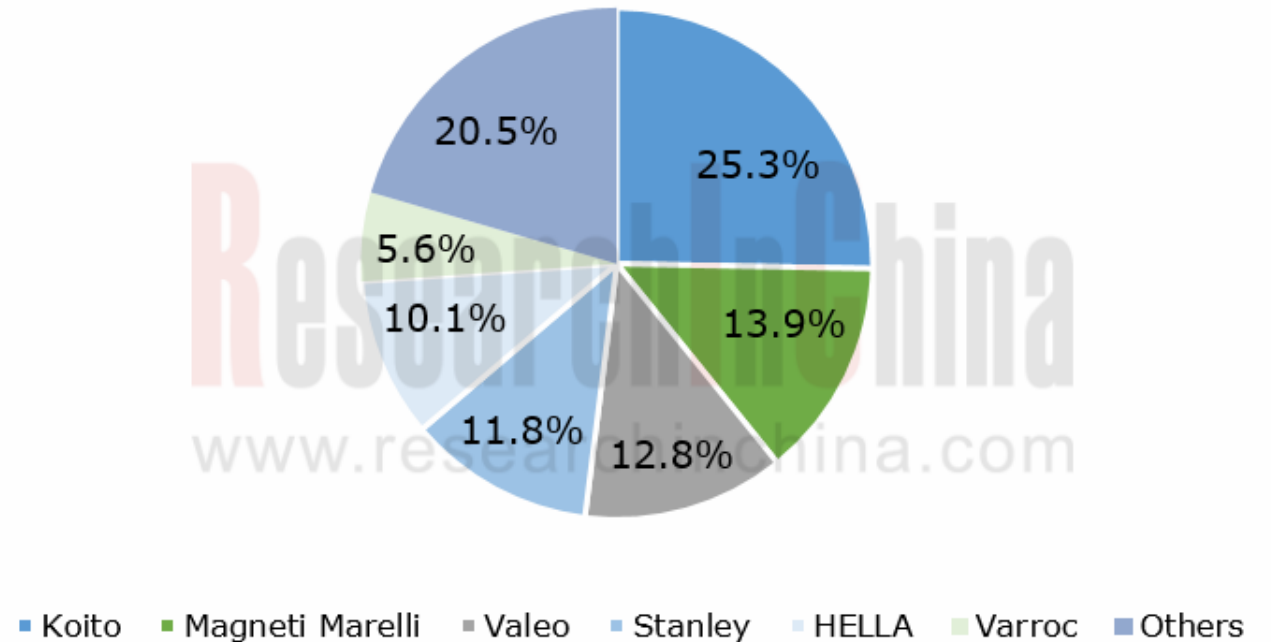
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Global and China Automotive Lighting Industry Report, 2021 combs through intelligence trends of automotive lighting, technology routes, laws and regulations for automotive lighting industry, competitive pattern of automotive lighting market, automotive lighting companies' deployments in intelligence, and their intelligent lighting configurations for mid- and high-class vehicle models.

**Global automotive lighting market is highly concentrated, and Koito is the champion.**

Automotive lighting is a highly concentrated market where bellwethers play a dominant role, that is, there are “one superpower and several powers”. In the global automotive lighting market, European, American and Japanese manufacturers are the main players. In 2020, Japan-based Koito was positioned first with market share of 25.3%, Italy's Magneti Marelli (13.9%) and France-based Valeo (12.8%) followed, three together sweeping 52% of the global market.

