OSRAM LED
CREATING TOMORROW

Brilliant LED Solutions
for Solid State Lighting

OSRAM
Opto Semiconductors

Content

Our strengths – your benefit

Imagine a portfolio of LED components that make the most challenging installations possible. That's precisely what you get from OSRAM Opto Semiconductors. We deliver a broad portfolio of low-, mid- and high-power LEDs that can be mixed and matched in endless combinations. Thanks to our extremely miniaturized components and the energy efficiency inherent in LED technology, the once unimaginable has become today's reality.

Our products combine the competence of nearly 40 years of expertise in the semiconductor industry with 100 years of experience in lighting technology from OSRAM AG. We concentrate all opto semiconductor processes under one roof – from the chip developement, to package and phosphors up to finalized components. Whether you need powerful lighting for outdoor applications, atmospheric interior lighting or high color quality retail lighting – OSRAM Opto Semiconductors has the right LED in every performance class for every application!

Quality without compromise

The consistently high quality of our LEDs is one of our most important competitive factors. Beyond the standard performance goals, we place specific emphasis on ensuring lower aging over the lifetime at laboratory conditions. OSRAM Opto Semiconductors goes even further – optimizing our LEDs for the lowest failure rates and longest lifetimes under real application conditions. We deliver quality without compromise and you can benefit from it.

We deliver. You benefit.
With OSRAM Opto Semiconductors LED products at the core of your applications, from lamps to luminaires – you benefit from outstanding quality and continuous improvement. Satisfaction guaranteed – for you and your customers!

When it comes to high quality and reliability, you can count on OSRAM's reliability and engineering research group. Our experts, coupled with our in-house reliability labs in Germany, Malaysia and the US guarantees the product we deliver is of the highest quality and best reliability.
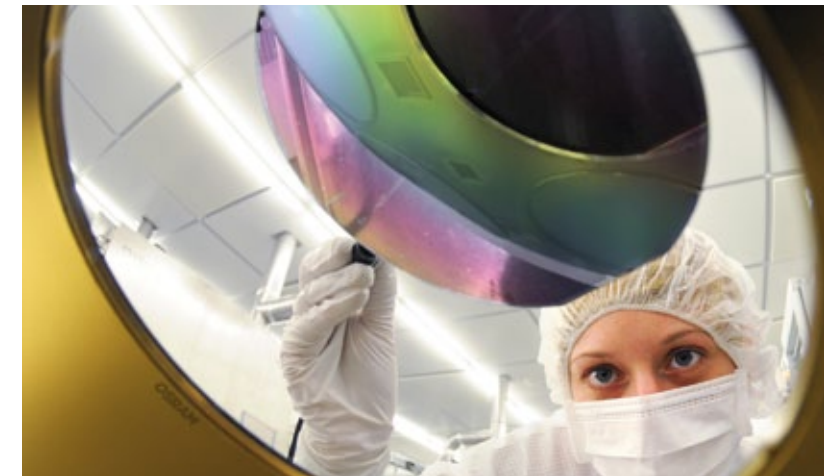
Our quality pledge
- We deliver LEDs of highest quality standards
- We have tough qualification profiles for our LEDs
- We never compromise quality for lower costs or higher luminous efficacy
- We provide SSL LED products that exceed our customers' quality expectations

We meet the standards

Standardization is important to create transparency and comparability. From an industry perspective standards provide a platform for consistent language in regard to performance (optical, electrical, mechanical), lifetime prediction, test methods, test lab accreditation and for all levels in the value chain including product design, manufacturing and testing.

In the lighting industry today there are various global standards such as ISO, CIE, IEC, as well as national standards to include IESNA, CSA, JISC/JELMA. OSRAM Opto Semiconductors actively participates in industry committees and in defining new standards such as IEC and Zhaga. Our LED portfolio meets a range of industry standards and fulfills the requirements of LM-80-08, TM-21-11, UL 8750 as well as IEC 62471. You can rest assured that all our LEDs have to demonstrate their superior quality and reliability in comprehensive standardized tests.

OSRAM Opto Semiconductors is committed to IESNA LM-80-08, the LED-based lumen maintenance test that runs for at least 6,000 hours at three different temperatures. Compliant results from these tests are the bottom line for getting the EPA's Energy Star Certification label on an LED lamp, an LED light engine or an LED luminaire.

