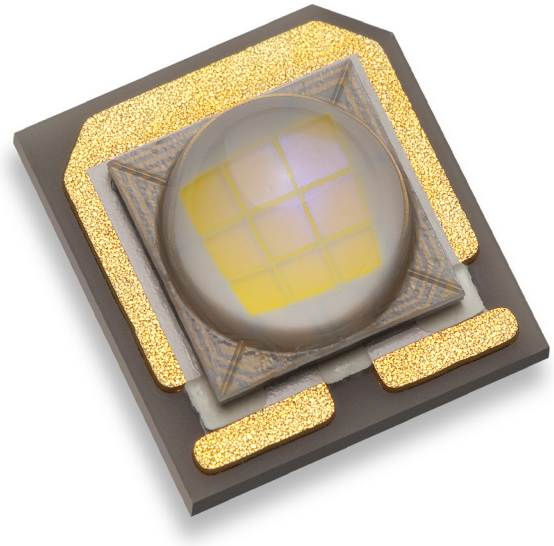

LUXEON S

Optimized solution for applications requiring high flux and tight beam control

Technical Datasheet DS80

LUXEON
NEVER BEFORE POSSIBLE

RoHS Compliant

LUXEON® S
High Flux Density

Introduction

The LUXEON® S emitters deliver uniform beam intensity and high flux density from a uniform source. This enables tight beam control at the system level using secondary optics to provide the high center beam intensity, uniform beam and crisp, single shadow required for high performance accent spotlighting applications. LUXEON S delivers tight Correlated Color Temperature control to ensure consistency in system color point. In addition these parts deliver the efficacy, lifetime and reliability that all LUXEON LEDs are renowned for. This document contains the performance data needed to design and engineer LUXEON S based applications.

LUXEON S features

- Specified, targeted and tested hot, at real world operating temperatures: T_j = 85°C, to ensure *in application* performance
- High flux density with 1300 lumens from an 8mm diameter source
- Uniform intensity and color across source
- *Freedom from Binning* delivers color consistency within a single 3-step MacAdam ellipse
- Exceed ENERGY STAR® lumen maintenance requirements
- Recognized under the Component Recognition Program of Underwriters Laboratories Inc. UL listing E327436
- High efficacy for sustainable design.

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Product Nomenclature

LUXEON S is tested and binned hot at 85°C Tj and 700 mA DC.

The part number designation is explained as follows:

L X S A – B C D E

Where:

A — designates minimum CRI (value 8 for 80)

B — designates radiation pattern (value P for Lambertian)

C — designates color (W for White)

D — designates nominal CCT (30 for 3000K)

Therefore products tested and binned at 700 mA follow the part numbering scheme:

L X S 8 - P W 3 0

Average Lumen Maintenance Characteristics

Lumen maintenance for solid-state lighting devices (LEDs) is typically defined in terms of the percentage of initial light output remaining after a specified period of time. Philips Lumileds projects that LUXEON S products will deliver, on average, 70% lumen maintenance (L70) at 50,000 hours of operation at a forward current of up to 700 mA. This projection is based on constant current operation with junction temperature maintained at or below 110°C. This performance is based on independent test data, Philips Lumileds historical data from tests run on similar material systems, and internal LUXEON reliability testing. Observation of design limits included in this data sheet is required in order to achieve this projected lumen maintenance.

Environmental Compliance

Philips Lumileds is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON S is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS directive. Philips Lumileds will not intentionally add the following restricted materials to the LUXEON S: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Product Selection

Product Selection for LUXEON S, Junction Temperature = 85°C [2]

Table 1.

Nominal CCT	Part Number	Minimum CRI	Typical CRI	Minimum Luminous Flux (lm) Φ_V	Typical Luminous Flux (lm) Φ_V
3000K	LXS8-PW30	80	85	1175	1300

Notes for Table 1:

1. Philips Lumileds maintains a tolerance of ± 6.5% on luminous flux and ± 2 on CRI measurements.
2. Test current is 700 mA for all LXSx-PWxx products.

Optical and Electrical Characteristics

LUXEON S at Test Current [1]
Junction Temperature = 85°C

Table 2.

