



## Automotive lighting manufacturers rely on UL Solutions for testing services

Widespread implementation of LED lamps and vertical-cavity surface-emitting lasers (VCSELs) in automotive lighting design and the rapid development of innovative technology, such as advanced driver-assistance systems (ADAS), have increased the importance of testing for various in-vehicle products. Independent safety and reliability testing have become vital tools for manufacturers seeking to access new markets, build their reputation and create brand loyalty.

Our global lighting laboratories provide automotive lamp LED testing to continuously meet the different needs of the industry derived from more diverse applications, especially in high-end fields (such as automotive taillights,

fog lights, brake lights, daytime running lights and headlights). Leverage UL Solutions experts' safety science expertise and global service to keep pace with lamp, module and component supply chain demands and energy efficiency requirements.

Our laboratories can test to principles of the AEC Quality Assessment System (AECQ), which covers electronic components, assemblies, processes and related materials, with normative references that include these Automotive Electronics Council (AEC) schemes:

- AEC-Q100 for integrated circuits (IC).
- AEC-Q101 for discrete semiconductors.

- AEC-Q102 for discrete optoelectronics (LED/laser) stress test, feature test, environmental test.
- AEC-Q104 for multi-chip modules.
- AEC-Q200 for passive components.

We have capabilities for stress and pre-conditioning testing, feature testing and environmental testing. Testing methods adhere to JEDEC or MIL-STD standards.

## UL Solutions laboratories have testing capabilities:

Test description	Follows the standard(s) of:
Dew (DEW)	JEDEC JESD22-A100D
Temperature and humidity with bias (THB)	JEDEC JESD22-A101D
Wet high temperature operating life (WHTOL)	JEDEC JESD22 A101D
High humidity high temperature reverse bias (H3TRB)	JEDEC JESD22 A101D
Temperature cycling (TC)	JEDEC JESD22-A104E, IEC 60068-2-14 Nb
Power temperature cycling (PTC)	JEDEC JESD22-A105C
High temperature operation life (HTOL)	JEDEC JESD22-A108F
Low temperature operating life (LTOL)	JEDEC JESD22-A108F
High temperature reverse bias (HTRB)	JESD22-A108F
Pulsed operating life (PLT)	JEDEC JESD22-A108F
Thermal shock (TSK)	IEC 60068-2-14 Na
Hydrogen sulfide (H2S)	IEC 60068-2-43, JIS C 60068-2-43
Gas Corrosion Test	IEC 60068-2-60, JIS C 60068-2-60, JEITA ED-4912A
Flowing Mixed Gas (FMG)	IEC 60068-2-60 Test method 4, JIS C 60068-2-60 Test method 4
Sulphur Dioxide Test (SO2)	IEC 60068-2-42

### UL Solutions automotive lighting testing laboratories



Reliability testing services are critical to product performance and quality for LED/VCSEL packages, modules and lamps for the automotive lighting industry. Our laboratories can perform testing services for optoelectronic semiconductors, photodiodes, phototransistors, optocouplers, laser (VCSEL/OLED) light sources, modules and finished products. These include loop environment, mechanical, optoelectronic properties and electromagnetic compatibility testing.





## LED/ VCSEL Reliability testing

UL Solutions offers automotive lighting manufacturers reliability testing of LED/ VCSEL products for use, lifetime performance, endurance and electrical characteristics under various environmental conditions, in line with solid-state and semiconductor industry standards.

### Environmental and climate reliability

- Moisture sensitivity level test.
- High-temperature lighting test.
- High-temperature and high-humidity lighting test.
- Temperature cycling test.
- Power supply temperature cycling test.
- Low-temperature lighting test.
- Condensation test.
- Salt spray test.
- Industrial gas (SO<sub>2</sub>/H<sub>2</sub>S/NO<sub>2</sub>/Cl<sub>2</sub>) testing.
- Optical quality assessment.

### Mechanical reliability

- External assessment.
- Vibration/sinusoidal/random vibration testing.

- Mechanical shock test.
- Drop test.
- Ball/die shear test.
- Hermeticity test.
- Reflow test.
- Solderability test.

### Electrical operation reliability

- High-temperature forward/reverse bias test.
- High-temperature/low-temperature operating life test.
- High-temperature and high-humidity bias test.
- High-temperature and high-humidity reverse bias test.
- High-temperature and high-humidity operating life test.
- Electrical test before and after stress.
- Electrostatic discharge human body model/charged device model.

### LED/VCSEL module reliability

- UV testing.
- Luminous intensity and chromaticity maintenance.
- Mechanical shock test.
- Vibration test.

- Electromagnetic compatibility testing.
- Power supply temperature cycling test.
- Module weight test.
- Maximum power test.
- Overvoltage test.
- Reverse voltage test.
- Transient voltage test.
- Static testing.
- Pulse test.

### Headlight reliability

- Optical colorimetric testing.
- High-temperature test.
- Vibration test.
- Water resistance test.
- Humidity test.
- Dust resistance test.
- Corrosion resistance (salt spray) test.
- Abrasion test.
- Temperature cycling test.
- Internal heat test
- Electromagnetic compatibility testing.

# Why UL Solutions?

The rapid evolution of automotive lighting system designs to achieve better performance, greater energy efficiency and improved product safety while incorporating innovative technologies provides exciting opportunities for manufacturers, but it also presents a range of challenges.

UL Solutions is familiar with JEDEC standards and automotive component standards, such as AECQ-102 and other relevant industry requirements.

Our global network of laboratories and testing facilities empowers us to offer services for the automotive industry that combine our global reach with local and regional support.

We understand the distinct needs for automotive lighting in different regions and the markets they want to penetrate. We provide a variety of services to meet your lighting needs, including:

- Safety testing.
- Energy efficiency.
- Performance and reliability testing.
- Global market access.
- Connected lighting services.

**Learn more about safety testing and certification and performance and reliability testing for transportation products [online](#), or connect with our engineering experts in your region.**

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