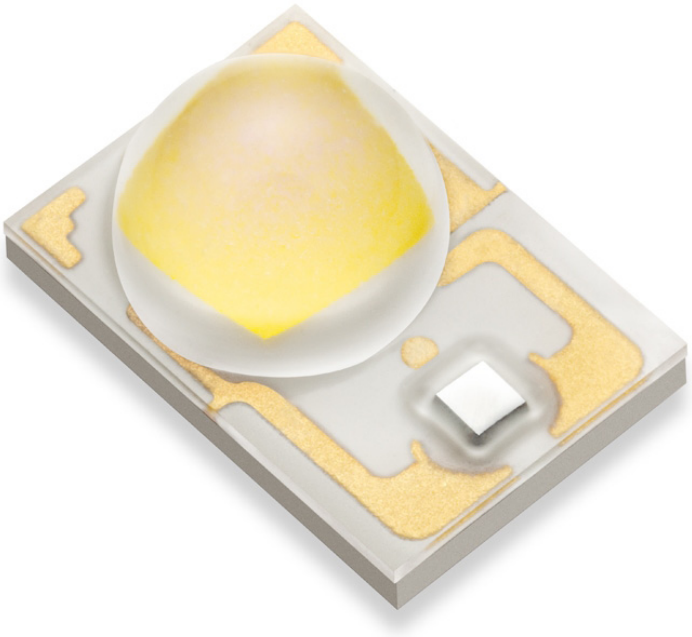


LUXEON A

Freedom From Binning
Hot Tested
Superior Quality of Light

Technical Datasheet DS100

LUXEON
NEVER BEFORE POSSIBLE

RoHS Compliant

LUXEON® A

Freedom From Binning

Introduction

LUXEON® A brings Illumination Grade LED light sources to the lighting market. It has never been simpler to design LED solutions and bring them to market. With hot testing and color binning, every LUXEON A is tested and specified at real world operating conditions, Tj 85°C. With *Freedom From Binning*, every LUXEON A LED falls within a single 3 step MacAdam ellipse centered on the black body curve and now, luminaire manufacturers can be confident in color consistency from LED to LED. There's never been a more supportable and consistent light emitting diode. The superior quality of light, light output, and real world efficacy enable leading performance and efficient solution development in a wide variety of segments including retrofit bulbs, office, hospitality, school, and home lighting.

- *Freedom From Binning* for superior quality of light
- Hot tested and color binned at Tj 85°C
- Maximum light output and lowest cost of light
- Specified color over angle
- Simplified design and accellerated time to market.

PHILIPS
LUMILEDS

Table of Contents

General Product Information

Product Nomenclature

LUXEON A emitters are tested and binned "hot" under conditions comparable to those found in "real-world" lighting products. The test conditions for LUXEON A are 700 mA D.C. with junction temperature at 85°C.

The part number designation for the LUXEON A emitters is explained as follows:

L X H A - B C D E

Where:

A — designates minimum CRI performance (value 8 = 80 minimum)

B — designates radiation pattern (value P for Lambertian)

C — designates color (value W = White)

D & E — designates nominal ANSI CCT (value 27 = 2700K and 30 = 3000K)

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

L X H x - P W x x

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 A products will deliver, on average, 70% lumen maintenance (L70) at 50,000 hours of operation at a forward current of 1000 mA. This projection is based on constant current operation with junction temperature maintained at or below 135°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 A is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS and REACH directives. Philips Lumileds will not intentionally add the following restricted materials to the LUXEON A: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Product Selection

Product Selection Guide for LUXEON A Emitters Junction Temperature = 85°C

Table 1.

Performance at Test Current					
Nominal ANSI CCT	Part Number	Minimum CRI	Typical CRI	Minimum Luminous Flux (lm) [1] [2]	Test Current (mA)
2700K	LXH8-PW27	80	85	140	700
3000K	LXH8-PW30	80	85	150	700

Notes for Table 1:

1. Minimum luminous flux performance within published operating conditions. Philips Lumileds maintains a tolerance of ± 6.5% on luminous flux measurements.
2. LUXEON A products with even higher luminous flux levels will become available in the future. Please consult Philips Lumileds or Future Lighting Solutions for more information.

Typical Luminous Flux Characteristics at 350 mA, 700 mA and 1000 mA for LUXEON A, Junction Temperature = 85°C

Table 2.

Nominal ANSI CCT	Part Number	Typical Luminous Flux (lm) @ 350 mA Forward Current	Typical Luminous Flux (lm) @ 700 mA Forward Current	Typical Luminous Flux (lm) @ 1000 mA Forward Current
2700K	LXH8-PW27	89	160	218
3000K	LXH8-PW30	92	165	224

Optical Characteristics

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

Table 3.