Nominal CCT	Color Temperature [2], [5] CCT Min.	CCT Typ.	CCT Max.	Typical Total Included Angle [3] (degrees) $\theta_{0.90V}$	Typical Viewing Angle [4] (degrees) 2θ 1/2
3000K	2870K	3045K	3220K	135	115

Notes for Table 2:

1. Test current is 700 mA for all LXSx-PWxx products.
2. CCT ± 5% tester tolerance.
3. Total angle at which 90% of total luminous flux is captured.
4. Viewing angle is the off axis angle from lamp centerline where the luminous intensity is ½ of the peak value.
5. All white products are built with Indium Gallium Nitride (InGaN).

Electrical Characteristics at 700 mA for LUXEON S
Junction Temperature = 85°C

Table 3.

Nominal CCT	Forward Voltage V_f [3] (V) Min.	Typ.	Max.	Typical Temperature Coefficient of Forward Voltage [2] (mV/°C) $\Delta V_f / \Delta T_J$	Typical Thermal Resistance Junction to Thermal Pad (°C/W) $R\theta_{J-C}$
3000K	24.5	27	30.5	- 18 to - 36	1.3

Notes for Table 3:

1. Philips Lumileds maintains a tolerance of 0.5% on forward voltage measurements.
2. Measured between 25°C ≤ T_J ≤ 110°C at I_f = 700 mA
3. Dynamic resistance is the inverse of the slope in linear forward voltage model for LEDs. See Figure 13.

Absolute Maximum Ratings

Table 4.

Parameter	Maximum Performance
DC Forward Current	700 mA
Peak Pulsed Forward Current	700 mA
ESD Sensitivity	< 8000V Human Body Model (HBM) Class 3A JESD22-A114-E < 400V Machine Model (MM) Class B JESD22-A115-B
Storage Temperature	- 40°C - 135°C
LED Junction Temperature [1]	115
Operating Case Temperature at 700 mA	- 40°C - 85°C
Autoclave Conditions	121°C at 2 ATM 100% Relative Humidity for 96 Hours Maximum
Reverse Voltage (V_r)	LUXEON S LEDs are not designed to be driven in reverse bias

Note for Table 4:

