



Arima Laser Solutions for the Automotive Market

Light is all around us. It shapes our lives, triggers memories, evokes emotions, and brings context to the experiences of a lifetime. As a foundation of laser technology, it also is the driving force of Arima Lasers. The company's laser devices are used for much more than visible or invisible light. Laser is the most powerful light we interact with. The optronic engineering team at Arima have their fingers on the pulse of laser technology and user habits to make sure their products enhance technological capabilities and are ready to be integrated into an ever-changing landscape.

The automotive industry is constantly acquiring the latest technologies from various fields. Currently, electric and autonomous vehicles are sparking demand for improved semiconductor lasers. Innovative laser applications are playing a decisive role.

With years of laser manufacturing experience, Arima Lasers Corp. (ALC) has the ability to understand its customers' requirements and provide advanced and easy-to-use laser components. They are continually refining their components to ensure that they not only meet customer requirements but exceed them.

Since 2019, ALC is successively certified by IATF16949, VDA6.3. Their laser diodes meet AECQ-102 qualification, offering automotive laser diodes and modules to high-end partner and tier 1, 2, and 3 suppliers.

Vehicles are equipped with:

- Laser Headlight
- Head-Up Display
- LiDAR
- Autopilot System
- Anti-Fatigue Detection System
- Air Quality Monitoring System
- Laser Indicator



Laser Headlight

The continuous improvement in the automotive industry can best be seen in headlight technologies. During the last decades they changed from Halogen to Xenon and LED. Now, laser doubtlessly is the latest way to improve brightness and energy conversion efficiency. Offering the below benefits, laser has opened up new horizons for the design and performance of headlights.



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Compared to LEDs, ...

- Laser diodes are much smaller.
- The efficiency of laser light is about 30% higher.
- Lasers require about half the operation power of LEDs.
- At approximately 600 m, laser light illuminates more than twice the distance of LEDs.
- Laser diodes draw less electricity from the battery of electric vehicles.

In 2020, Europe lead the global automotive laser headlight market with approximately 41% of the market value. The global automotive laser headlight market is expected to reach approximately US\$18.64 billion by 2027, featuring a compound annual growth rate of 26.8%. ALC cooperates with Europe partners to develop and package laser headlights.

Head-Up Display

HUD (Head-Up display) is an augmented reality (AR) display that provides a safe driving environment by showing information derived from vehicle sensor data. Laser HUDs offer the best performance because they can effectively call the displayed information to the driver's attention and show a seamless image with a wide color gamut and high brightness contrast.

ALC has its own brand of high-power single-mode red lasers for this kind of miniaturized projection devices. They are also experienced in developing three-color laser optical modules and can customize the design and manufacture of optical modules.



Anti-Fatigue Driving Detection System

Preventing drivers from drowsiness is a crucial matter of traffic safety. Fatigued driving is not easy to detect or stop; and is a frequent cause for accidents. An anti-fatigue driving detection system is a driver monitoring system based on 3D facial image recognition. It detects movements such as eye closing, yawning, or nodding. When drowsiness is detected, it will send a notification or an alarm to the driver before an accident occurs.

When combined with an infrared laser, drowsiness detectors can more sensitively determine the facial motion detection – especially during daytime, when the bright laser light counters the interference of the strong ambient light.

ALC offers single-mode infrared lasers and structured light modules which combine laser light with diffractive optical elements as a form of structure light. They add precision when the drowsiness detector calculates the 3D image it receives from the reflecting light from driver's face.



LiDAR

Integrated into vehicles, LiDAR (Light Detection and Ranging) is an active remote sensing system to determine the distance and nature of obstacles.

How do LiDAR sensors work?

- They measure the Time of Flight (ToF) of a laser beam by:
 - Emitting infrared laser pulses
 - Receiving the reflected laser light with a light sensor
- The measured data is used to calculate the distance of each object

Based on the above system, LiDAR can produce a 3D matrix of the environment around the vehicle.

ALC offers both 905nm laser diodes and high-power 940 nm lasers for automotive OEMs. A 1550 nm laser light source is currently being developed and preliminary results have been very promising. Instead of LiDAR, some manufacturers use camera systems, but they do not work as directly as laser. The acquisition of laser is fast and reliable. Moreover, at night or in low-brightness and poor climate environments, laser can achieve precise detection operations that camera lenses cannot achieve. LiDAR is still a promising market for lasers.



Air Quality Monitoring System

Nowadays, air pollution is defined as the presence of one or more contaminants in the atmosphere that can be injurious to human health, including certain amounts of so-called PM 2.5 particulates. High-efficiency cabin air filter systems with air quality detection are used to provide good automotive air circulation. One of the characteristics of laser light is its highly directional beam which makes it perfect for detecting particles in the air.

ALC provides dedicated red laser diodes and modules for air quality monitoring. The company also offers stable and reliable solutions to automotive customers.



Laser Indicator

Anti-collision brake warning lights increase visibility at the rear end of the vehicle. They warn following drivers not to get too close so that traffic accidents can be avoided. At night, they can provide a clearer position of the vehicle and indicate the turning direction. Laser light is brighter and clearer than lamps or LEDs, which is an advantage - not only at night, but in bad weather such as fog, rain, or snowfall.

ALC has its own brand of visible laser modules, which can be applied to this kind of subsidiary indicator light system.

Please contact LASER COMPONENTS to customize the design and manufacture of these optical modules.



Arima Lasers' Solutions in Automotive Market

Type	Application	Product
Detecting	Anti-collision brake warning light	635 nm; 100 mW
	PM 2.5 detection	650 nm; 7 mW
	Anti-fatigue detection system	940 nm
	Face recognition unlocking system	940 nm
HUD	Head-up display	635 nm / 650 nm

Arima Lasers Corp. has established a competitive, vertically integrated technology line including epitaxy, device fabrication, packaging, testing and module assembly. The executive team comprises experienced professionals in laser diode R&D, production, and marketing. Thanks to continuing innovations in products and services, the company keeps bringing added value to its customers at an outstanding cost/performance ratio. Recent novelties include DVD LDs, industrial single mode 635 nm LDs, high brightness 635 nm LDs, APC IC integrated LDs, the smallest collimated laser modules etc. Its motto „Innovative Laser Diode Solutions“ has made ALC unique in the laser diode industry.

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