Light is pathbreaking
Opto components for automotive applications

Light is OSRAM

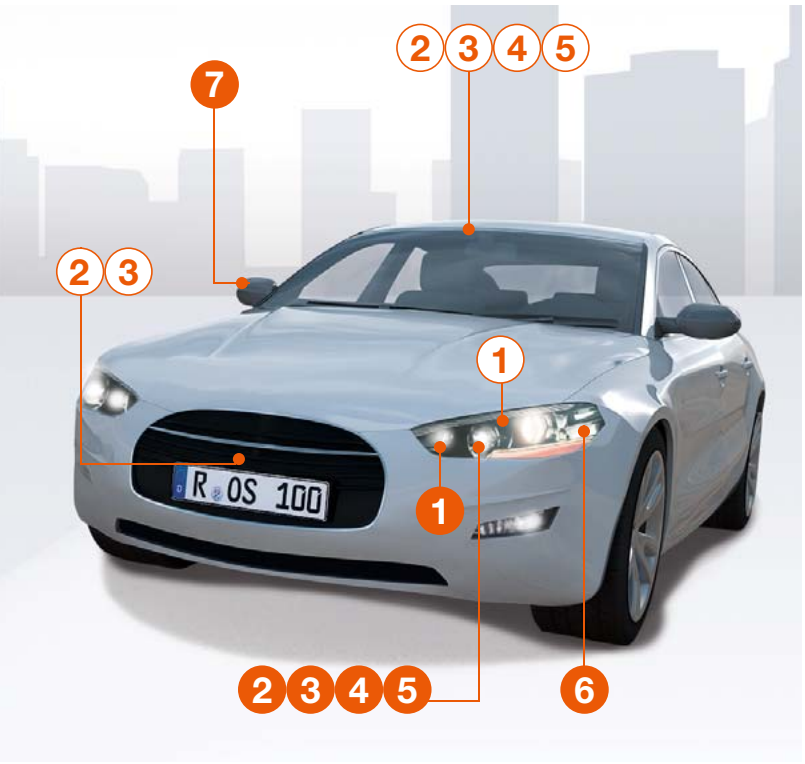
OSRAM
Opto Semiconductors

Paving the way for far-ranging new interior and exterior automotive applications, OSRAM Opto Semiconductors' LED, laser and infrared products are the perfect companions for our customers.

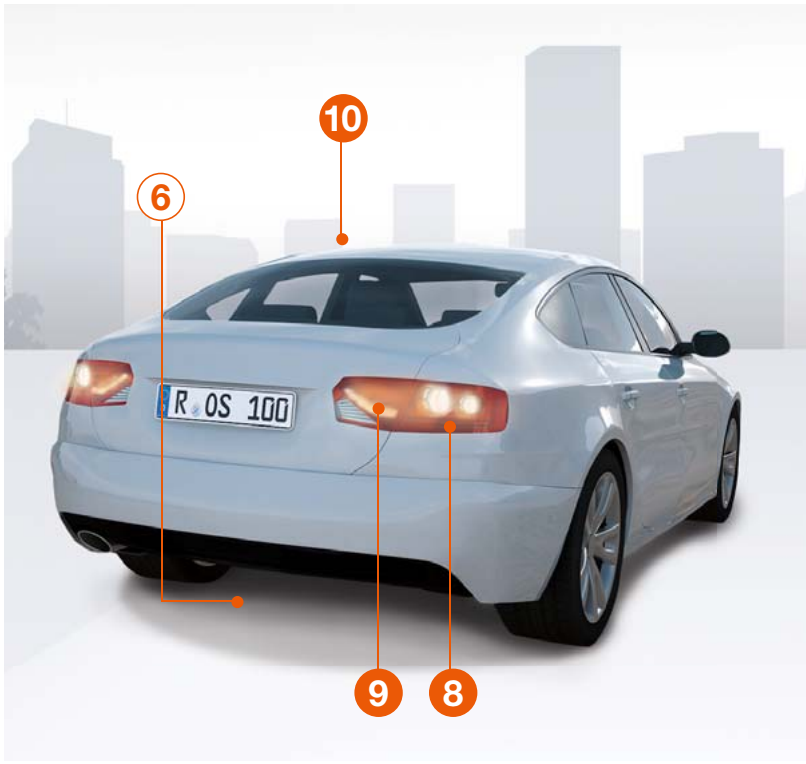
Content

Looking out for new opportunities

As the market and innovation leader in the field of automotive LED illumination OSRAM Opto Semiconductors is constantly showing the way with new products and solutions.



OSRAM Opto Semiconductors delivers a broad portfolio of state-of-the-art LEDs, laser diodes and infrared components in every performance class. Ready to use or customized for special needs and requirements. Thus we are a one-stop-shop for our customers, enabling them to realize virtually every vision and design wish – for exterior or interior applications. For automobile exteriors, we can offer perfect solutions for the most diversified and innovative applications.



Visible light:

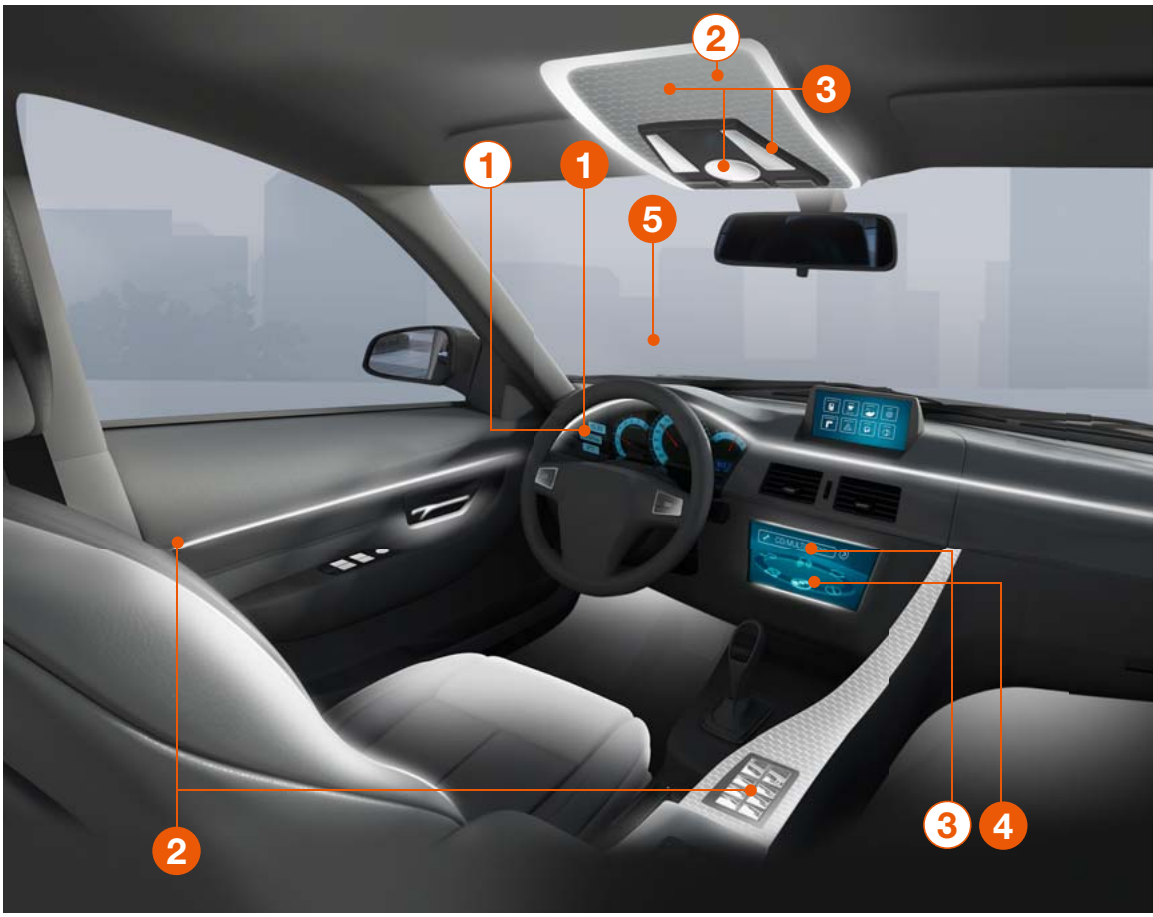
1. Fog light
2. Position light
3. Daytime running light
4. High-beam headlight
5. Low-beam headlight
6. Front turn indicator
7. Side turn indicator
8. Rear turn indicator
9. Rear combination light
10. Center high mounted stop light

Infrared light & sensors:

1. Night vision
2. Adaptive cruise control
3. Precrash sensing
4. Pedestrian protection
5. Prefield recognition
6. Gesture recognition

New visions inside

Thanks to OSRAM Opto Semiconductors' extremely reliable products and the energy efficiency inherent in LED technology, the once unimaginable has become today's reality – opening up new interior automotive applications.