1. Proper current derating must be observed to maintain junction temperature below the maximum

Mechanical Dimensions

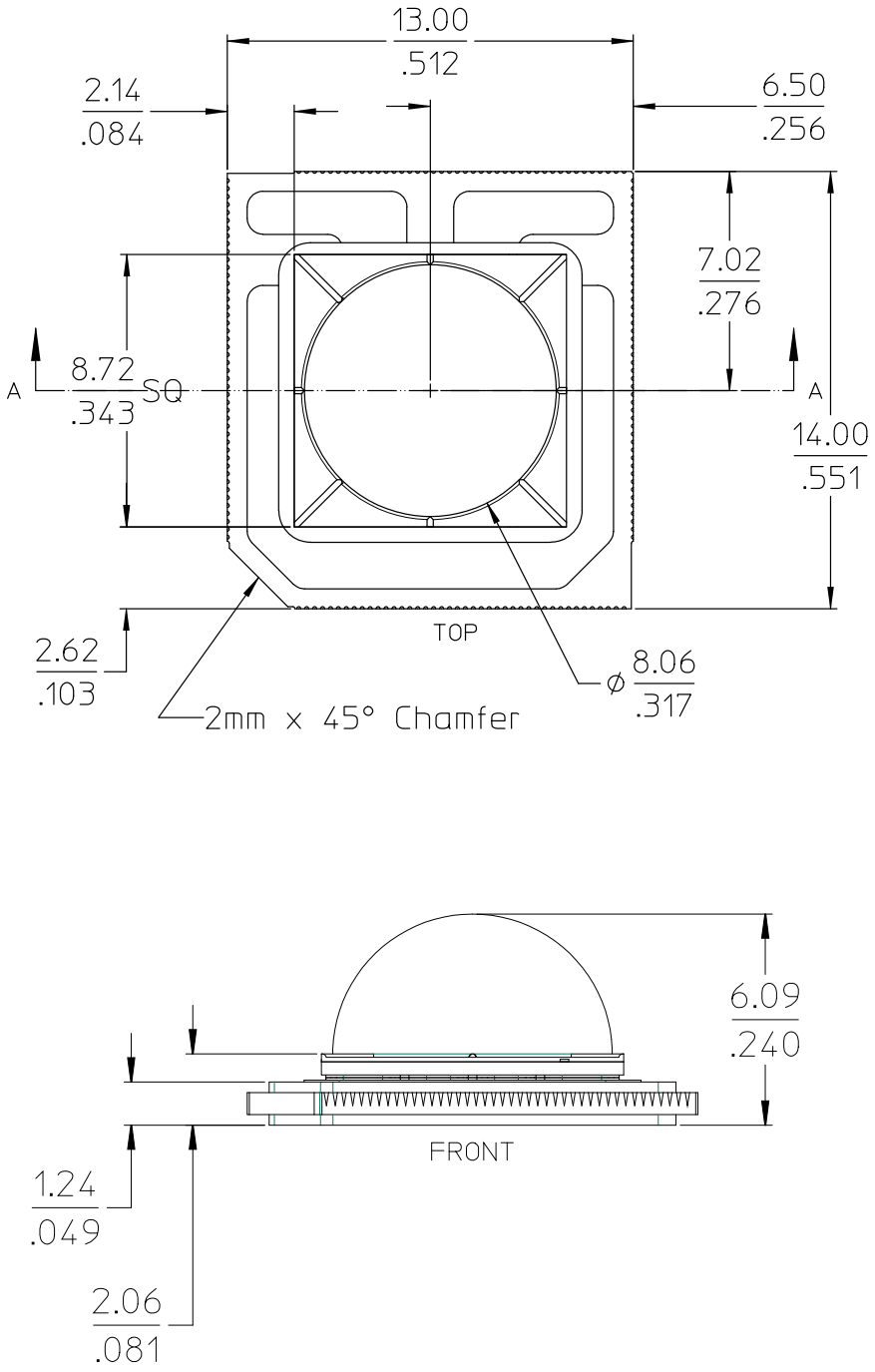

Figure 1. Package outline drawing.

Notes for Figure 1:

- Care should be taken to avoid damage to the lens or the interior of the device that can be damaged by excessive force to the lens.
- Drawings not to scale..
- All dimensions are in millimeters.
- The Thermal Pad is electrically isolated from the Anode and Cathode contact pads.

Relative Spectral Distribution vs. Wavelength Characteristics

LUXEON S (3000K) at Test Current, Junction Temperature = 85°C

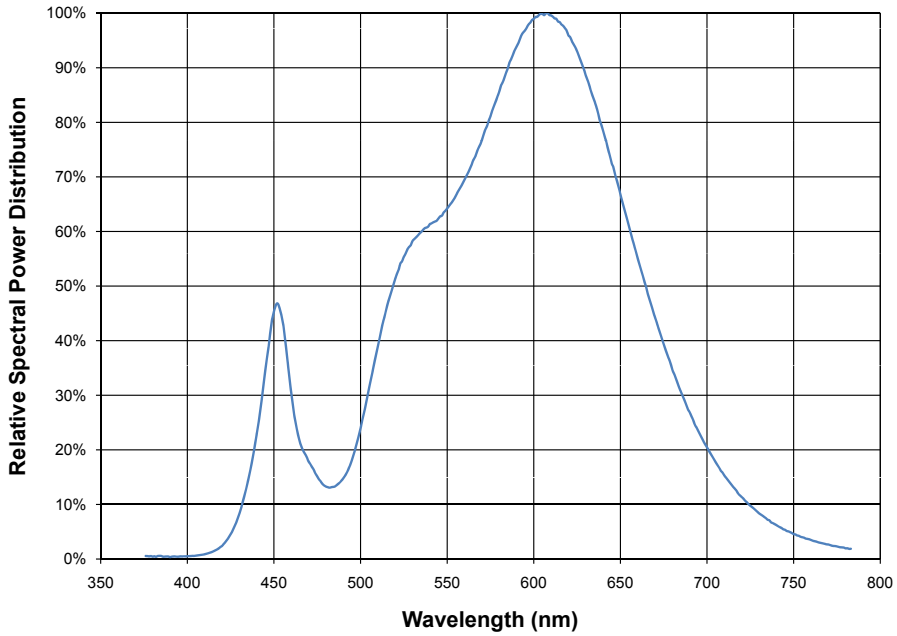

Figure 2. Color spectrum of 3000K, 80 minimum CRI emitters, integrated measurement for LXS8-PW30.

