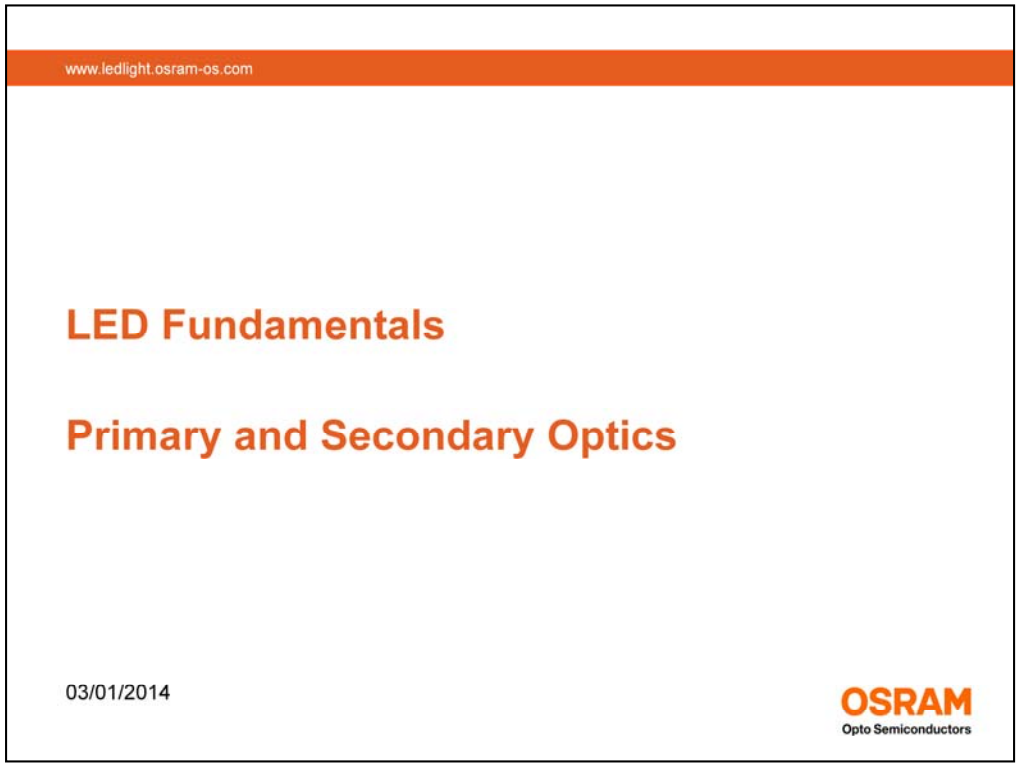



Welcome to this presentation on Primary and Secondary Optics, part of OSRAM Opto Semiconductors‘ LED Fundamentals series.

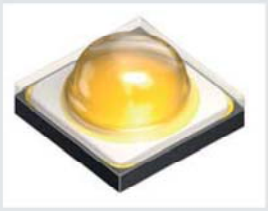
In this presentation we will review various primary optic designs for OSRAM Opto Semiconductors’ Solid State LEDs and discuss resources for choosing primary optics.

## Primary and Secondary Optics

### Definition of terms

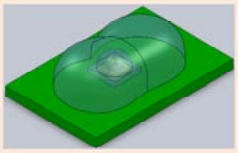
**Primary Optics**

- Lens integrated into LED package
- Optimized for...
  - Light extraction
  - General beam shaping
  - Or both



**Secondary Optics**

- Optical element separate from LED package
- Typically separated from LED by an air gap
  - Gap could also be filled by index matching material to reduce Fresnel loss





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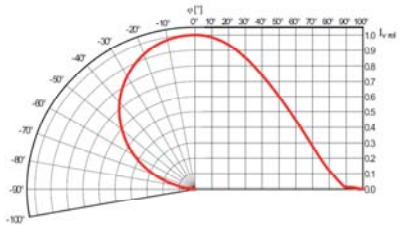
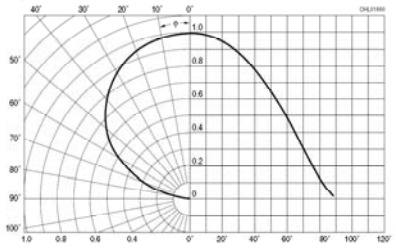
In this context, a primary optic is one integrated onto the LED package, while a secondary optic is separate from the LED. Since a primary optic is limited on the amount of beam control it can achieve, secondary optics are often required to meet the objectives of a particular application.