Visible light:

1. Dashboard lights
2. Ambient lighting
3. Dome and map lighting
4. Center stack
5. Head-up display

IR Infrared light & sensors:

1. Drowsy driver detection
2. Occupancy detection
3. Gesture recognition

Covering all performance classes, package sizes and colors (even colors on demand), OSRAM Opto Semiconductors offers a highly diversified portfolio of LED, laser and IRED components for almost every conceivable interior automotive application.

Whether for control lights, ambient lighting, dome and map lighting, or operating devices, head-up displays, active safety systems and gesture recognition, you will certainly find the perfect product from OSRAM Opto Semiconductors. Providing solutions for all these applications, we are also open for discussions to find out your specific demands and develop customized products.

Light in motion: adaptive front-lighting systems

Increasing visibility and reducing glare, adaptive front-lighting systems (AFS) like Adaptive Driving Beam (ADB) enhance safety and comfort for both drivers and traffic participants. A shining example is automatic adaptive control of light distribution depending on the situation, allowing for glare-free always-on high beam. OSRAM Opto Semiconductors' LED technology has the potential to lift AFS matrix beam applications to the next level, with new styling options, improved functionality and scalability.

Lighting functions that can be realized with LED matrix beam technology

- Pedestrian area light
- Town light
- Country road light
- Motorway light
- Dynamic bending light
- Cornering light
- Intersection light
- Adaptive Driving Beam

Adaptive Driving Beam (ADB) is one of the most advanced AFS developments. Drivers virtually drive with an always-on high beam light distribution while other drivers on the road only experience low-beam glare. With camera integration, ADB detects other vehicles or obstacles and either dynamically shadows out these vehicles in order to prevent glare or illuminates these obstacles to ensure safety.

LED Matrix Beam is a smart AFS/ADB solution. Completely solid state digital parts are needed to adjust or control the movement of the headlight. The control of the LEDs is done in combination with a camera system. A light matrix is created by individually switching on and off the LEDs using a multichip device such as the OSRAM OSTAR® Headlamp or single chip LEDs such as OSLON® Compact.

OSLON® Compact

	LUW CEUN.CE	LUW CEUP.CE
Dimensions (x, y, z)	1.6 × 1.2 × 0.75	1.9 × 1.5 × 0.75
Viewing angle	120°	120°
Luminous flux (typ.)	100 lm @350 mA	220 lm @700 mA
Thermal resistance (typ electrical)	9.4 K/W	4.1 K/W
Max junction temperature (T_j)	up to 150 °C	up to 150 °C
Relative luminous flux at T_j = 100 °C	90 %	90 %
Max forward current I_F	700 mA	1.5 A

OSRAM OSTAR® Headlamp

	5 Chip LE UW U1A5 05
Dimensions (x, y, z)	20.0 × 20.0 × 2.4
Luminous flux (typ.)	800 lm @500 mA
Thermal resistance (typ electrical)	2.3 K/W
Max junction temperature (T_j)	up to 150 °C
Relative luminous flux at T_j = 100 °C	90 %
Max forward current I_F	1.2 A

Enhancing vision: Fog, high and low-beam headlights

LEDs offer totally new design capabilities and new innovative functionalities such as fog light, highway light or turning light, without any mechanical components. With their small size and high efficiency, LEDs also mean a reduction in weight. Their extremely long lifetime makes lamp replacements virtually unnecessary. With color temperatures similar to daylight, LED light makes driving safer as drivers suffer less from fatigue and can concentrate better.

OSLON® Compact

	LUW CEUN.CE	LUW CEUP.CE
Dimensions (x, y, z)	1.6 × 1.2 × 0.75	1.9 × 1.5 × 0.75
Viewing angle	120°	120°
Luminous flux (typ.)	100 lm @350 mA	220 lm @700 mA
Thermal resistance (typ electrical)	9.4 K/W	4.1 K/W
Max junction temperature (T_j)	up to 150 °C	up to 150 °C
Relative luminous flux at T_j = 100 °C	90 %	90 %
Max forward current I_F	700 mA	1.5 A

OSLON® Black Flat

	LUW HWQP
Dimensions (x, y, z)	3.8 × 3.8 × 0.5
Viewing angle	120°
Luminous flux (typ.)	300 lm @1 A
Thermal resistance (typ electrical)	3.0 K/W
Max junction temperature (T_j)	up to 150 °C
Relative luminous flux at T_j = 100 °C	90 %
Max forward current I_F	1.5 A

OSRAM OSTAR® Headlamp Pro, OSLON® Black Flat and OSLON® Compact

- High luminous flux at high temperatures
- Long lifetime
- High efficiency
- “Best in class” for thermal resistance
- OSRAM OSTAR® Headlamp Pro, precisely configurable according to application requirements – thanks to scalable chip arrangement

OSRAM OSTAR® Headlamp Pro

	2 Chip LE UW U1A2 01	3 Chip LE UW U1A3 01	4 Chip LE UW U1A4 01	5 Chip LE UW U1A5 01
Dimensions (x, y, z)	20.0 × 20.0 × 2.4	20.0 × 20.0 × 2.4	20.0 × 20.0 × 2.4	20.0 × 20.0 × 2.4
Luminous flux (typ.)	600 lm @1 A	900 lm @1 A	1200 lm @1 A	1500 lm @1 A
Thermal resistance (typ. real)	2.6 K/W	2.0 K/W	1.8 K/W	1.5 K/W
Max junction temperature (T_j)	up to 150 °C	up to 150 °C	up to 150 °C	up to 150 °C
Relative luminous flux at T_j = 100 °C	90 %	90 %	90 %	90 %
Max forward current I_F	1.5 A	1.5 A	1.5 A	1.5 A

OSLON® Black Flat

	KW H2L531.TE	KW H3L531.TE	KW H4L531.TE	KW H5L531.TE
Dimensions (x, y, z)	3.1 × 3.8 × 0.4	4.2 × 3.8 × 0.4	5.3 × 3.8 × 0.4	6.4 × 3.8 × 0.4
Viewing angle	120°	120°	120°	120°
Luminous flux (typ.)	600 lm @1 A	900 lm @1 A	1200 lm @1 A	1500 lm @1 A
Thermal resistance (typ electrical)	1.1 K/W	0.9 K/W	0.7 K/W	0.6 K/W
Max junction temperature (T_j)	up to 150 °C	up to 150 °C	up to 150 °C	up to 150 °C
Relative luminous flux at T_j = 100 °C	90 %	90 %	90 %	90 %
Max forward current I_F	1.5 A	1.2 A	1.2 A	1.2 A

See and be seen: position and Daytime Running Light

Driven by high efficiency and long lifetime, LEDs are going to be used more and more for position light and Daytime Running Light (DRL) applications. Compared to conventional warm white incandescent lamp solutions, cold white LED color temperatures can be perceived far better by other road users. LEDs also leave behind other light sources in terms of aesthetics, allowing far more freedom of design thanks to smaller dimensions and higher adaptability. DRL is now obligatory for new cars in many countries, but is also often used voluntarily to create distinctive design features.