Light Output Characteristics over Temperature

Relative Light Output Characteristics over Temperature at Test Current

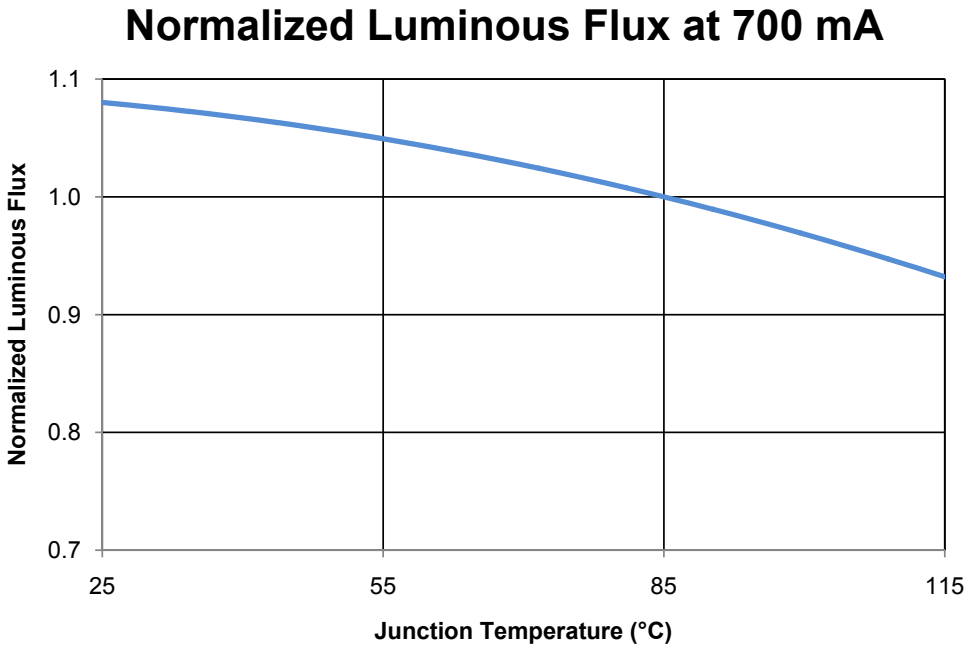

Figure 3. Relative light output vs. junction temperature.

Typical Forward Current Characterisics

Typical Forward Current vs. Forward Voltage, Junction Temperature = 85°C

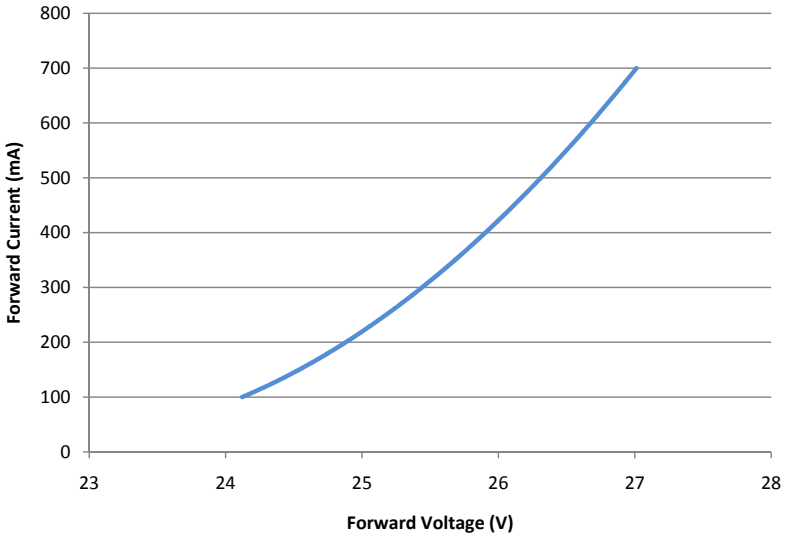

Figure 4. Forward current vs. forward voltage, junction temperature = 85°C.