**Market Shares of Global Automotive Lighting Companies, 2020**

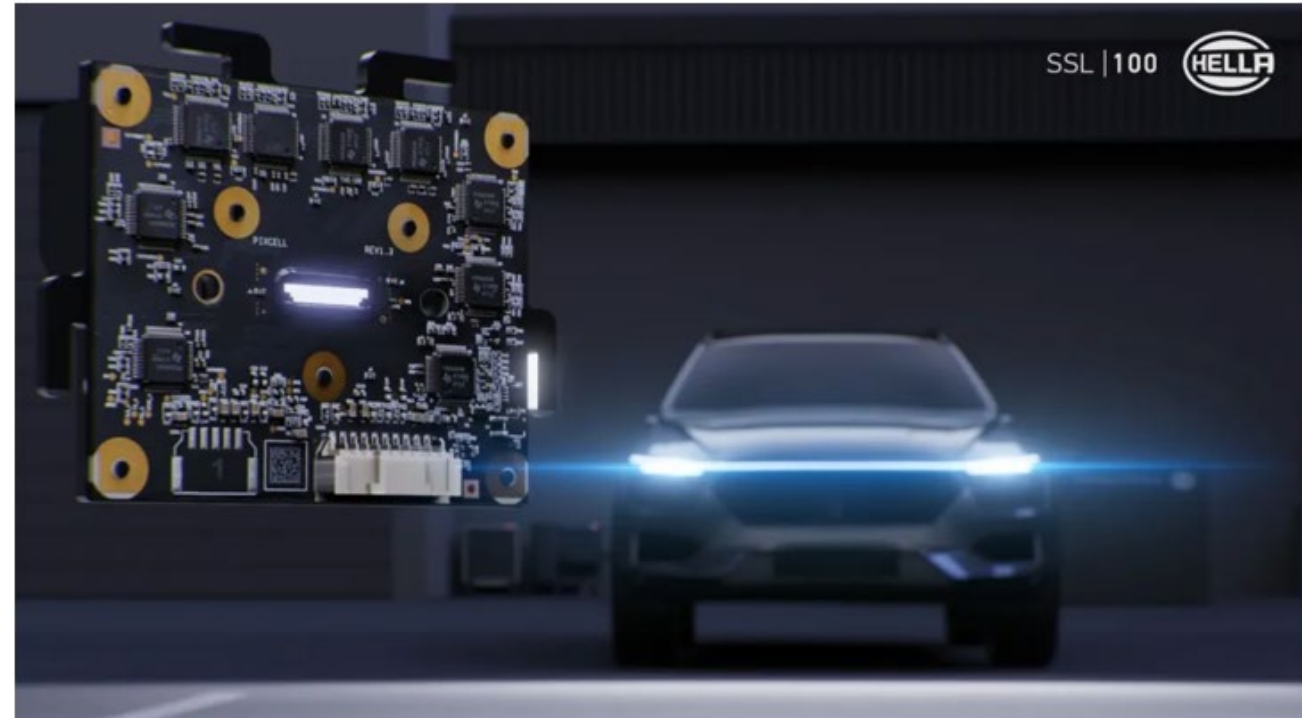


Source: Varroc

Global automotive lighting leaders vie more fiercely for new technologies:

- ◆ In September 2019, Koito rolled out BladeScan?ADB headlamp system which has been mounted on 2019 Lexus RX and 2021 Lexus LS.
- ◆ At CES 2019, Magneti Marelli introduced its third-generation Smart Corner lighting technology which can integrate with all types of sensors including LiDAR, radar, camera and ultrasonic radar. The company also displayed advanced LED lighting functions such as digital light processing (DLP) and adaptive driving beam (ADB).
- ◆ In March 2020, Hella unveiled SSL 100 light module. The system offers up to 102 pixels, each of which can be activated independently, and controls light distribution via ECU to automatically turn on and turn off LED in a designated area. SSL 100 light module has been introduced into Chinese market and mass-produced at HELLA lamp plant in Jiaxing.
- ◆ In November 2020, the Human Centric Lighting (HCL) innovator Biological Innovations and Optimization Systems, LLC (BIOS), and Lumileds, joined forces to create a new SkyBlue? LED. BIOS SkyBlue Circadian rhythm technology used in the new product is a solution to technical challenges of HCL.

## HELLA SSL 100 Light Module



Source: HELLA



Not to be outdone, Chinese automotive lighting bellwethers have developed dynamically interactive lighting technology in the automotive CASE trend. For example, at Auto Shanghai 2021, HASCO Vision Technology displayed an intelligent interactive lighting system that consists of PML intelligent headlamps and ISD tail lights. The system can input user-defined texts, pictures and videos into the lighting domain controller which will then convert the content into elements and materials that the lamps can recognize to display the specific content and interact with the outside world. The system is mounted on Human Horizons HiPhi X. In 2020, Changzhou Xingyu Automotive Lighting Systems also managed to develop rhythmic taillights capable of welcoming, the second-generation ambient lights with public voice interaction function, gesture controlled indoor lamps, and pixel-type headlamp modules.

## Intelligent Interactive Lighting System for HiPhi X



Source: HASCO Vision

## Demand for intelligent headlights increases, and six technology routes come to the forefront.

Intelligent headlights provide higher visibility for drivers in bad weathers to ensure driving safety. The data shows that the use of intelligent lamps helps to reduce 57%-74% traffic accidents at night. With the increasing demand, more and more intelligent headlights are installed in mid- and high-class cars. According to GMI Research and its public data, it is estimated that the global intelligent headlight market will be worth nearly USD6.84 billion in 2026 compared with USD4.83 billion in 2020.

There are six intelligent headlight technology routes: LED Matrix,  $\mu$ AFS, LCD, DLP, Blade Scan and MEMS.