OSLON® Black Flat and OSLON® LX 120

- Compact package
- High luminous flux at high temperatures
- Long lifetime
- ESD protection
- High efficiency
- Different radiation characteristics
- Compatibility within the OSLON® family – thanks to same soldering pad
- OSLON® family with or without insulated heat conduction pad
- Robust package design

OSLON® LX 120

	LUW CVBP.CE
Dimensions (x, y, z)	3.0 × 3.0 × 2.23
Viewing angle	120°
Luminous flux (typ.)	133 lm @350 mA
Thermal resistance (typ electrical)	9.1 K/W
Max junction temperature (T_j)	up to 150 °C
Relative luminous flux at T_j = 100 °C	88 %
Max forward current I_F	1 A

OSLON® Black Flat

	LUW HWQP
Dimensions (x, y, z)	3.8 × 3.8 × 0.5
Viewing angle	120°
Luminous flux (typ.)	300 lm @1A
Thermal resistance (typ electrical)	3.0 K/W
Max junction temperature (T_j)	up to 150 °C
Relative luminous flux at T_j = 100 °C	90 %
Max forward current I_F	1.5 A

Advanced Power TOPLED®

- Compact package
- Wide brightness range
- High luminous efficiency

Advanced Power TOPLED®

	LW G6CP
Dimensions (x, y, z)	3.3 × 3.4 × 1.9
Viewing angle	120°
Luminous intensity	10 cd @140 mA
Thermal resistance (typ electrical)	35 K/W
Max junction temperature (T_j)	up to 150 °C
Max forward current I_F	250 mA
Forward Voltage	3.30 V @140 mA

OSLON® Compact

- Ceramic package
- 120° Lambertian Emitter
- Improved corrosion robustness
- C2 Technology (Ceramic Conversion)

OSLON® Compact

	LUW CEUN.CE	LUW CEUP.CE
Dimensions (x, y, z)	1.6 × 1.2 × 0.75	1.9 × 1.5 × 0.75
Viewing angle	120°	120°
Luminous flux (typ.)	100 lm @350 mA	220 lm @700 mA
Thermal resistance (typ electrical)	9.4 K/W	4.1 K/W
Max junction temperature (T_j)	up to 150 °C	up to 150 °C
Relative luminous flux at T_j = 100 °C	90 %	90 %
Max forward current I_F	700 mA	1.5 A

Power SIDELED®




	LA B6SP	LR B6SP	LS B6SP	LY B6SP
Dimensions (x, y, z)	3.8 × 4.8 × 4.6	3.8 × 4.8 × 4.6	3.8 × 4.8 × 4.6	3.8 × 4.8 × 4.6
Viewing angle	120°	120°	120°	120°
Luminous intensity	6.4 cd @140 mA	5.1 cd @140 mA	4.0 cd @140 mA	5.1 cd @140 mA
Thermal resistance (typ electrical)	35 K/W	35 K/W	35 K/W	35 K/W
Max junction temperature (T_j)	up to 125 °C	up to 125 °C	up to 125 °C	up to 125 °C
Relative luminous flux at T_j = 100 °C	43 %	46 %	53 %	28 %
Max forward current I_F	200 mA	200 mA	200 mA	200 mA

MULTILED®

	LYYY G6SF
Dimensions (x, y, z)	3.3 × 3.0 × 1.8
Viewing angle	120°
Luminous intensity	6.4 cd @50 mA
Thermal resistance (max. real)	180 K/W
Max junction temperature (T_j)	up to 125 °C
Max forward current I_F	70 mA
Forward Voltage	3 × 2,15 V (= 6,45 V)

Changing direction: front, side indicators

LEDs provide the basis for highly cost effective solutions, and are especially suitable for light conductor applications and applications at high ambient temperatures (> 60 °C at continuous operation). Only yellow LEDs are used for front- and side and turn indicators, and the range of products here is especially large. Also included in the signaling sector are sidemarker lights which have to be on at all times during a journey, unlike conventional indicators. This application can mostly be found on commercial vehicles, but is also obligatory for passenger cars in some countries.

MULTILED® LYYY G6SF

- Especially suitable for mirror turn indicators
- 3 dies in one package applications
- Serial and parallel use in simple circuits possible
- Low power loss at 12 V circuits possible

OSLON® Compact

	LCY CEUP
Dimensions (x, y, z) in mm	1.9 × 1.5 × 0.75
Viewing angle	120°
Luminous flux (typ.)	150 lm @700 mA
Thermal resistance (typ electrical)	4.3 K/W
Max junction temperature (T_j)	up to 150 °C
Relative luminous flux at T_j = 100 °C	87 %
Max forward current I_F	1 A

OSLON® Black Flat

	LCY H9PP
Dimensions (x, y, z) in mm	3.75 × 3.75 × 0.7
Viewing angle	120°
Luminous flux (typ.)	67 lm @350 mA
Thermal resistance (typ electrical)	4.7 K/W
Max junction temperature (T_j)	up to 150 °C
Relative luminous flux at T_j = 100 °C	89 %
Max forward current I_F	700 mA

Focusing function: center high mounted stop light and back-up light

LEDs are the perfect choice for simple and cost effective innovative rear light solutions, such as rear combination light (RCL) and center high mounted stop light (CHMSL). For this area of application a large number of different products are available. The main focus being on the colors white, amber, red and super red. With LEDs from OSRAM Opto Semiconductors, customers benefit from unlimited freedom of design within the relevant norms and standards, allowing them to realize any kind of pixel, point, area and light conductor designs – and combining up to four different light functions in one light source.

OSLON® Black

	LUW H9GP.CE
Dimensions (x, y, z)	3.85 × 3.85 × 2.29
Viewing angle	90°
Luminous flux (typ.)	121 lm @350mA
Thermal resistance (typ electrical)	6.5 K/W
Max junction temperature (T_j)	up to 150 °C
Relative luminous flux at T_j = 100 °C	88 %
Max forward current I_F	1 A

Dual binning: one LED, multiple light functions

Using dual binning technology, different light functions can be implemented easily with one and the same LED for rear combination lights with appropriate ECE taillamp design:

Rear and stop light: two different currents are adjusted via series resistors – 4 mA for the rear light, 50 mA for the brake light function (e. g. with Power TOPLED® LA E67F)

Stop and fog light: e. g. with Advanced Power TOPLED® LA G6SP

OSLON® Black Flat

	LA H9PP
Dimensions (x, y, z)	3.9 × 3.8 × 0.7
Viewing angle	120°
Luminous flux (typ.)	66lm @350mA
Thermal resistance (max. real)	11 K/W
Max junction temperature (T_j)	up to 150 °C
Max forward current I_F	1.0 A
Forward Voltage	2.2 V @350 mA

Power SIDELED®

	LA B6SP	LR B6SP	LS B6SP
Dimensions (x, y, z)	3.8 × 4.8 × 4.6	3.8 × 4.8 × 4.6	3.8 × 4.8 × 4.6
Viewing angle	120°	120°	120°
Luminous intensity	6.4 cd @140 mA	5.1 cd @140 mA	4.0 cd @140 mA
Thermal resistance (typ electrical)	35 K/W	35 K/W	35 K/W
Max junction temperature (T_j)	up to 125 °C	up to 125 °C	up to 125 °C
Relative luminous flux at T_j = 100 °C	43 %	46 %	53 %
Max forward current I_F	200 mA	200 mA	200 mA

Controlling performance: cluster and instrument

The clustered illumination of multiple dashboard instruments and control displays, such as the speedometer, tachometer, fuel indicator, turn indicator lights, lights on/off and many more, is the classical and central interior automotive application – and has been for decades. LEDs used here have to cover the complete brightness range, as well as different colors and package sizes. OSRAM Opto Semiconductors offers the right LEDs in all relevant performance classes and colors, and even colors on demand.