Typical Relative Luminous Flux vs. Forward Current Junction Temperature = 85°C

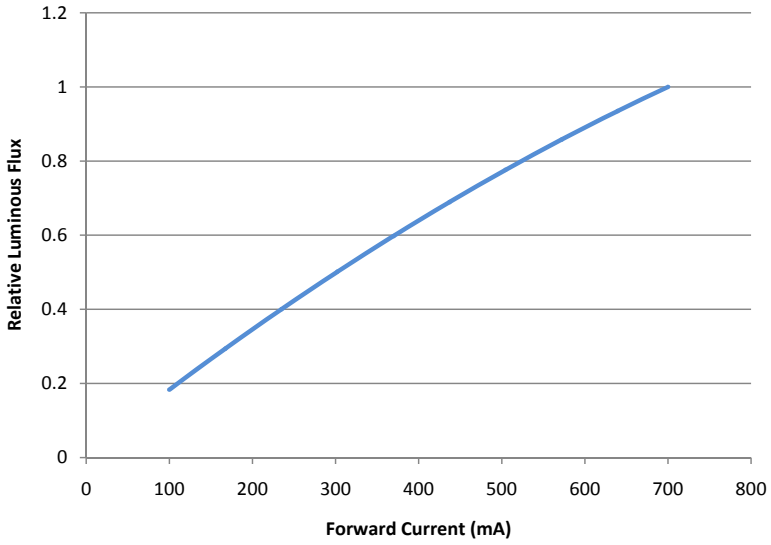

Figure 5. Typical relative luminous flux vs. forward current, junction temperature = 85°C.

Current Derating Curves

Current Derating Curve for 700 mA Drive Current

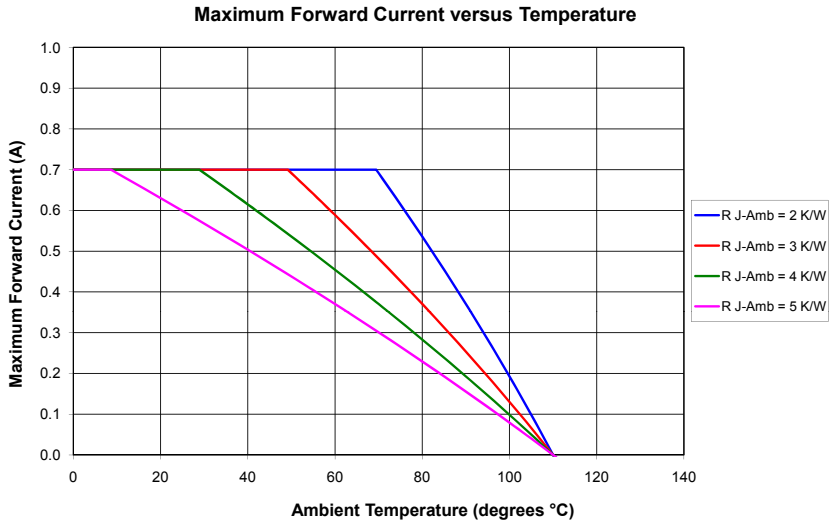

Figure 6. Maximum forward current vs.ambient temperature, based on T_{JMAX} = 110°C.