First-class services
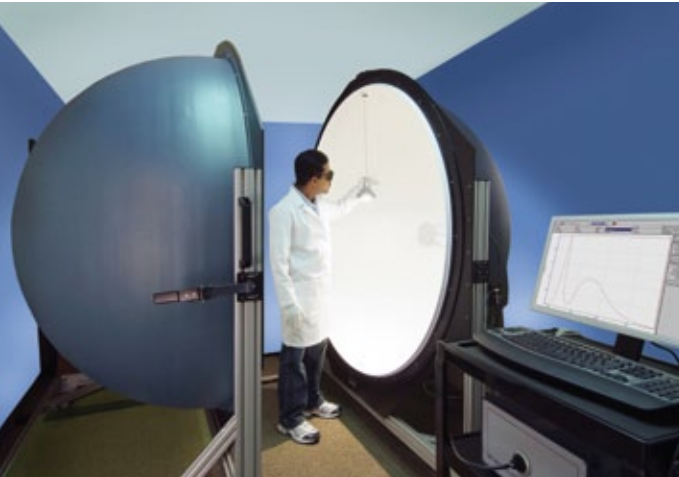
Need support to realize your next LED lighting application? A broad variety of LED experts from OSRAM Opto Semiconductors and specialists from the **LED Light for you** network are ready to assist you.

Worldwide application team
To realize a high performance LED project, know-how from various disciplines is required to include electrical, optical and thermal management. OSRAM Opto Semiconductors' worldwide application team provides you interdisciplinary support and comprehensive, high quality service, whatever the challenge!

General Application Support

What to expect on www.osram-os.com and ledlight.osram-os.com
- Application notes on handling, driving and measuring
- Ray files of our LEDs for optical simulation
- Electrical simulation models to ensure safe driving of the LEDs
- CAD files of our LEDs to assure a save and easy system design
- ... and more

Electrical Support
- LED driving
- Color management
- Electronic design evaluation
- Design and prototyping
- PCB layout design

Optical Support
- Measurement and preparation of rayfiles for all SSL related LEDs
- Optical design for customer requests

Thermal Support
- PCB reference designs
- Cooler reference designs
- Thermal design evaluation for customers

Simulation and Measurement Capabilities
- SPICE
- EAGLE
- Power measurement

Simulation and Measurement Capabilities
- Optical design with
  - Lighttools
  - Zemax
- Light planning with Dialux
- Matlab for special tasks

Simulation and Measurement Capabilities
- SolidWorks Flow Simulation
- Mentor Graphics FlowTHERM
- Thermal imaging
- Thermal measurement

LED Light for you

LED Light for you is a global network brought to you by OSRAM. Its worldwide certified partners will support you with standard and customized solutions. From optical experts to specialists in electronics and thermal management, the LED Light for you partners have the expertise to meet your dedicated requirements. Moreover, our system integrators will assist you at all stages of a project, from an ambitious concept and attractive design to the right layout, and from a qualified consultation up to a committed system level implementation.

For whom

Designer   Architect   Luminaire manufacturer

LED Light for you serves professionals who want to realize a general lighting project powered by OSRAM LED technology. Designers, architects and light manufacturers will find worldwide experts to support them in realizing not only standard applications, but exceptional and extravagant light applications. Big projects or small ones – LED Light for you offers the right solution.

How it works

LED Light for you
powered by OSRAM

www.ledlightforyou.com

You are a
- Designer
- Architect
- Lighting Consultant
- Luminaire Manufacturer
- ...

You look for

General lighting LED technology

Your solution: LED Light for you network
Certified partners participate in:

Optical Solutions | Thermal Solutions | Electronic Solutions | System Integrator

Additional Partners

Color Rendering Index

The Color Rendering Index (CRI) was developed and published by the CIE in 1974 to evaluate the color quality of light sources. It describes the deviation of the test light source to a reference light source. If the colors are reproduced faithfully compared with daylight or an incandescent lamp, the CRI value is at its maximum of 100. In many applications, color rendering is balanced with the efficacy of the light source. OSRAM Opto Semiconductors has employed this technique to bring you a choice of CRI and efficacy combinations, letting you choose the LED best suited to your application.

| OSLON® SSL White Versions				
	LCW.CC Color Champ	LCW.EC Eco Champ	LCW.PC Power Champ	LUW
Product Benefit	Maximized light quality	Ideal balance of CRI and luminous flux	Maximized luminous flux	Maximized luminous flux
CCT range	2700 K - 4000 K warm/neutral white	2700 K - 5000 K warm/neutral white	4000 K - 5000 K neutral white	5700 K - 6500 K cool white
CRI	95 (typ.)	80 (min.)	70 (typ.)	70 (typ.)
Applications				
	Premium interior lighting, e.g., shop	Various indoor lighting, e.g., office	Outdoor lighting, industrial lighting	Outdoor lighting, architectural lighting

Good to know
- The existing CRI is a value that indicates how good the test light source renders or reproduces colors compared to the reference light source.
- A good color rendering is also known as high color fidelity.
- Another aspect is color preference, which gives you an indication of how much colors are emphasized.