TOPLED®


Power TOPLED®


PointLED®


MULTILED®


Mini TOPLED®

TOPLED®, Power TOPLED®, PointLED®, MULTILED® and Mini TOPLED®

- Broad portfolio
- Different chip technologies for different brightness needs
- Different package size for individual customer requirements
- Suitable for all SMT assembly methods
- Wide range of colors available (see color selection guide, page 32/33)

Engineering individuality: ambient lighting

Interior lighting that can be adjusted individually according to mood and time of day is one of the forthcoming automotive LED application trends. The most common ambient lighting functions are footwell lights, headliner lights, spotlights and side door lights, all of which can be easily achieved with light guides.

TOPLED®, MULTILED®, SIDELED®, Mini TOPLED® and PointLED®

- Broad portfolio
- Trendsetter
- Fits perfectly into light guide solutions
- Freedom of design
- Different size packages – no limits of design
- Wide range of colors available (see color selection guide, page 32/33)

TOPLED®

MULTILED®

SIDELED®

Mini TOPLED®

PointLED®

Increasing comfort: dome and map lighting

For classic dome and map lighting applications such as trunk, glove box, door sill, make-up mirror and reading lights, conventional lamps vanish more and more. At present, vehicles feature a combination of conventional lamps and LEDs, but the trend is clearly towards LED lighting throughout. The main light color here is white, in different tones, anything from warm white to cold white. To achieve a living-room-like atmosphere and a high level of comfort for the driver, efforts are being made to harmonize the functional with the ambient lighting.

OSLON® Black, Advanced Power TOPLED®, Mini TOPLED® and SYNIOS® E4014

- No design limits
- Different beam angles
- High color rendering index (CRI)
- All power classes (0.1–1 Watt)
- Different white color temperatures from 3,000 K to 6,500 K (see color selection guide, page 32/33)

OSLON® Black

Advanced Power TOPLED®

Mini TOPLED®

SYNIOS® E4014

Improving usability: radio, climate control, switches and buttons

The lighting of controls is another central application for LEDs, especially for the center stack elements such as the radio and HVAC system (Heating, Ventilation and Air Conditioning), and in particular the switches and buttons. For perfect usability different colors and packages are of great importance. Low brightness levels are needed for backlighting switches and buttons to avoid dazzling the driver. For applications where higher brightness is necessary our brighter LEDs can be used with light guides.


TOPLED®


Mini TOPLED®


PointLED®


SIDELED®


SYNIOS® E4014

TOPLED®, Mini TOPLED®, PointLED® and SIDELED®

- Same packages available with different binning currents
- Despite new more powerful chip technologies, applications in need of low brightness levels can be covered to provide a uniform appearance – with light guides optimized for the LEDs' characteristics
- Wide range of colors available (see color selection guide, page 32/33)

SYNIOS® E4014

- SMT package, colored silicone resin
- Available colors for display applications: Multiphosphor white (sRGB), Cx/Cy = 0.26/0.22, general BLU binning
- Typical brightness 35 lm @120 mA @Cx/Cy 0.265/0.25
- Optical efficiency of 85 lm/W
- Especially for LCD backlighting

Looking at safety: head-up display

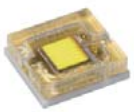
A head-up display presents data without requiring the driver to look away from the road. Head-up displays are becoming increasingly available in high and midline cars, and usually offer speedometer, tachometer, distance control and navigation system information. These systems can improve road safety enormously. OSRAM Opto Semiconductors offers highly efficient projection LEDs and laser diodes for this forthcoming application.

OSRAM OSTAR® Compact and Projection Compact

- Package: SMD package
- Chip technology: ThinFilm and ThinGaN®
- Small form factor
- High luminance thanks to “chip on air”

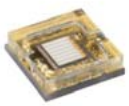
The thermal resistance (R_{th}) or absolute thermal resistance is defined as the rate of temperature increase for the supplied power and in the end, is a measure of the capability to dissipate heat. The temperature increase is caused by the portion of the power dissipation not transformed into light: $R_{th,el} = \Delta T/P_{el}$
The real thermal resistance considers the actual flow of heat that is dissipated through the housing. The optical power of the LED needs to be taken into consideration for accurate evaluation with: $R_{th,real} = \Delta T/(P_{el}-P_{opt})$; $P_{opt}=(1-\eta_{LED})$

OSRAM OSTAR® Compact



	LE UW Q9WP
Top emitting area in mm	1.5 × 1.2
LED package size in mm	3.9 × 3.7 × 1.2
Thermal resistance $R_{th\ JS\ (real)}$	6.7 K/W
Typ. dominant wavelenght @25 °C	0.31/0.32 @1.4 A
Typ. forward voltage per chip @25 °C	3.4 V @1.4 A
Typ. brightness @25 °C	320 lm @1.4 A

OSRAM OSTAR® Projection Compact



	LE x Q8WP
Top emitting area in mm	1.5 × 1.2
LED package size in mm	3.9 × 3.7 × 1.2
Thermal resistance $R_{th\ JS\ (real)}$	3 K/W
Typ. dominant wavelenght @25 °C	A: 617 nm T: 536 nm CG: 0.32/0.64 B: 459 nm @1.4 A
Typ. forward voltage per chip @25 °C	A: 2.3 V T: 3.6 V CG: 3.45 V B: 3.45 V @1.4 A
Typ. brightness @25 °C	A: 160 lm T: 250 lm CG: 540 lm B: 1.60 W @1.4 A

Single-mode laser PL 450B and PL 520

- Single transverse mode laser
- Perfect beam quality
- Miniaturized TO38 ICut package
- High modulation capability

Single-mode laser

	PL 450B	PL 520
Output power	80 mW	50 mW
Emission wavelength typ.	450 nm	520 nm
Threshold current typ.	30 mA	45 mA
Operating current typ.	100 mA	150 mA
Wall plug efficiency	14 %	5–6 %
Package type	TO38 icut	TO38 icut

Waving goodbye to buttons and switches: gesture recognition

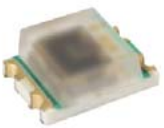
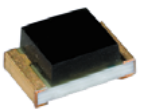
A detector IC is used together with up to 3 separate IREDs to form a sensor which can detect 3D movements of objects in front of the device. With this information the content of a display can be controlled without pressing a button, just by hand waving.

Gesture recognition:
This sensor acts as an intelligent switch and can replace mechanical switches, sliders, rotary knobs, etc. Detection ranges up to 20 cm are achievable, and the range can easily be extended by using an external driver circuit together with high power emitters.

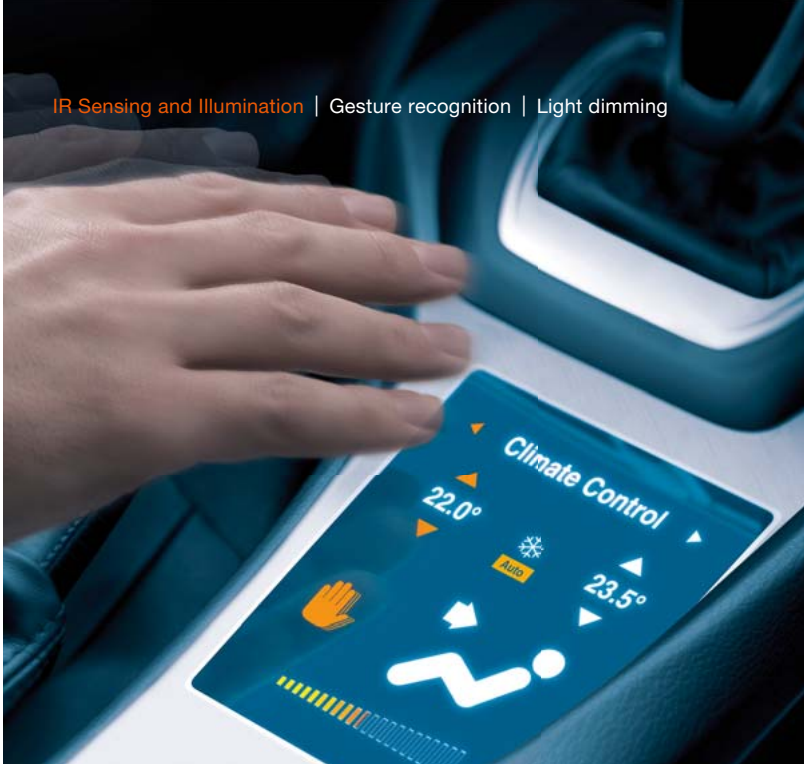
Light dimming:
Special photo detectors adapted to the spectral sensitivity of the human eye (V_λ-curve) provide a photo current which is directly proportional to the illuminance (lux). This enables dimming according to the brightness sensation of the human eye.