Typical Radiation Patterns

Typical Spatial Radiation Pattern for Lambertian

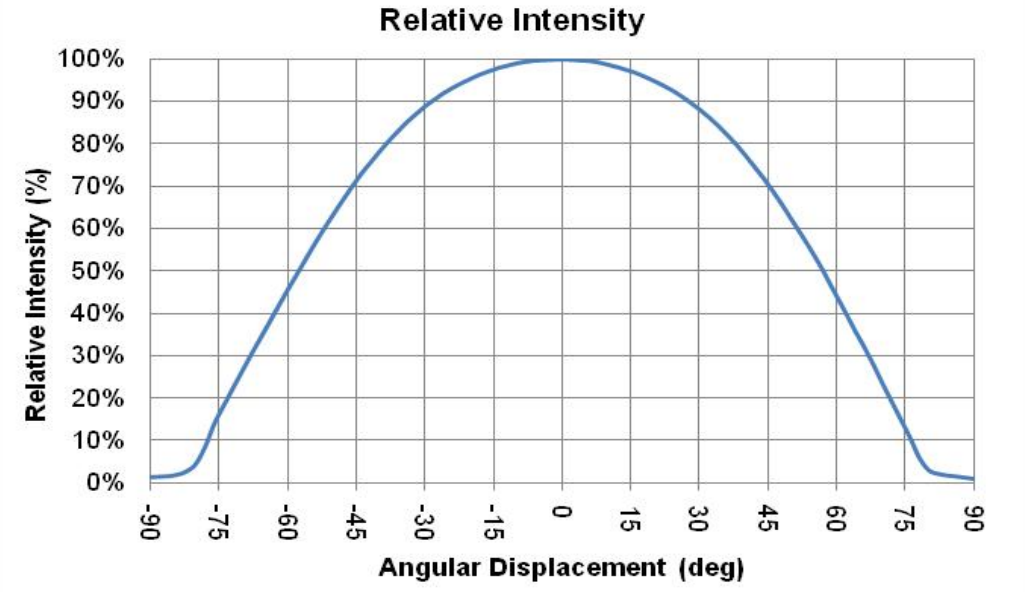

Figure 7. Typical representative spatial radiation pattern for lambertian.

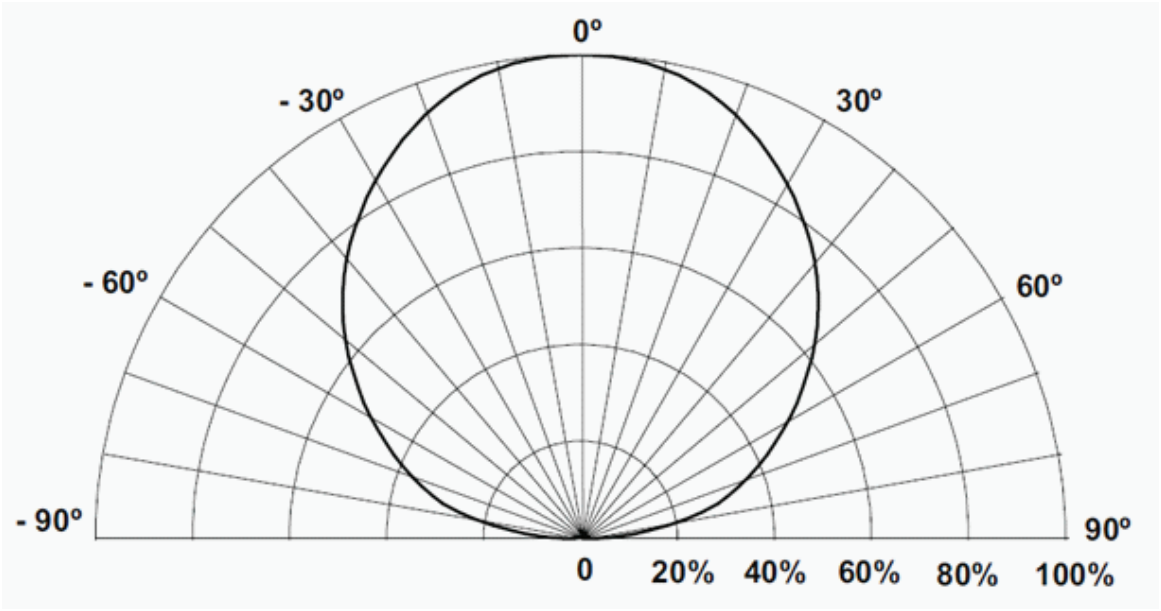

Figure 8. Typical polar radiation pattern for lambertian.