- Thanks to this effect colors can look brilliant – even at a CRI 80 value.
- The spectrum of LED light can be modified in many direction by proper choice of LEDs.
- Some applications like streetlighting do not need a high CRI value at all.

White Binning

Binning means the sorting of LED packages by color and brightness group in order to maintain color consistency within a finished product. Each LED is tested for specific characteristics such as luminous intensity, luminous flux, forward voltage, dominant wavelength and chromaticity. Upon completion of assembly, LEDs are measured for brightness and color and are then placed into "bins" according to their intensity group and their color group. The binned LEDs are then placed onto reels for shipment.
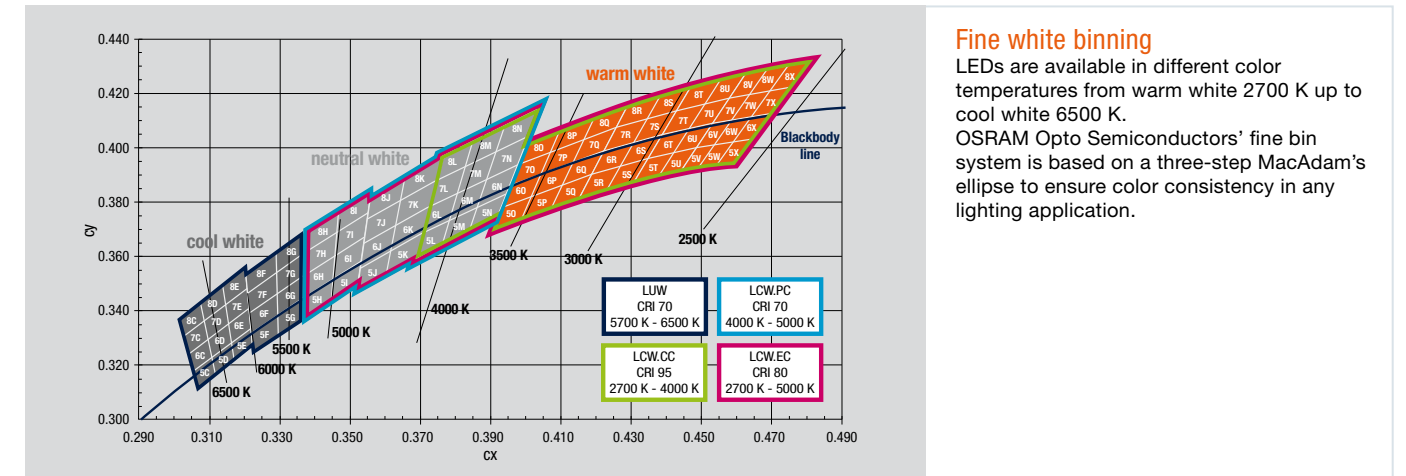
Fine white binning
LEDs are available in different color temperatures from warm white 2700 K up to cool white 6500 K.