Nominal ANSI CCT	Part Number	Color Temperature [2] CCT Typical	Typical Total Included Angle [3] (degrees) $\theta_{0.90V}$	Typical Viewing Angle [4] (degrees) 2θ 1/2
2700K	LXH8-PW27	2725K	160	120
3000K	LXH8-PW30	3045K	160	120

Notes for Table 3:

1. Test current is 700 mA D.C. for all LXH8-PWxx emitters.
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.

Electrical Characteristics

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

Table 4.

Nominal ANSI CCT	Forward Voltage V_f [1] (V) Min.	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) $R\theta_{J-C}$
2700K	2.5	3.5	-1.8 to -2.4	6
3000K	2.5	3.5	-1.8 to -2.4	6

Notes for Table 4:

1. Philips Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
2. Measured between 25°C = T_J = 110°C at I_f = 700 mA.

Typical Electrical Characteristics at 350 mA, 700 mA and 1000 mA for LUXEON A, Junction Temperature = 85°C

Table 5.

Nominal ANSI CCT	Typical Forward Voltage V_f (V) @ 350 mA Forward Current	Typical Forward Voltage V_f (V) @ 700 mA Forward Current	Typical Forward Voltage V_f (V) @ 1000 mA Forward Current
2700K	2.73	2.88	2.98
3000K	2.73	2.88	2.98

Note for Table 5:

- Philips Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.

Absolute Maximum Ratings

Table 6.

Parameter	2700K and 3000K
DC Forward Current (mA)	1000 mA
Peak Pulsed Forward Current (mA) [2]	1200 mA
Average Forward Current (mA)	1000 mA
ESD Sensitivity	< 8000V Human Body Model (HBM) Class 3B JESD22-A114-E
LED Junction Temperature[1]	150°C
Operating Case Temperature at 700 mA	-40°C - 135°C
Storage Temperature	-40°C - 135°C
Soldering Temperature	JEDEC 020c 260°C
Allowable Reflow Cycles	3
Autoclave Conditions	121°C at 2 ATM 100% Relative Humidity for 96 Hours Maximum
Reverse Voltage (Vr)	LUXEON A LEDs are not designed to be driven in reverse bias

Notes for Table 6:

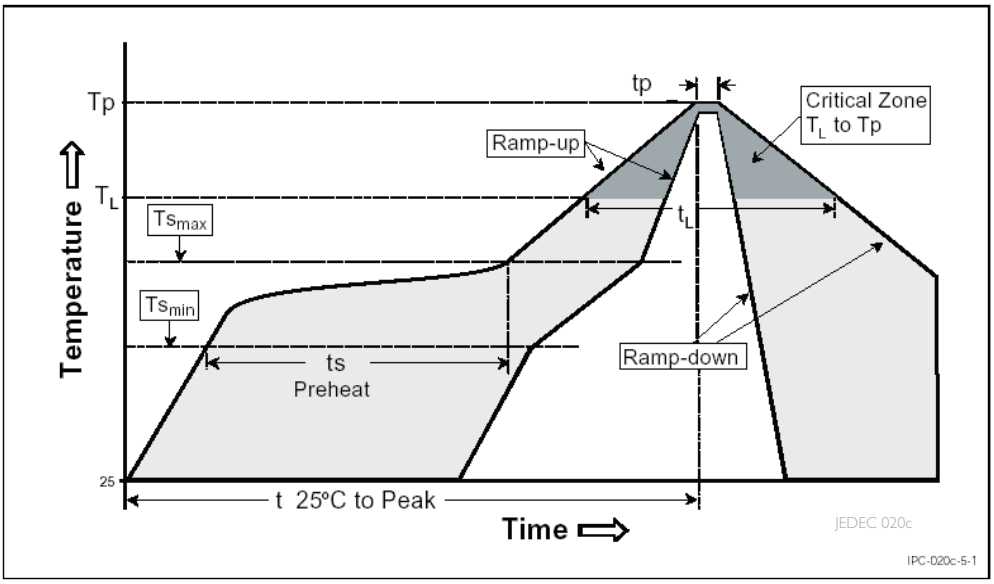
1. Proper current derating must be observed to maintain junction temperature below the maximum.
2. Maximum Rating of 1200 mA Peak Pulsed Forward Current can be applied for device operation not to exceed 60 seconds (cumulative time).

JEDEC Moisture Sensitivity

Table 7.

Level	Floor Life		Soak Requirements Standard	
	Time	Conditions	Time	Conditions
1	unlimited	≤ 30°C / 85% RH	168h + 5 / -0	85°C / 85% RH

Reflow Soldering Characteristics



Temperature Profile for Table 8.