**Comparison of Advantages and Disadvantages between Six Intelligent Headlight Technology Routes**

Technology Route	Advantages	Disadvantages	Typical Manufacturer
<b>LED Matrix</b>	Economic pixel implementation, mature, low development uncertainty, short development cycle	The LED package dimension means the megapixel magnitude has almost reached the ceiling	Hella
<b><math>\mu</math>AFS</b>	Low cost, small size, and fairly high efficiency	$\mu$ AFS underperforms the LCD and DLP types in pixel magnitude. The current pixel magnitude delivered by $\mu$ AFS stays at 1,000 pixels	OSRAM
<b>LCD</b>	Lower cost, smaller size, wider light pattern stretching angle, higher contrast of light and shadow, than the DLP type	The loss of polarizer and LCD panel leads to lower optical efficiency	Hella
<b>DLP</b>	Higher than megapixel	High cost, need for larger space	Texas Instruments
<b>Blade Scan</b>	The use of 22 light sources achieves the effects that the conventional matrix offers with 400 light sources, which thus lowers the cost of manufacturing	-	Koito
<b>MEMS</b>	If passing automotive-grade certification and used in intelligent headlight systems, it may be the most efficient, the smallest solution that delivers pixel magnitude close to the DLP type	It is not up to automotive standards. The scanned projection imaging is likely to be superposed with the frequency caused by vehicle vibration, producing visible image jitters or flickers, which may make driver feel uncomfortable in severe cases	Bosch

Source: ResearchInChina

---As LED packaging technology matures and its cost falls, matrix ADB will still be the main implementation form of intelligent headlights which tend to sink from high-class car models to the lower-class.

OSRAM has introduced EVIYOS 1.0, the world's first  $\mu$ AFS delivering 1,024 pixels on 4mm x 4mm SoC. OSRAM EVIYOS 2.0 offering 25,600 pixels is under development and will be rolled out in 2023.

DLP technology based on digital mirror device (DMD) is monopolized by TI. According to our statistics, there are a total of six DMD-enabled models including New Mercedes-Benz S Class, Great Wall VV6/VV7, and IM Zhiji. The more frequent interactions of vehicles with the outside world come with the development of intelligent connected vehicles. Automotive DLP technology allows light projections on ground to form various light patterns and icons so as to build a bridge to communicate with the outside world, and its high resolution helps to enable ADAS functions, for example, traffic sign lighting for recognizing traffic signs. Hence DLP technology will find broad application in intelligent connected vehicles.

Automakers play as “lighting factory” to accelerate the layout of intelligent lighting.

## Intelligent Lighting Configurations of Some Mid-to-high-class Models

Automaker	Intelligent Lighting Configuration	Supported Model
<b>Audi</b>	Digital light processing (DLP)	2021 e-tron and e-tron Sportback
<b>BYD</b>	Through-type taillight	BYD e2, New Tang EV
<b>HiPhi</b>	PML intelligent headlights + ISD intelligent interactive lamps	HiPhi X
<b>Zhiji</b>	DLP headlight + ISD intelligent interactive lamps	Zhiji L7
<b>Great Wall WEY</b>	Intelligent ADB headlight, intelligent laser headlight, and intelligent pixel headlight	WEY VV6
<b>Mercedes-Benz</b>	DMD headlight	2018 Maybach, 2020 Mercedes-Benz S Class
<b>Buick</b>	Third-generation intelligent Matrix Pixel headlight	Envision S, LaCrosse GS
<b>FAW Hongqi</b>	Matrix LED + OLED taillight	New Hongqi H9
<b>Mazda</b>	Matrix Adaptive LED Headlight (ALH)	ATENZA
<b>Lexus</b>	BladeScan LED	Lexus RX
<b>Volvo</b>	Through-type taillight	Polestar 2
<b>Geely</b>	Through-type taillight	Geometry C

Source: ResearchInChina

To meet market demand, automakers also step up their efforts to deploy intelligent lighting. Audi has made long and frequent deployments in automotive lighting. In June 2020, Audi released New Q5, a new model carrying Audi's latest intelligent OLED lighting technology, which makes Audi the first automaker digitalizing taillights into a display. Audi is working to develop flexible digital OLED.

Among Chinese automakers, BYD has developed automotive lighting independently since 2003. FinDreams Vision Co., Ltd. BYD established in 2019 is devoted to developing vision technology, motor vehicle lighting and signal system. Having been the first automaker to integrate automotive lighting vertically, BYD is working toward development of new technologies in automotive lighting and environment interconnection.

In addition, Mazda has also developed its adaptive LED headlight (ALH) technology.

As the technology advances, automotive lighting is no longer a simple lighting tool but will integrate with driving assistance functions, for example, combined with cameras to enable safer driving through high and low beam switch according to the objects ahead. In future, more intelligent, more interactive and safer automotive lighting will be demanded in a new age.

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