OSRAM Opto Semiconductors' fine bin system is based on a three-step MacAdam's ellipse to ensure color consistency in any lighting application.
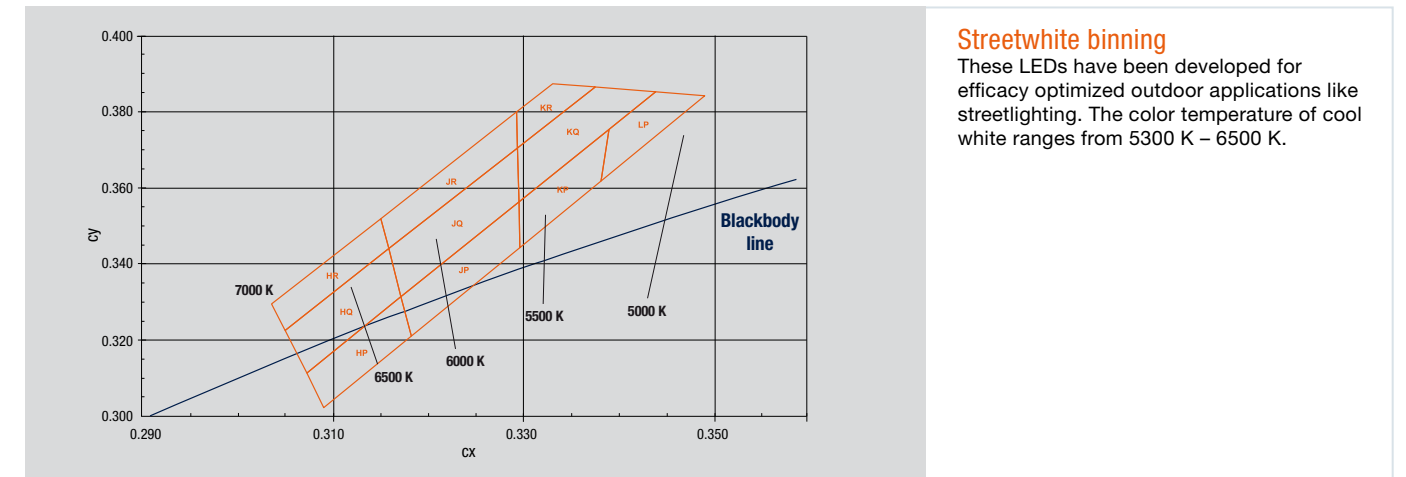
Streetwhite binning
These LEDs have been developed for efficacy optimized outdoor applications like streetlighting. The color temperature of cool white ranges from 5300 K – 6500 K.
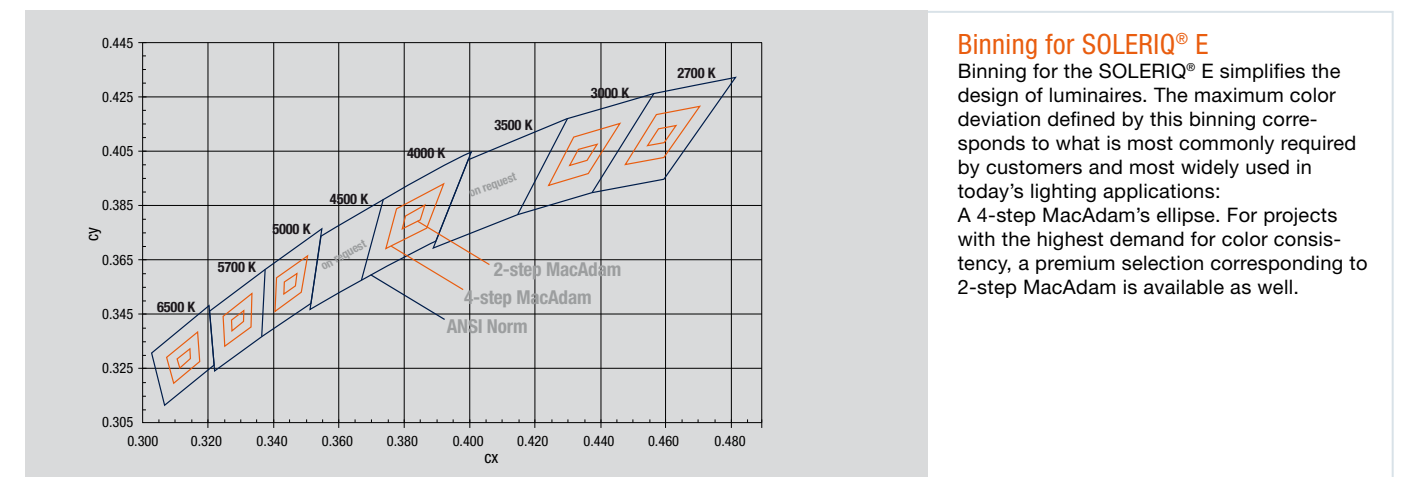
Binning for SOLERIQ® E
Binning for the SOLERIQ® E simplifies the design of luminaires. The maximum color deviation defined by this binning corresponds to what is most commonly required by customers and most widely used in today's lighting applications:
A 4-step MacAdam's ellipse. For projects with the highest demand for color consistency, a premium selection corresponding to 2-step MacAdam is available as well.