## OSRAM Opto Semiconductors Primary Optics

DURIS E 3

DURIS E 5







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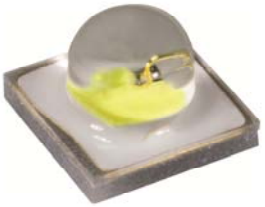
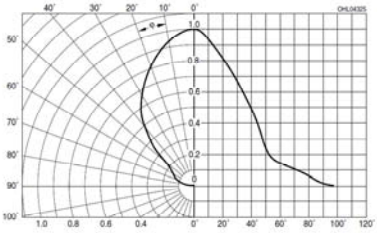
Both the DURIS E 3 and DURIS E 5 have nearly Lambertian distributions which are well suited for both reflectors and lenses.

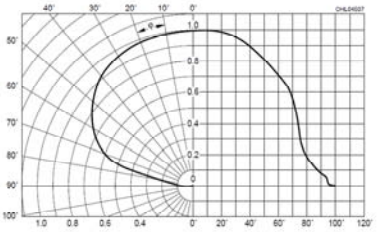
## OSRAM Opto Semiconductors Primary Optics



OSLON SSL 80°



OSLON SSL 150°





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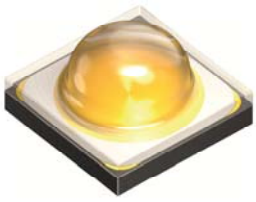
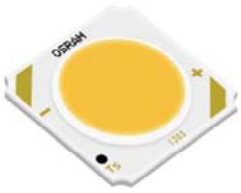
The OSLON SSL 80° has a tight beam pattern designed for downlighting and for use with small secondary optics. The wide beam angle of the OSLON SSL 150 is well suited to work with reflectors.

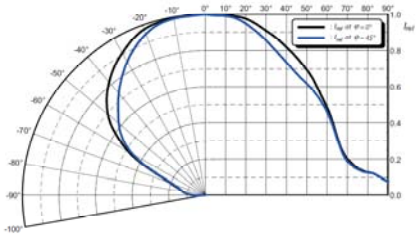
## OSRAM Opto Semiconductors Primary Optics

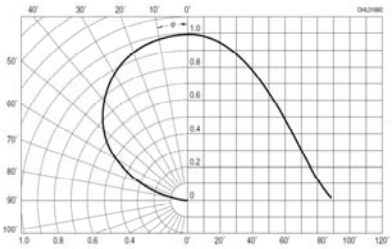


OSLON Square




SOLERIQ S and E







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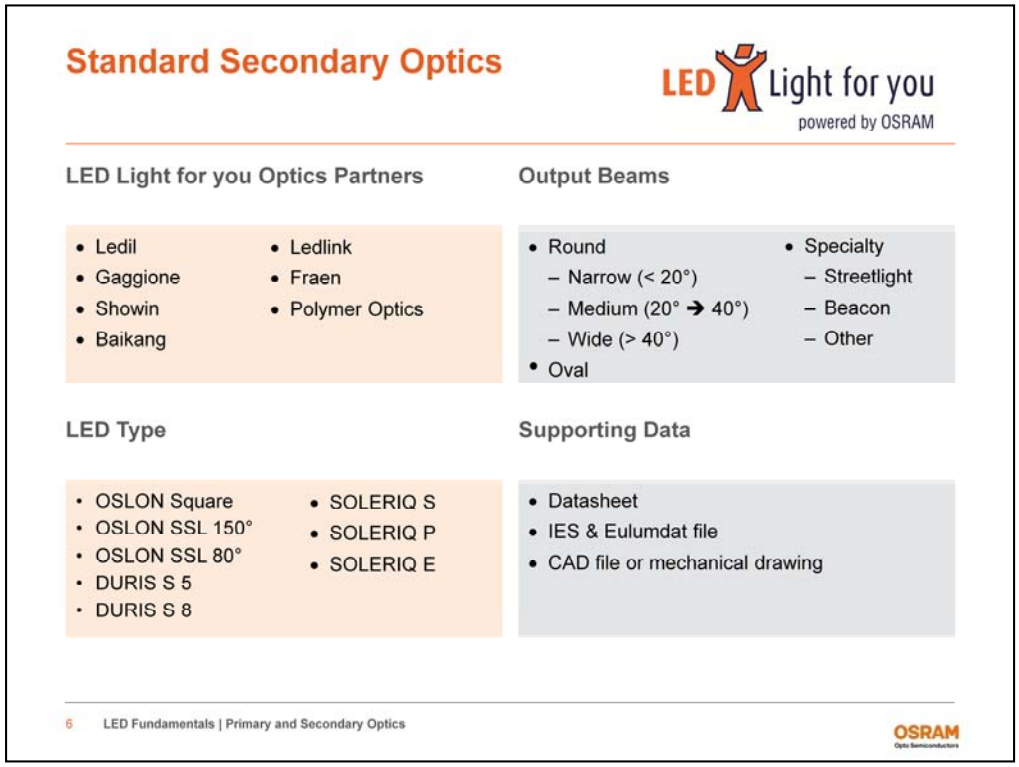
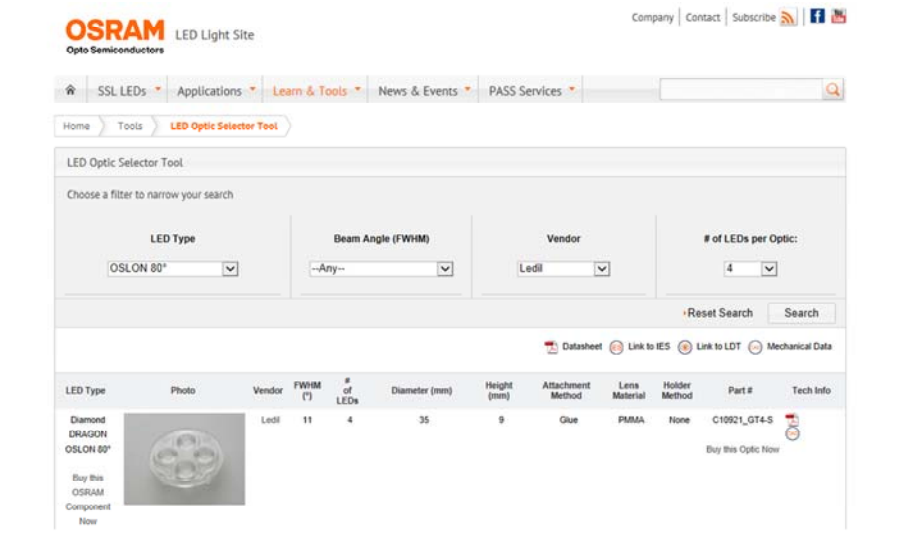
The primary optics of the OSLON Square strike a balance between extraction efficiency and secondary optic match. The SOLERIQ products are best suited for reflectors due to their large source size.