Light dimming



	SFH 3410	SFH 2430	SFH 5711	SFH 3711
Device type	Photo transistor	Photodiode	Opto hybrid	Photo transistor
LED package size in mm	1.9 × 4.2 × 1.0	3.8 × 4.4 × 1.1	2.8 × 2.2 × 1.1	2.0 × 2.0 × 0.7
Signal in µm@1000 lx	500	5.8	30 logarithmic	500
Sensitivity range in klux	1–100	5–100	3–80	1–100



Gesture recognition

	SFH 7770 E6
Device type	Proximity + ALS Sensor
LED package size in mm	2.8 × 2.8 × 0.9
Detection range	up to 200 mm
Ambient light sensitivity	0.03 lx – 65000 lx

Gesture recognition




	SFH 4650	SFH 4258	SFH 4258S	SFH 4259
Package type	MIDLED® Toplooker	Power TOPLED® with lens	Power TOPLED® with lens	Power TOPLED® with lens
LED package size in mm	3.1 × 2.25 × 1.6	3.5 × 2.8 × 3.5	3.5 × 2.8 × 3.5	3.5 × 2.8 × 3.5
Wavelength	850 nm	850 nm	850 nm	850 nm
Typ. radiant intensity, Ie	65 mW/sr @100 mA	110 mW/sr @100 mA	100 mW/sr @70 mA	55 mW/sr @100 mA
Total radiant flux, Φe	60 mW @100 mA	70 mW @100 mA	80 mW @70 mA	70 mW @100 mA
Viewing angle	+/–15°	+/–15°	+/–15°	+/–2 5°

Gesture recognition


	SFH 4259S	SFH 4715
Package type	Power TOPLED® with lens	IR OSLON® Black Series
LED package size in mm	3.5 × 2.8 × 3.5	3.75 × 3.75 × 2.3
Wavelength	850 nm	850 nm
Typ. radiant intensity, Ie	60 mW/sr @70 mA	250 mW/sr @1000 mA
Total radiant flux, Φe	80 mW @70 mA	590 mW @1000 mA
Viewing angle	+/–25°	+/–45°

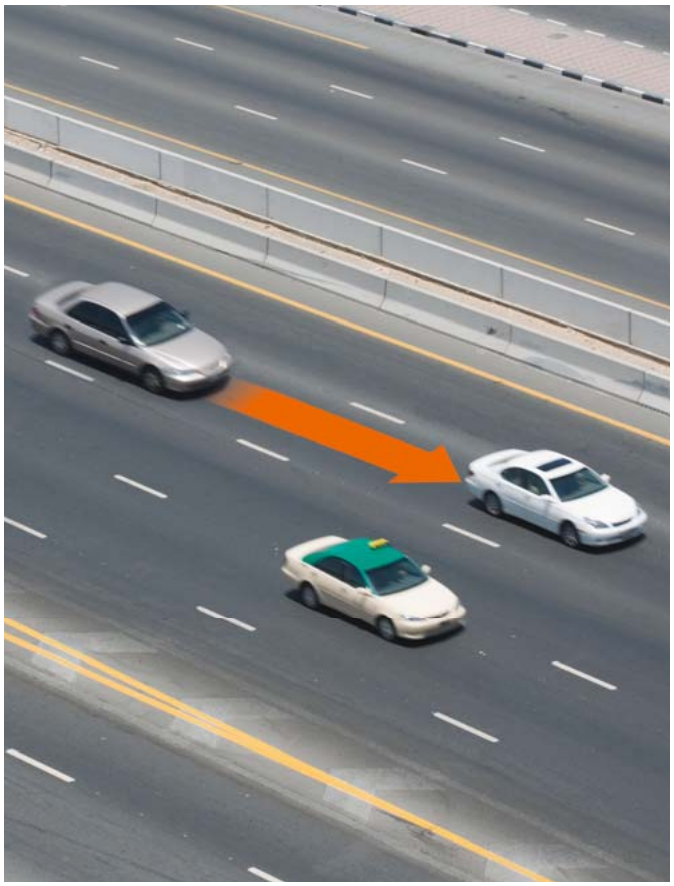

amazon
ATTENTION !

Improving safety

An Adaptive Cruise Control (ACC) system measures the distance and the relative speed of the car in front of. The distance from this car is adjusted automatically. The measurement is based on the propagation time of a very short light pulse generated by an IR pulse laser. The reflected light pulse is detected and the distance and speed are calculated.

For Pre-Crash Sensing the area in front of the car up to 20 m ahead is illuminated by an IR power light source, and a 3D camera records a 3-dimensional image and recognizes obstacles. If a collision is imminent, the driver gets a warning. If there is no appropriate reaction, an emergency brake will be automatically activated.

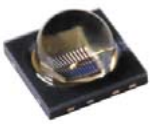
Pedestrian Protection is the same as Pre-Crash Sensing, but here pedestrians are detected and the driver is alerted if a pedestrian crosses in front of the vehicle. Emergency braking is again activated if the driver fails to respond.



Hybrid Pulsed Laser Diodes

	SPL LL90 3
Type	Pulse laser
Package size in mm	4.9 × 2.4 × 12.2
Wavelength (nm; typ.)	905
Opt. peak power	70 W
Beam divergence	30° × 15°

IR OSLON® Black Series



	SFH 4715S
LED package size in mm	3.75 × 3.75 × 2.3
Wavelength	850 nm
Typ. radiant intensity, Ie	500 mW/sr @1000 mA
Total radiant flux, Φe	1070 mW @1000 mA
Viewing angle	+/–45°

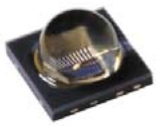
IR Platinum DRAGON®

	SFH 4235
LED package size in mm	11.0 × 6.0 × 1.8
Wavelength	850 nm
Typ. radiant intensity, Ie	320 mW/sr @1000 mA
Total radiant flux, Φe	950 mW @1000 mA
Viewing angle	+/– 60°

Providing protection: drowsy driver and occupancy detection

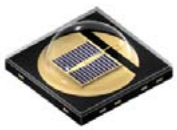
For occupancy detection the front passenger seat is monitored by invisible IR light and a CMOS camera. The person sitting there is detected and their size and position are measured so that in case of an accident the airbag is suitably deployed. In some cases (for example if the passenger's face is close to the airbag compartment) the airbag may not be deployed in order to prevent severe injury to the passenger.