DURIS® E and DURIS® P

The DURIS® E and P are the new low- and mid-power LEDs, ideal for efficient and homogeneous lighting applications.
The combination of a small/medium lumen package, a wide beam angle and a compact footprint is perfect for uniform light distribution.
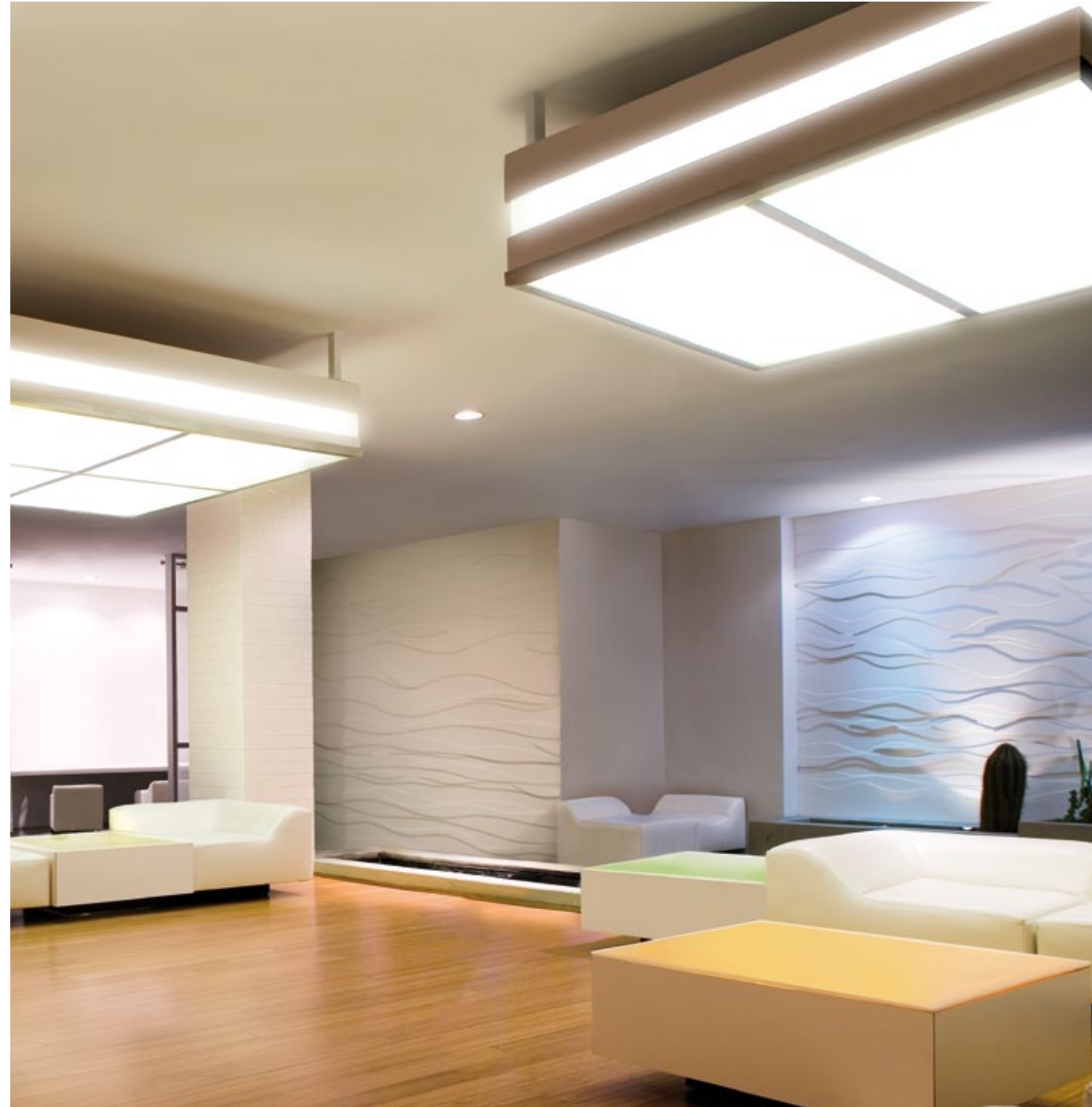
Linear lighting

Light bulbs

Linear and area lighting

Features DURIS® E
- Footprint of 3.0 mm x 1.4 mm (DURIS® E 3) / 5.6 mm x 3.0 mm (DURIS® E 5)
- Compact light source in cost-effective PLCC package
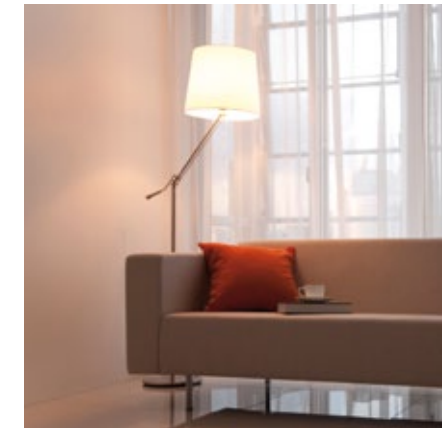- Stable brightness over lifetime
- High efficacy of typ. 110 lm/W @ 5000 K (DURIS® E 3) / typ. 110 lm/W @ 5000 K (DURIS® E 5)

Features DURIS® P
- Footprint of 2.6 mm x 2.2 mm
- Long lifetime also at high temperatures and high currents (L70/B50 > 50,000 h at T_j = 125°C and I_f = 200 mA)
- High efficacy of up to 110 lm/W @ 3000 K
- Superior corrosion resistance for high-quality lighting solutions
- High maximum forward current of 200 mA

Applications of all types
- Homes
- Shops
- Offices
- Industries, e.g., white goods
- Hospitality
- Signage, e.g., channel letters

