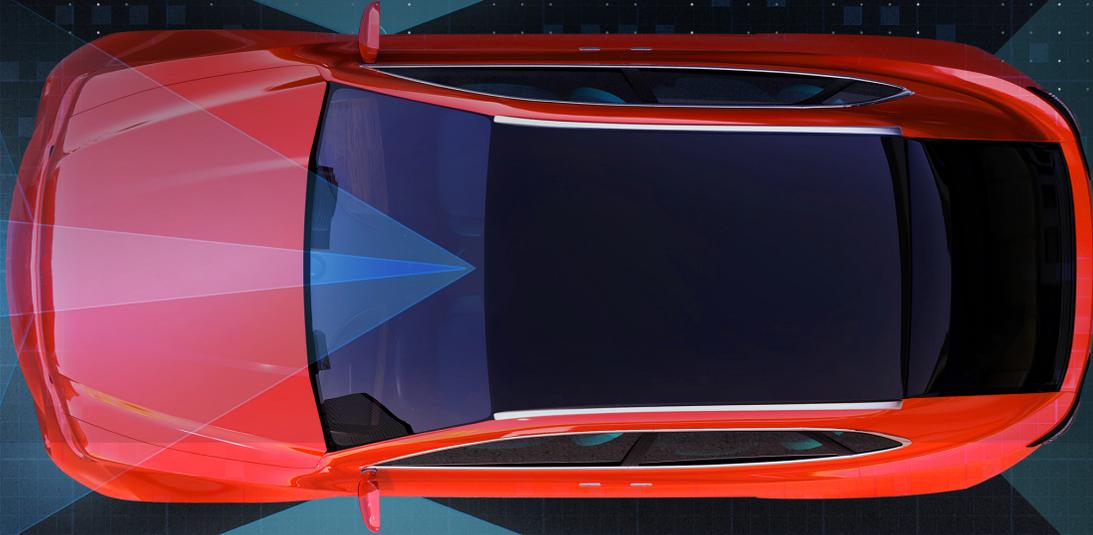
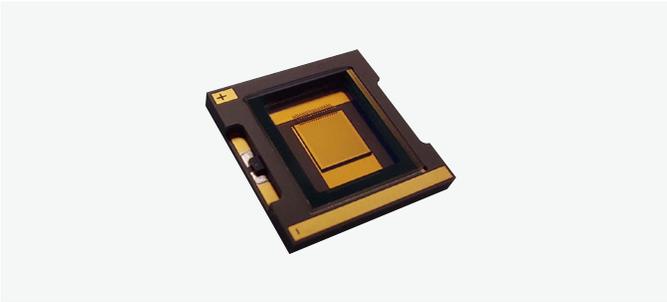


AUTOMOTIVE LIDAR ILLUMINATION SOURCES



Leonardo systems have proven reliability and robust operation in extremely harsh defense environments. The latest advancements in Advanced Driver Assist Systems (ADAS) and autonomous vehicle sensors require high-performance illumination sources that can be custom designed to fit particular sensor architectures and maintain performance over extreme automotive conditions.

VCSEL and edge emitter arrays can be supplied as a bare die, chip on sub-mounts, or fully packaged units. Leonardo also offers integration with optics, short pulse drivers, and thermally managed housings. Our team of experts works with customers to provide the best illumination solution for short, mid, and long-range lidar systems. Whether using a flash, scanning, or a hybrid approach to lidar, Leonardo can help provide a cost-effective source from concept and initial product demonstration through to high-volume production.



VCSEL ARRAYS

VCSEL arrays are offered from 800 nm to 980 nm with customizable emitter geometries. Arrays can be combined to provide the desired power and size. They can be individually addressed or sections within an array can be addressed individually. Operation modes are from nanosecond pulses to CW with intensities of $>10 \text{ kW/cm}^2$ in nanosecond pulses.

PACKAGING

Leonardo offers custom packaging options that can be AEC Q102 qualified.

TYPICAL VCSEL SPECIFICATIONS

| Parameters | Units | Typical Value |
|-----------------------------|---|----------------|
| Wavelength | nm | 800 to 980 |
| Operating Voltage | V | 2.8 |
| FWHM Beam Divergence | ° | <30 (circular) |
| Spectral Width | nm | <3 |
| Power Conversion Efficiency | % | 35 |
| Pulse Width | Typical Intensity (W/mm²) | |
| Short Pulse (1 ns - 100 ns) | 100 | |
| QCW (10 μs - 100 μs) | 10 | |
| CW | 1 – 2 | |

AUTOMOTIVE QUALITY SOLUTIONS

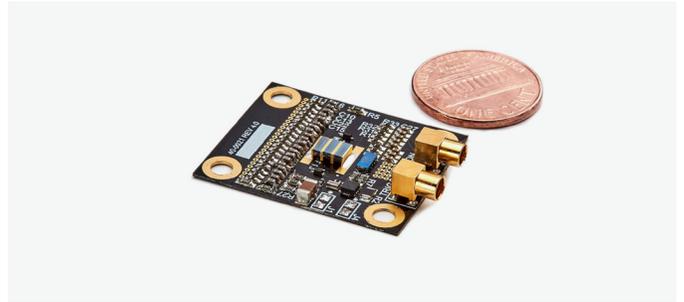
AEC-Q102

Leonardo offers stress-tested products for automotive applications.

Leonardo Electronics US Inc.
7775 N. Casa Grande Highway
Tucson, AZ - 85743 - USA
520 744 5700
sales@leonardo.us



leonardo.us



EDGE EMITTER ARRAYS

Edge emitter arrays are offered from 760 nm to 1.6 microns with high brightness and customizable geometries.

ACCESSORIES

Leonardo's VCSEL and edge emitting arrays can be fully integrated with drive electronics, power boards, and housings.

TYPICAL EDGE EMITTER SPECIFICATIONS

| Parameters | Units | Typical Value |
|--------------------------------|-------|--|
| Pulse Width | ns | <5 |
| Peak Output Power ¹ | kW | up to 1 |
| Wavelength | nm | 760 to 1600 |
| FWHM Beam Divergence | ° | 10 (slow axis) 0.2 (fast axis) ² |
| Spectral Width | nm | 6 |
| Power Conversion Efficiency | % | up to 60 |

¹Dependent on array geometry (power scales with array size)

²With fast axis collimator

IATF 16949 Certified

Leonardo uses automotive-approved, process oriented, quality systems.

Patent Numbers:
US 7,660,335 | US 7,864,825 | US 6,352,873 | US 6,295,307

Certifications:
AS 9100D Including ISO 9001:2015
IATF 16949:2016 Automotive
ISO 14001:2016 Environmental Management System