IR OSLON® Black Series

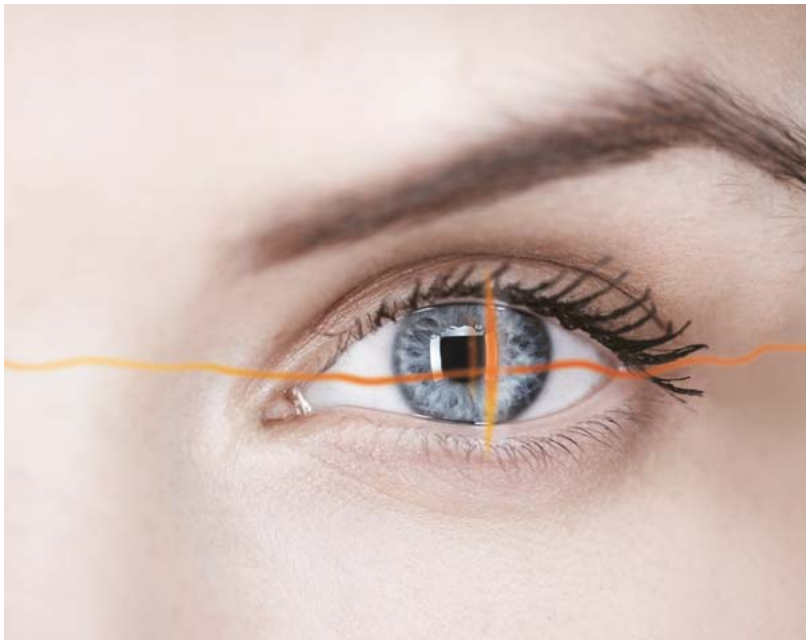


	SFH 4725S
LED package size in mm	3.75 × 3.75 × 2.3
Wavelength	940 nm
Typ. radiant intensity, Ie	450 mW/sr @1000 mA
Total radiant flux, Φe	980 mW @1000 mA
Viewing angle	+/– 45°

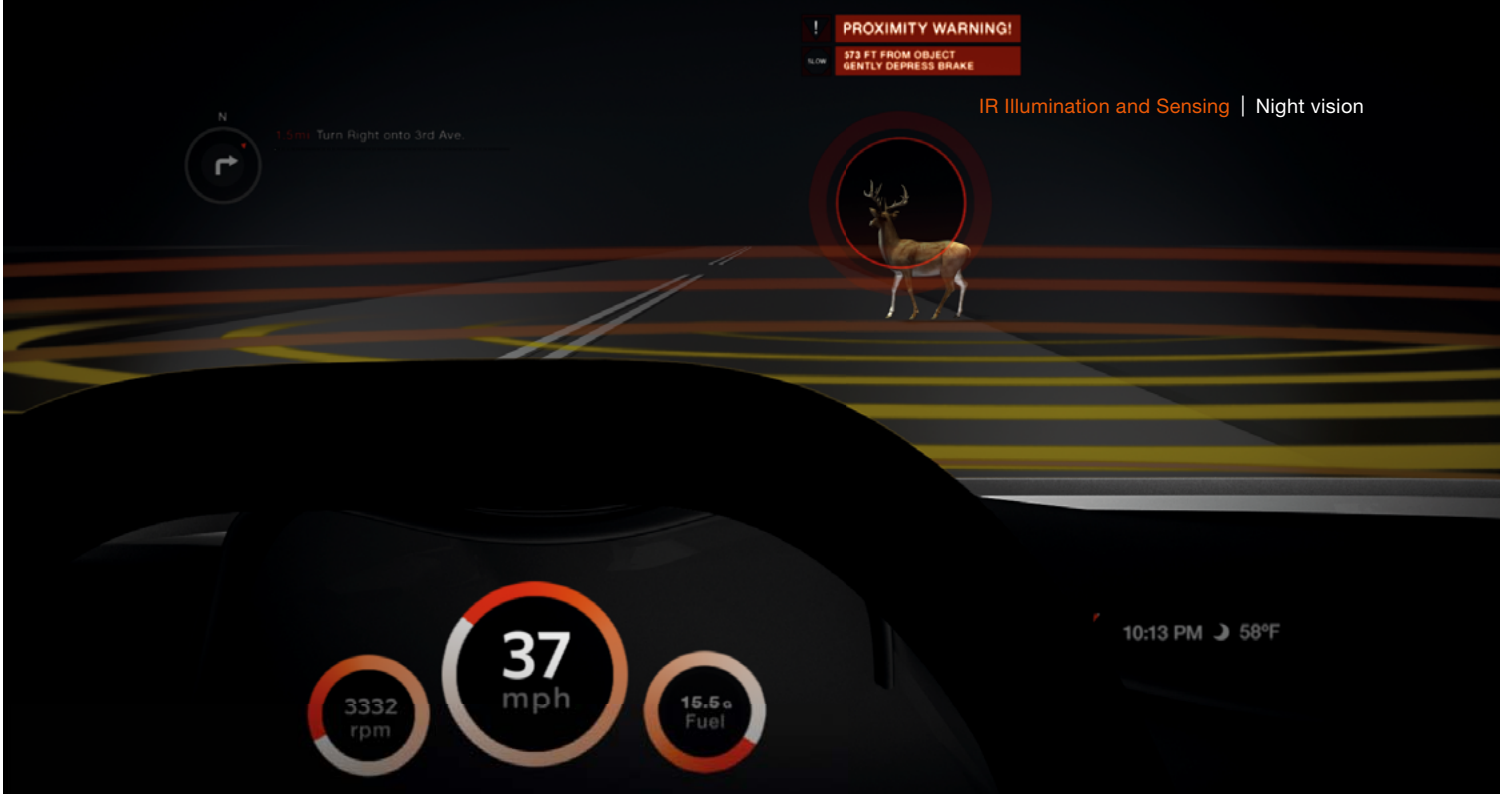
IR OSLON® Black Series



	SFH 4726S
LED package size in mm	3.75 × 3.75 × 1.51
Wavelength	940 nm
Typ. radiant intensity, Ie	215 mW/sr @1000 mA
Total radiant flux, Φe	990 mW @1000 mA
Viewing angle	+/–75°



In order to detect whether the driver is tired or distracted, a camera observes the drivers face which is illuminated by IR light. Especially the eyes are observed and in case of drowsyness a warning is provided.



Better visibility with invisible light: night vision

A strong IR light source is used to illuminate the road up to 150–200 m ahead (similar to high beam operation). A camera records the scene and presents the image to the driver on a suitable display or, one day, on a head-up display.

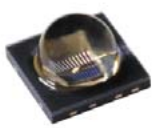
Some systems give the driver a warning if an obstacle or moving object is detected. The light source is placed in the headlamp of the car, the camera is located behind the rear view mirror.

For best results 850 nm IR light is used for which the sensitivity of the CMOS camera is acceptable. This light appears as a red glow to the human eye which can be hidden in the white light of the headlamps.

IR Platinum DRAGON®

	SFH 4235
LED package size in mm	11.0 × 6.0 × 1.8
Wavelength	850 nm
Typ. radiant intensity, Ie	320 mW/sr @1000 mA
Total radiant flux, Φe	950 mW @1000 mA
Viewing angle	+/– 60°

IR OSLON® Black Series



	SFH 4715S
LED package size in mm	3.75 × 3.75 × 2.3
Wavelength	850 nm
Typ. radiant intensity, Ie	500 mW/sr @1000 mA
Total radiant flux, Φe	1070 mW @1000 mA
Viewing angle	+/– 45°

Advanced Power TOPLED®

	LUW GVCP	LW G6CP	LA G6SP	LR G6SP	LS G6SP	LCY G6SP
Dimensions (x, y, z)	3.3 × 3.4 × 1.9	3.3 × 3.4 × 1.9	3.3 × 3.4 × 1.9	3.3 × 3.4 × 1.9	3.3 × 3.4 × 1.9	3.3 × 3.4 × 1.9
Viewing angle	120°	120°	120°	120°	120°	120°
Luminous intensity (typ.)	10.1 cd @140 mA	10.1cd @140 mA	6.35 cd @140 mA	5.05 cd @140 mA	4.02 cd @140 mA	5.05 cd @140 mA
Thermal resistance (max. real)	40 K/W	40 K/W	60 K/W	60 K/W	60 K/W	40 K/W
Max junction temperature (T_j)	up to 150 °C	up to 150 °C	up to 150 °C	up to 150 °C	up to 150 °C	up to 150 °C
Max forward current I_F	250 mA	250 mA	200 mA	200 mA	200 mA	250 mA
Forward Voltage	3.05 V @350 mA	3.30 V @140 mA	2.15 V @140 mA	2.10 V @140 mA	2.15 V @140 mA	3.30 V @140 mA

OSLON® MX ECE

	LUW CN7N
Dimensions (x, y, z)	3.0 × 3.0 × 2.4
Viewing angle	80°
Luminous flux (typ.)	90 lm @350 mA
Thermal resistance (max. real)	20 K/W
Max junction temperature (T_j)	up to 150 °C
Max forward current I_F	500 mA
Forward Voltage	3.4 V @350 mA