DURIS® E 3

Type	Color	CCT	Typ. CRI	Typ. Luminous Flux (20 mA)	
LCW JNSH.EC	warm / neutral white	2700 K - 5000 K	85 @ 4000 K	6.5 lm @ 4000 K	
LUW JNSH.EC	cool white	5700 K - 6500 K	85 @ 6500 K	7.0 lm @ 6500 K	
LCW JNSH.PC	warm / neutral white	3000 K - 5000 K	72 @ 4000 K	7.3 lm @ 4000 K	

DURIS® E 5

Type	Color	CCT	Typ. CRI	Typ. Luminous Flux (120 mA)	
LCW JDSH.EC	warm / neutral white	2700 K - 5000 K	85 @ 4000 K	42 lm @ 4000 K	
LUW JDSH.EC	cool white	5700 K - 6500 K	85 @ 6500 K	43 lm @ 6500 K	

DURIS® P 5

| Type	Color	CCT	Min. CRI	Typ. Luminous Flux (100 mA)	
GW DASPA1.EC	warm white	3000 K	80	29 lm	
GW DASPA1.EC	neutral white	4000 K	80	30 lm	
GW DASPA1.EC	neutral white	5000 K	80	32 lm	

COLOR PORTFOLIO AVAILABLE

Golden DRAGON® Plus

Available in a choice of whites from cozy warm to a cool, highly efficient 6,500 K, as well as a range of colors from red to blue, the Golden DRAGON® Plus is a bright and exceptionally durable LED. Its outstanding efficiency of more than 100 lm/W makes it the ideal answer to today's need for sustainable indoor and outdoor lighting solutions.

Industrial lighting
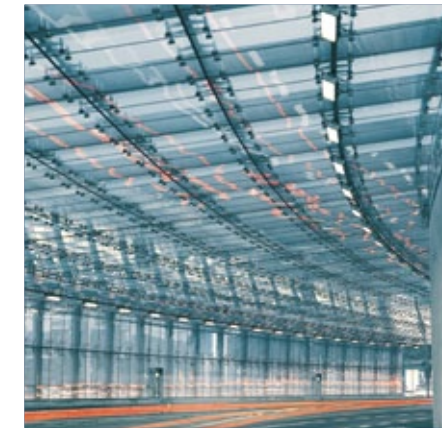
Tunnel lighting

Urban lighting

Features
- Full white color spectrum: cool white, neutral white, warm white
- Broad color portfolio: red, green, blue and other colors
- Outcoupling lens 170°
- Radiation characteristics well suited for secondary optics
- Maximum junction temperature of 135°C
- Thermal resistance R_{thJS} (typ.) 6.5 K/W

Applications
- Streets and tunnels
- White interior and exterior lighting
- Industrial lighting
- Interior lighting and spots
- Recessed downlights
- Linear lights and cove lighting
- Decorative and design luminaires
- Fluorescent replacement
- Shop lighting: food (freezers, shelves), non-food (under cabinet)
- Horticultural lighting

Golden DRAGON® Plus

Type	Color	Typ. CRI	CCT/Wavelength	Typ. Luminous Flux
LCW W5AM	warm / neutral white	82	2700 K - 4500 K	85 lm @ 3500 K (350 mA)
LCW W5AM.PC	neutral white	70	4000 K - 5000 K	101 lm @ 4500 K (350 mA)
LW W5AM	neutral / cool white	80	4500 K - 7000 K	100 lm (350 mA)
LUW W5AM	cool white	70	5500 K - 7000 K	116 lm (350 mA)
LD W5AM	deep blue		455 nm	453 mW (350 mA)
LB W5AM	blue		470 nm	28 lm (350 mA)
LV W5AM	verde		505 nm	62 lm (350 mA)
LT W5AM	true green		523 nm	93 lm (350 mA)
LY W5AM	yellow		590 nm	55 lm (400 mA)
LA W5AM	amber		617 nm	74 lm (400 mA)
LR W5AM	red		625 nm	80 lm (400 mA)
LH W5AM	hyper red		645 nm	320 mW (400 mA)

COLOR PORTFOLIO AVAILABLE

OSLON® SSL

These remarkably compact LEDs offer beam angles optimized for use with lenses and reflectors. This revolutionary feature, combined with a broad range of color temperatures and color rendering indexes, open up new possibilities for cost-effective and efficient lighting solutions – for any application.