Numerous off-the-shelf secondary optics have been designed for use with OSRAM Opto Semiconductors LEDs. While most of the optics are designed to produce a circular beam pattern of a certain beam angle, a number of specialized lenses are also available. All of OSRAM's LED Light for you optics partners are also capable of producing custom optics.

## Optic Selector Tool at ledlight.osram-os.com






This website has a tool for selecting a stock optic from one of our LED Light for you partners. You can search by LED type, beam angle, vendor, and number of LEDs per lens. There are also links to supporting files such as datasheets and IES files.

## The LED and Your Application

| | LED | Lumen Output | Apparent Source Size | Intensity Distribution | Preferred Applications & Advantages |
|---|---|---|---|---|---|
|  | DURIS E 3 and E 5 | Low to Medium | Small to Medium | Medium | Linear, signage and A-lamp applications. Combine with reflector or lens. |
|  | DURIS P 5 | Medium | Medium | Medium | Linear and signage in harsh environments. Combine with reflector or lenses. |
|  | DURIS S 5 | Medium | Medium | Medium | Linear, omnidirectional and downlight applications. |
|  | DURIS S 8 | Medium | Medium | Medium | Spot lights, downlights, directional and omnidirectional retrofits and high bay applications. |



These next slides provide a summary of OSRAM Opto Semiconductors' LEDs for Solid State Lighting, listing their advantages and preferred applications. This table lists the low and medium power LEDs. These LEDs tend to be used in arrays with both reflectors and lenses.

## The LED and Your Application

| | LED | Lumen Output | Apparent Source Size | Intensity Distribution | Preferred Applications & Advantages |
|---|---|---|---|---|---|
|  | OSLON SSL 80° | High | Medium | Narrow | Narrow beam applications. Combine with TIR optics. Can be packaged in tight clusters. |
|  | OSLON SSL 150° | High | Medium | Wide | Wide beam applications. Combine with reflector or TIR optics. Can be packaged in tight clusters. |
|  | OSLON Square | High | Medium | Medium | Applications where high source lumens are required. Combine with reflector or TIR optics. |
|  | SOLERIQ S | Very High | Large | Medium | Spot and downlight applications. High luminance sources. Combine with reflectors. |
|  | SOLERIQ E | Very High | Very Large | Medium | Spot and downlight applications. High luminance sources. Combine with reflectors. |



This table lists the high power and chip-on-board packages from OSRAM Opto Semiconductors. The OSLON SSL 80 degree LED has a narrow beam and designed to be used without secondary optics either singly or in clusters, or with TIR optics. In complement to the OSLON 80, the OSLON 150 degree LED has a wide beam and is designed to work with reflectors. The medium width distribution of the OSLON Square is suitable for both reflectors and lenses. The larger sizes of the SOLERIQ S and E and chip-on-board packages tend to lead to reflector solutions.

OSRAM Opto Semiconductors offers products suited for a wide range of applications and optical systems. Please contact your OSRAM Opto Semiconductors' sales representative for assistance with your application.


Thank you for viewing this presentation by OSRAM Opto Semiconductors.