OSLON® Black

	LUW HWQP	LA H9PP	LR H9PP
Dimensions (x, y, z)	3.8 × 3.8 × 0.5	3.75 × 3.75 × 0.7	3.75 × 3.75 × 0.7
Viewing angle	120°	120°	120°
Luminous flux (typ.)	300 lm @1A	66 lm @350 mA	49 lm @350 mA
Thermal resistance (max. real)	3.0 K/W	11 K/W	11 K/W
Max junction temperature (T_j)	up to 150 °C	up to 150 °C	up to 150 °C
Max forward current I_F	1.5 A	1.0 A	1.0 A
Forward Voltage	3.20 V @1 A	2.2 V @350 mA	2.15 V @350 mA

Power TOPLED®

	LY E67F	LY E6SF	LY ETSF	LA E67F	LR E67F	LS E67F
Dimensions (x, y, z)	3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9
Viewing angle	120°	120°	120°	120°	120°	120°
Luminous intensity (typ.)	2020 mcd @50 mA	2020 mcd @50 mA	2020 mcd @50 mA	2520 mcd @50 mA	2520 mcd @50 mA	1260 mcd @50 mA
Thermal resistance (max. real)	130 K/W	130 K/W	130 K/W	130 K/W	130 K/W	130 K/W
Max junction temperature (T_j)	up to 125 °C	up to 125 °C	up to 125 °C	up to 125 °C	up to 125 °C	up to 125 °C
Max forward current I_F	70 mA	70 mA	70 mA	70 mA	70 mA	70 mA
Forward Voltage	2.15 V @50 mA	2.15 V @50 mA	2.15 V @50 mA	2.15 V @50 mA	2.15 V @50 mA	2.15 V @50 mA

TOPLED®

	LA T67F	LR T67F	LS T67F
Dimensions (x, y, z)	3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9
Viewing angle	120°	120°	120°
Luminous intensity (typ.)	1010 mcd @20 mA	635 mcd @20 mA	610 mcd @20 mA
Thermal resistance (max. real)	280 K/W	280 K/W	280 K/W
Max junction temperature (T_j)	up to 125 °C	up to 125 °C	up to 125 °C
Max forward current I_F	50 mA	50 mA	50 mA
Forward Voltage	2.15 V @20 mA	2.05 V @20 mA	2.05 V @20 mA

SIDELED®

	LA A67F
Dimensions (x, y, z)	4.0 × 3.6 × 4.0
Viewing angle	120°
Luminous intensity (typ.)	1800 mcd @30 mA
Thermal resistance (max. real)	180 K/W
Max junction temperature (T_j)	up to 125 °C
Max forward current I_F	50 mA
Forward Voltage	2.00 V @30 mA

LY G6SP
3.3 × 3.4 × 1.9
120°
5.05 cd @140 mA
60 K/W
up to 150 °C
200 mA
2.25 V @140 mA

OSLON® SX ECE

	LUW CN7M
Dimensions (x, y, z)	3.0 × 3.0 × 2.2
Viewing angle	90°
Luminous flux (typ.)	49 lm @200 mA
Thermal resistance (max. real)	30 K/W
Max junction temperature (T_j)	up to 150 °C
Max forward current I_F	250 mA
Forward Voltage	3.4 V @200 mA

LS H9PP	LY H9PP	LCY H9PP
3.75 × 3.75 × 0.7	3.75 × 3.75 × 0.7	3.75 × 3.75 × 0.7
120°	120°	120°
42 lm @350 mA	57 lm @350 mA	67 lm @350 mA
11 K/W	11 K/W	7.5 k/W
up to 150 °C	up to 150 °C	up to 150 °C
1.0 A	1.0 A	700 mA
2.15 V @350 mA	2.2 V @350 mA	2.95 V @350 mA

OSLON® SX

	LY CN5M
Dimensions (x, y, z)	3.0 × 3.0 × 2.4
Viewing angle	60°
Luminous intensity (typ.)	12 cd @140 mA
Thermal resistance (max. real)	30 K/W
Max junction temperature (T_j)	up to 150 °C
Max forward current I_F	200 mA
Forward Voltage	2.25 V @140 mA

LA E6SF	LR E6SF	LS E6SF	LA ETSF	LA E65F	LA E63F	LS E63F
3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9	3.2 × 2.8 × 1.9	3.2 × 2.8 × 3.5	3.2 × 2.8 × 3.8	3.2 × 2.8 × 3.8
120°	120°	120°	120°	60°	30°	30°
2520mcd @50 mA	1600 mcd @50 mA	1600 mcd @50 mA	2520 mcd @50 mA	6350 mcd @50 mA	16000 mlx @50 mA	8050 mlx @50 mA
130 K/W	130 K/W	130 K/W	130 K/W	130 K/W	130 K/W	130 K/W
up to 150 °C	up to 150 °C	up to 150 °C	up to 150 °C	up to 125 °C	up to 125 °C	up to 125 °C
70 mA	70 mA	70 mA	70 mA	70 mA	70 mA	70 mA
2.15 V @50 mA	2.15 V @50 mA	2.15 V @50 mA	2.15 V @50 mA	2.15 V @50 mA	2.15 V @50 mA	2.15 V @50 mA

LR A67F	LS A67F
4.0 × 3.6 × 4.0	4.0 × 3.6 × 4.0
120°	120°
1600 mcd @30 mA	1100 mcd @30 mA
180 K/W	180 K/W
up to 125 °C	up to 125 °C
50 mA	50 mA
2.00 V @30 mA	2.00 V @30 mA

Choose perfection – easily

✓ **recommendation**

	OSRAM OSTAR® Headlamp Pro	OSLON® Black Flat				OSLON® Black Flat			OSLON® Compact		
	white	2 Chip	3 Chip	4 Chip	5 Chip	white	yellow, conversion yellow	red, amber, superred	white	yellow, conversion yellow	
Lighting Function											
Adaptive Driving Beam | Adaptive Forward Lighting System	✓								✓		
Low beam	✓	✓	✓	✓	✓	✓					
High beam	✓	✓	✓	✓	✓	✓			✓		
Fog		✓				✓			✓		
Signaling Function											
Daytime Running Light	✓	✓				✓			✓		
Position light						✓			✓		
Front turn indicator							✓			✓	
Side markers							✓			✓	
Rear turn indicator							✓			✓	
Rear Combination Light											
Stop/Tail								✓			
CHMSL								✓			
Backup						✓			✓		
Rear fog light								✓			

	OSLON® LX 120	OSLON® Black			Power SIDELED®		Advanced Power TOPLED®			OSLON® SX	OSLON® SX ECE	OSLON® MX ECE	MULTILED®
	white	white	**amber**	yellow, conversion yellow	red, amber, superred	yellow	white	amber	yellow, concersion yellow	yellow	white	white	
	✓	✓											
	✓	✓									✓	✓	
	✓	✓				✓	✓				✓	✓	
							✓						
				✓	✓			✓	✓	✓			✓
				✓	✓				✓	✓			✓
				✓	✓			✓	✓	✓			✓
			✓	✓	✓			✓					
				✓				✓					
	✓	✓				✓	✓				✓		
			✓					✓					