Packaging

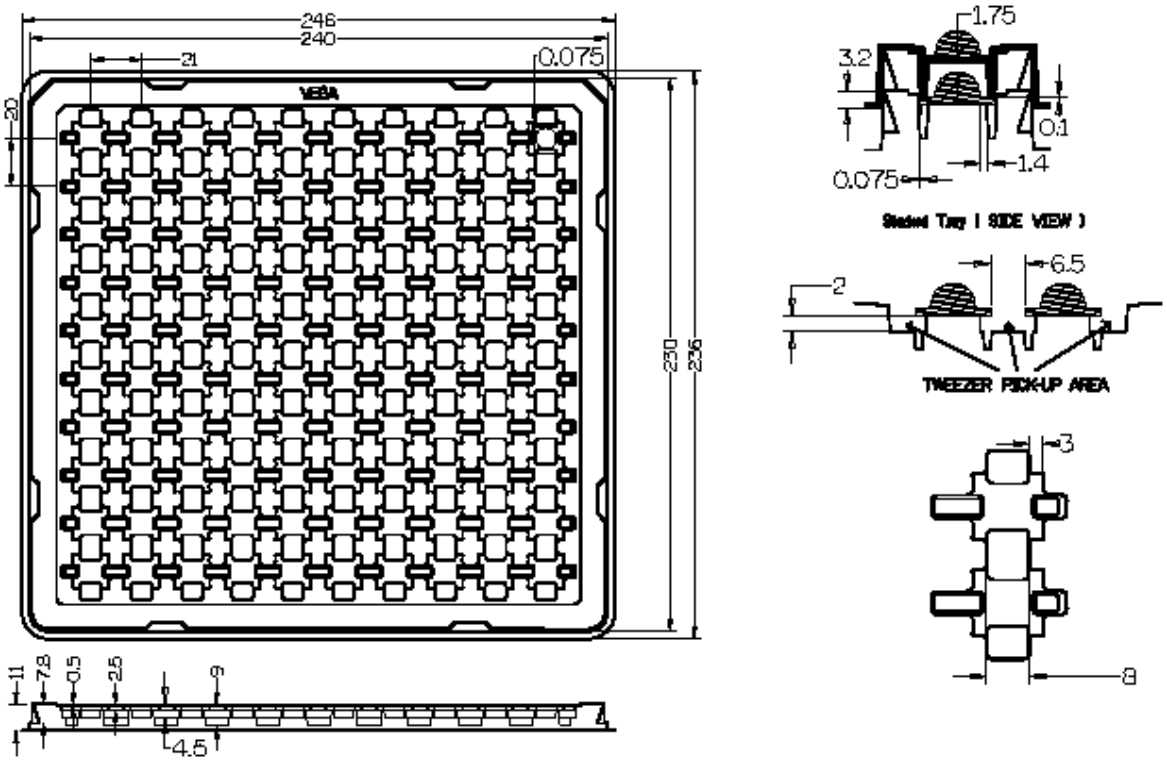

Figure 9. LUXEON S devices are packaged in stackable trays containing 100 pieces per tray. The trays are designed to provide easy access to the thermal pad at the bottom of the LUXEON S emitter.

Product Binning and Labeling

Purpose of Product Binning

In the manufacturing of semiconductor products, there is a variation of performance around the average values given in the technical data sheets. For this reason, Philips Lumileds bins the LED components for luminous flux, color and forward voltage (V_f).

Decoding Product Bin Labeling

LUXEON S emitters are labeled using a four digit alphanumeric code (CAT code) depicting the bin values for emitters packaged in a single tray. All emitters packaged within a tray are of the same 2-variable bin combination.

Trays of 3000K emitters are labeled with a four digit alphanumeric CAT code following the format below.

A73B

A = Flux bin (H, J, K)
73 = within 3 step MacAdam ellipse at 3000K Correlated Color Temperature
B = Vf bin (H, J , K)

Luminous Flux Bins

Table 5 lists the standard photometric luminous flux bins for LUXEON S emitters (tested and binned at 700 mA with junction temperature of 85°C).

Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

Table 5.