Outdoor lighting

Indoor lighting

Architectural lighting

Features
- The first power LED with sophisticated beam angles (80°/150°)
- Ultra-compact footprint for high-density arrays saving space and simplifying color mixing (only 3 mm x 3 mm)
- Neutral to warm white, capable of high power up to 0.8 A, cool white and all colors up to 1 A
- Compact and symmetrical, allowing dense clustering for high-flux packages
- Thermal resistance of R_{thJS} (typ.) 7 K/W
- Lifetime of more than 50,000 hours, depending on application conditions
- Different versions (LCW.CC, LCW.EC, LCW.PC, LUW) for various application requirements
- Broad color portfolio: red, green, blue, and other colors
- Light recycling by reflective layer of the package, using every single lumen

Applications
Interior lighting (Home, office, shop & hospitality)
- Retrofits & fixtures (e.g., fluorescent replacement)
- Spotlights
- Task lights
- Shelf lighting
- Downlights

Outdoor lighting
- Street
- Tunnels
- Parking lots
- Pedestrian areas

Architecture and entertainment
- Color changing fixtures (colored, white, decorative, etc.)
- Entertainment
- Stage and studio lighting

OSLON® SSL

Type 80	Type 150	Color	CRI	CCT/Wavelength	Typ. Luminous Flux (350 mA)
LCW CQ7P.CC	LCW CQDP.CC	warm / neutral white	95 (typ.)	2700 K - 4000 K	76 lm @ 3000 K
LCW CR7P.EC	LCW CRDP.EC	warm / neutral white	80 (min.)	2700 K - 5000 K	105 lm @ 3000 K 111 lm @ 4000 K
LCW CR7P.PC	LCW CRDP.PC	neutral white	70 (typ.)	4000 K - 5000 K	122 lm @ 4000 K 128 lm @ 5000 K
LUW CR7P	LUW CRDP	cool white	70 (typ.)	5700 K - 6500 K	128 lm @ 6000 K
LD CQ7P	LD CQDP	deep blue		455 nm	515 mW
LB CP7P	LB CPDP	blue		465 nm	28 lm
LT CP7P	LT CPDP	true green		528 nm	93 lm
LY CP7P	LY CPDP	yellow		590 nm	56 lm
LA CP7P	LA CPDP	amber		617 nm	80 lm
LR CP7P	LR CPDP	red		625 nm	58 lm
LH CP7P	LH CPDP	hyper red		645 nm	355 mW

OSLON® SSL 80

OSLON® SSL 150

OSLON® Square

With the OSLON® Square, OSRAM Opto Semiconductors provides the most compact, high-power LED in its class. With a maximum driving current of 1.5 A and a broad range of color temperatures and color rendering indexes, the OSLON® Square product family is perfect for a large variety of indoor and outdoor applications. Amazing flexibility. Guaranteed.

Indoor lighting

Compact designs

Outdoor lighting

Features

- Ultra-compact footprint for high-density arrays to save space and simplify circuit designs (only 3 mm x 3 mm)
- Full color temperature range
- Suitable for driving currents up to 1.5 A
- Highly reflective package
- Thermal resistance of R_{thJS} (typ.) 3.8 K/W
- Lifetime of more than 50,000 hours, depending on application conditions
- Different product versions adjusted to fit the specific application requirements

Applications

Indoor Lighting
- Spotlights
- Task lights
- Shelf lighting
- Downlights

Outdoor Lighting
- Street lighting
- Tunnels
- Parking lots
- Pedestrian areas

Compact Designs
- Retrofit lamps
- Downlights
- Remote phosphor solutions
- LED clusters

OSLON® Square

Type	Color	CRI	CCT/Wavelength	Typ. Luminous Flux (700 mA)	Typ. Luminous Flux (350 mA)
LCW CQAR.EC	warm / neutral white	80 (min.)	2700 K - 5000 K	200 lm @ 3000 K 206 lm @ 4000 K	112 lm @ 3000 K 115 lm @ 4000 K
LCW CQAR.PC	neutral white	70 (typ.)	4000 K - 5000 K	251 lm @ 4000 K 262 lm @ 5000 K	141 lm @ 4000 K 147 lm @ 5000 K
LUW CQAR	cool white	70 (typ.)	5300 K - 6500 K	264 lm @ 6000 K	145 lm @ 6000 K
LD CQAR	deep blue		450 nm	1100 mW	594 mW

OSRAM OSTAR® Lighting Plus

The OSRAM OSTAR® Lighting Plus offers a very high light output in a very compact package – perfectly suited to turn on the spotlight. And the handling could hardly be easier – it takes only one LED to replace a light bulb.