Range of available colors

✓ **available**

		white	warmwhite	ultrawite	yellow	orange	amber	red	superred	puregreen	green	truegreen	blue	Color on demand
Interior illumination														
SIDELED®	Lx A67F				✓	✓	✓	✓	✓					
	Lx A673	✓										✓	✓	✓
	Lx A676				✓	✓	✓		✓	✓	✓			
	Lx A6SG	✓										✓	✓	✓
	Lx T67D				✓	✓	✓	✓	✓					✓
TOPLED®	Lx T67F				✓	✓	✓	✓	✓	✓	✓			
	Lx T676				✓	✓	✓	✓	✓	✓	✓			
	Lx T67K				✓	✓			✓	✓	✓			
	Lx T6SG	✓											✓	✓
	Lx TTSD	✓												✓
	Lx T673	✓										✓	✓	
	Lx T67D				✓	✓	✓	✓	✓					✓
Power TOPLED®	Lx E67F				✓	✓	✓	✓	✓					
	Lx E6SG	✓										✓	✓	✓
PointLED®	Lx P47F				✓		✓	✓	✓	✓				
	Lx P476				✓	✓			✓					
	Lx P473	✓											✓	✓
	Lx P4SG	✓										✓	✓	✓
MULTILED®	LSG T676													
	LSY T676													
Mini TOPLED®	Lx M676				✓	✓	✓		✓	✓	✓			
	Lx M67F				✓	✓	✓		✓					
	Lx M673	✓										✓	✓	✓
	Lx M67C	✓												✓

✓ available

		white	warmwhite	ultrawite	yellow	orange	amber	red	superred	puregreen	green	truegreen	blue	Color on demand
Ambient Lighting														
TOPLED®	Lx T67F				✓	✓	✓	✓	✓	✓	✓			
	Lx T676				✓	✓	✓		✓	✓	✓			
	Lx T6SG	✓											✓	✓
	Lx TTSD	✓										✓	✓	✓
	Lx T673	✓												✓
	Lx T67D				✓	✓	✓	✓	✓					✓
SIDELED®	Lx A67F				✓	✓	✓	✓	✓					
	Lx A6SG	✓										✓	✓	✓
PointLED®	Lx P47F				✓		✓	✓	✓	✓				
	Lx P476				✓	✓			✓					
	Lx P4SG	✓										✓	✓	✓
	Lx P473	✓											✓	✓
MULTILED®	LRTB G6SG													
	LTRB GFSF													
Mini TOPLED®	Lx M676				✓	✓	✓		✓	✓	✓			
	Lx M67F				✓	✓	✓		✓			✓	✓	
	Lx M673	✓												✓
	Lx M67C	✓												✓
Dome and Map Lighting														
OSLON® Black	Lx H9GP		✓	✓										
Advanced Power TOPLED®	Lx G6CP	✓	✓											
Advanced Power TOPLED® Plus	Lx G5GP		✓	✓										
TOPLED®	Lx E6SG	✓	✓											✓
	Lx M67K				✓	✓			✓	✓	✓			
	Lx M67S													✓

Choose perfection – easily

VIS **✓ available**

	Mini TOPLED®	TOPLED®	Power TOPLED®	SIDELED®	PointLED®	MULTILED®	Advanced Power TOPLED®	OSLON® Black	OSRAM OSTAR® Projection Compact	OSRAM OSTAR® Compact	SYNIOS® E4014
Interior Illumination	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Head-up display								✓	✓	✓	
Ambient lighting	✓	✓	✓	✓	✓	✓					
Dome and map lighting		✓	✓	✓			✓	✓			
LCD backlighting											✓
Page	16, 17, 18, 19	16, 17, 19	16	17, 19	16, 17, 19	16, 17	18	18	20	20	18,19

IR **✓ available**

	Single-mode laser	Proximity + ALS Sensor	Power TOPLED® with lens	MIDLED® Toplooker	IR Platinum DRAGON®	IR OSLON® Black Series	Hybrid Pulsed Laser
Head-up display	✓						
Gesture recognition | Light dimming		✓	✓	✓	✓	✓	✓
ACC | Pre-crash sensing | Pedestrian protection					✓	✓	
Drowsy driver | Occupancy detection						✓	
Night vision					✓	✓	
Page	21	23	23	23	25, 27	23, 25, 26, 27	25

Be informed – completely

Looking for more information and data on our products for LEDs in general lighting or LEDs in general? All you need to know about our state-of-the-art products, modern LED technology and the latest LED trends can be found on our website along with other related links.

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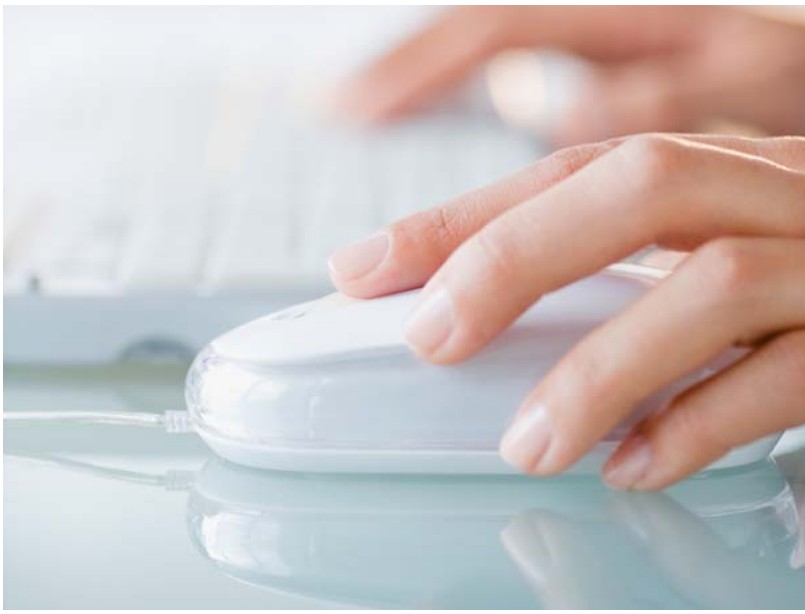
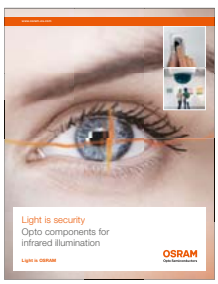
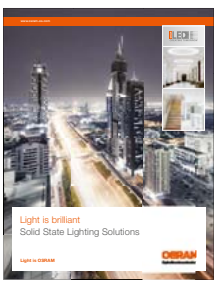


Application brochures available from OSRAM Opto Semiconductors
Our innovative products open up a wide variety of applications. Just contact us for assistance with your specific design (for contact information see last page) or order our application brochures: www.osram-os.com/downloads.





Bringing your visions to life

OSRAM Opto Semiconductors is one of the world's leading manufacturers of optoelectronic semiconductors and is considered an authority on innovative light technologies. With numerous patented technologies, a deep understanding of customer needs, close customer relations and highly committed employees, we take an active part in shaping the future of light.

Leader in technology
Because for decades we have been investing in technology and quality, steadily expanding our competencies, OSRAM Opto Semiconductors today sets the highest international standards in the fields of illumination, visualization and sensor technology. Our products range from high-performance light-emitting diodes (LEDs) and infrared diodes (IREDs) to detectors.

Your partner of choice

OSRAM Opto Semiconductors' close cooperation with our customers and partners generates new ideas for products and light solutions. Not least, these joint efforts have also resulted in an application-specific portfolio for a variety of applications: our semiconductors are used, for instance, in light solutions for automotive, white goods, entertainment and infotainment, projection and general lighting as well as numerous infrared and laser solutions.

Driver for innovation

Continuous commitment to research and development have established a solid foundation at OSRAM Opto Semiconductors for product development and manufacturing at a consistently high level. We have, for example, turned out pioneering technologies for almost 40 years and hold thousands of patents. Milestones reached in setting numerous standards in LED light technologies include the development of the first surface-mountable LED (TOPLED®), the first LED with white light and the OSRAM OSTAR® product platform with its versatile package design.

Competent light solutions around the globe

By engineering and manufacturing highly complex semiconductor chips and consistently developing new products for new applications, OSRAM Opto Semiconductors is able to satisfy the needs and requirements of customers around the world. With our headquarters in Regensburg (Germany), Sunnyvale (USA) for North America and Hong Kong for Asia, production sites in Regensburg, Penang (Malaysia) and soon in Wuxi (China), some of the most modern LED chip manufacturing facilities in the world, and a global network of sales and marketing centers, we and you are in an excellent position to meet the challenges of today and tomorrow.

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