Flux Bins		
Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)
H	1175	1300
J	1300	1425
K	1425	1575

LUXEON S Bin Structure

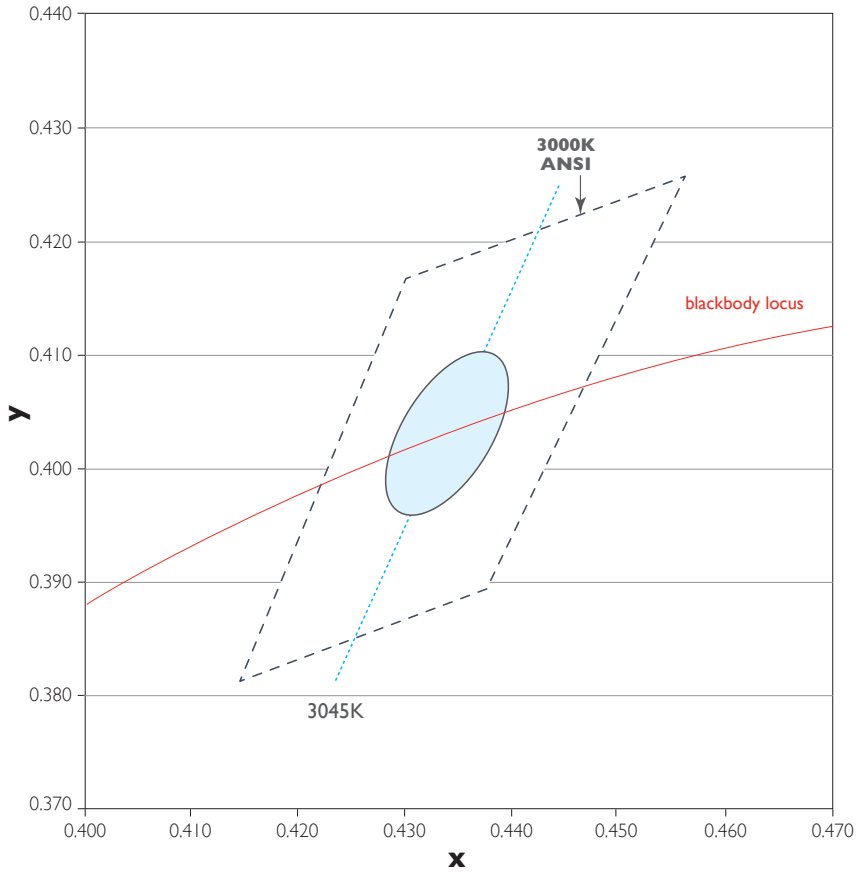

Figure 10. LUXEON S bin structure is within a single 3-step MacAdam Ellipse.

LUXEON S is tested and binned by x, y coordinates. The center of the ellipse is 3045K (x = 0.4338, y = 0.4030).

Forward Voltage Bins

Table 6 lists minimum and maximum V_f bin values per emitter. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

Table 6.

V_f Bins		
Bin Code	Minimum Forward Voltage (V)	Maximum Forward Voltage (V)
H	24.5	26.0
J	26.0	27.5
K	27.5	29.0
L	29.0	30.5

Company Information

Philips Lumileds is a leading provider of power LEDs for everyday lighting applications. The company's records for light output, efficacy and thermal management are direct results of the ongoing commitment to advancing solid-state lighting technology and enabling lighting solutions that are more environmentally friendly, help reduce CO_2 emissions and reduce the need for power plant expansion. Philips Lumileds LUXEON® LEDs are enabling never before possible applications in outdoor lighting, shop lighting, home lighting, consumer electronics, and automotive lighting.

Philips Lumileds is a fully integrated supplier, producing core LED material in all three base colors, (Red, Green, Blue) and white. Philips Lumileds has R&D centers in San Jose, California and in the Netherlands, and production capabilities in San Jose, Singapore and Penang, Malaysia. Founded in 1999, Philips Lumileds is the high flux LED technology leader and is dedicated to bridging the gap between solid-state technology and the lighting world. More information about the company's LUXEON LED products and solid-state lighting technologies can be found at www.philipslumileds.com.

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