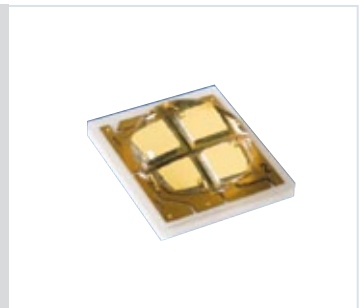Downlights

Task light

Downlights

Features
- Compact light source in multi-chip SMT
- Outstanding brightness and luminance based on pure surface emission
- Low thermal resistance of 3.5 K/W
- 140° beam angle ideal for secondary reflector optics
- Small package dimensions for good second-board reliability
- Ceramic package and silicone lens for solderability
- Lens design optimized for maximum package efficiency
- Stable brightness over lifetime

Applications
- Retrofit lamps
- Spot- and task lights
- Shop lighting
- Downlights
- Mood lighting
- Flashlights

OSRAM OSTAR® Lighting Plus

Type	Color	Typ. CRI	CCT	Typ. Luminous Flux (350 mA)
LE CW S2LN.EC	warm white	82	2700 K	355 lm
LE CW S2LN.EC	warm white	82	3000 K	365 lm
LE CW S2LN.EC	neutral white	82	4000 K	375 lm
LE UW S2LN	cool white	70	6000 K	425 lm
LE UW S2LN	cool white	70	6500 K	425 lm

SOLERIQ® E

OSRAM Opto Semiconductors' new SOLERIQ® E is a remarkably easy-to-use Chip-on-Board LED with excellent luminous efficacy. Available in all major color temperatures from 2700 K up to 6500 K, the high flux packages are ideal for downlights from 1500 lm up to 4500 lm. See for yourself how SOLERIQ® E makes lighting easy!

Hospitality lighting

Office lighting

Features of all types
- Color consistency within 4-step MacAdam
- Easy-to-use metal core board
- Stable brightness over lifetime
- Excellent color reproduction with CRI > 80
- Full range of color temperatures

Applications
- Homes
- Shops
- Offices
- Industries
- Hospitality

SOLERIQ® E 30

Type	Color	CCT	Typ. CRI	Typ. Luminous Flux @ 600 mA & Ts = 25°C	Typ. Luminous Flux @ 600 mA & Ts = 85°C
GW KAJRB2.EM	warm white	2700 K	82	2580 lm	2270 lm
GW KAJRB2.EM	warm white	3000 K	84	2770 lm	2440 lm
GW KAJRB2.EM	neutral white	4000 K	85	3000 lm	2640 lm
GW KAJRB2.EM	neutral white	5000 K	85	3040 lm	2675 lm
GW KAJRB2.EM	cool white	5700 K	84	3095 lm	2725 lm
GW KAJRB2.EM	cool white	6500 K	84	3080 lm	2710 lm

2700 K

SOLERIQ® E 45

Type	Color	CCT	Typ. CRI	Typ. Luminous Flux @ 880 mA & Ts = 25°C	Typ. Luminous Flux @ 880 mA & Ts = 85°C
GW KALRB3.EM	warm white	2700 K	82	3870 lm	3405 lm
GW KALRB3.EM	warm white	3000 K	84	4160 lm	3660 lm
GW KALRB3.EM	neutral white	4000 K	85	4500 lm	3960 lm
GW KALRB3.EM	neutral white	5000 K	85	4560 lm	4010 lm
GW KALRB3.EM	cool white	5700 K	84	4640 lm	4085 lm
GW KALRB3.EM	cool white	6500 K	84	4620 lm	4065 lm

6500 K

✓ recommendation   • alternate recommendation

	DURIS® E	DURIS® P	Golden DRAGON® Plus	OSLON® SSL	OSLON® Square	OSRAM OSTAR® Lighting Plus	SOLERIQ® E
Retrofit							
Omnidirectional	✓	•		•	✓		
Directional				•	✓	✓	
Linear	✓	•					
Home							
Pendant lighting				✓	✓	✓	
Strip lights	✓						
Under cabinet lighting	✓				•	✓	
Shop							
Shop spot lighting				•	✓	•	
Shop downlights	✓				•		✓
Shop linear lighting	✓	•		✓			
Freezer/display	•	✓		✓			
Shelf lighting	✓	•		✓			
Office							
Office downlights	✓			•	✓		✓
Office linear/area lights	✓	✓		•			
Recessed lighting	✓	✓		✓			
Architainment/Hospitality							
Accent/mood lighting	•	✓		✓			
Cove lighting	•	✓	✓	✓			
Strip lights	•	✓					
Stage lighting				✓			
Wall washer				✓			
Industrial							
Portable lighting					✓	✓	
Channel letters		✓					
Emergency lighting		✓					
High/low bay					✓		✓
Linear lighting	✓	✓					
Horticultural lighting			•	✓			
Outdoor							
Street			•	•	✓		
Tunnel			•	•	✓		
Parking			•	•	✓		
Path lighting			•	•	✓		
Effect/landscape lighting		✓		✓			
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More information about LED in General Lighting:

OSRAM Opto Semiconductors Website
www.osram-os.com/solid-state-lighting

LED Light Site
ledlight.osram-os.com

LED Light for you Network
www.ledlightforyou.com

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www.osram.com/led

For further information on the available
products please visit our product catalog
at http://catalog.osram-os.com