Table 8.

Profile Feature	Lead Free Assembly
Average Ramp-Up Rate (Ts_{max} to T_p)	3°C / second max
Preheat Temperature Min (Ts_{min})	150°C
Preheat Temperature Max (Ts_{max})	200°C
Preheat Time (ts_{min} to ts_{max})	60 - 180 seconds
Temperature (T_L)	217°C
Time Maintained Above Temperature (T_L)	60 - 150 seconds
Peak / Classification Temperature (T_P)	260°C
Time Within 5°C of Actual Peak Temperature (t_p)	20 - 40 seconds
Ramp - Down Rate	6°C / second max
Time 25°C to Peak Temperature	8 minutes max

Notes for Table 8:

- All temperatures refer to the application Printed Circuit Board (PCB), measured on the surface adjacent to the package body.
- For additional information on thermal measurement guidelines please refer to Application Brief AB33.

Mechanical Dimensions

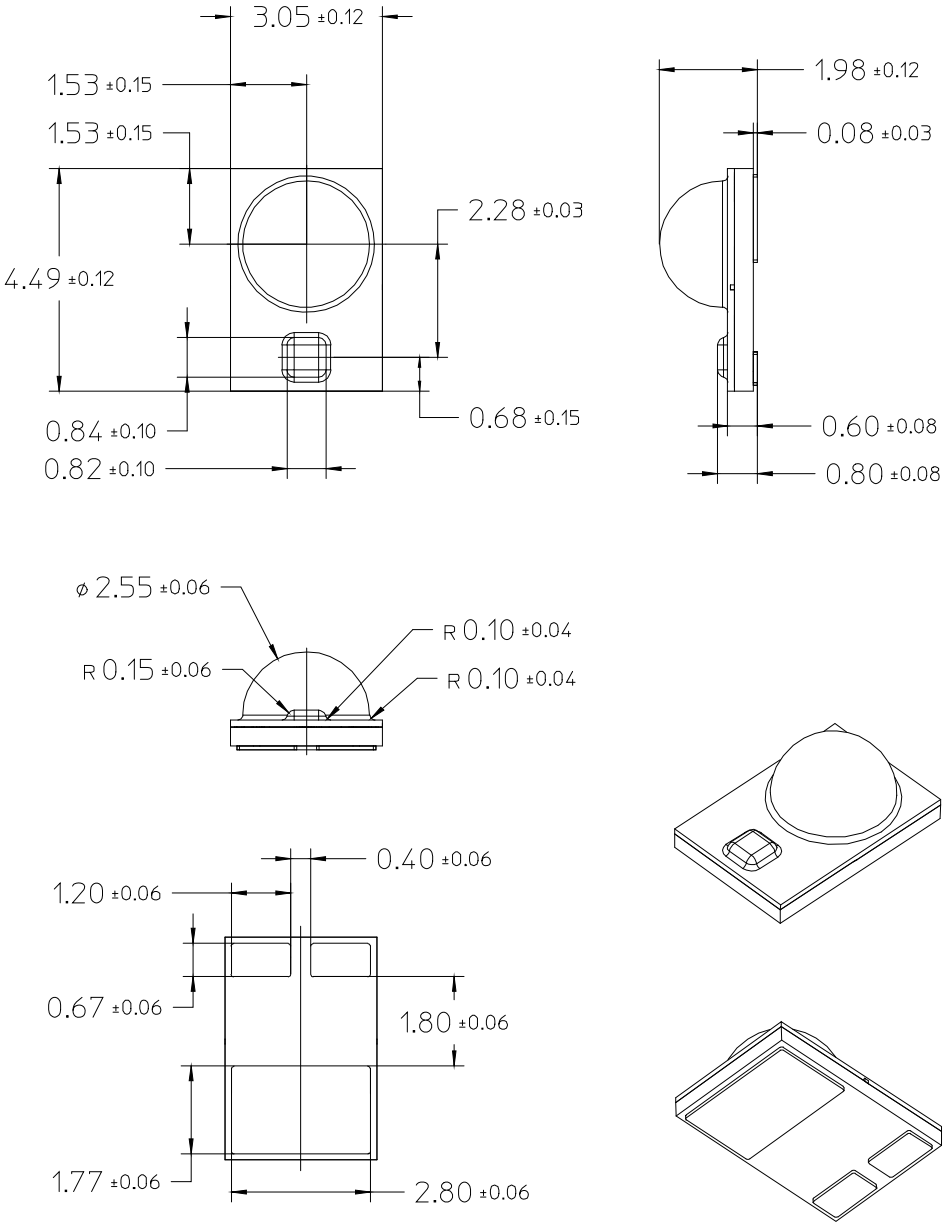
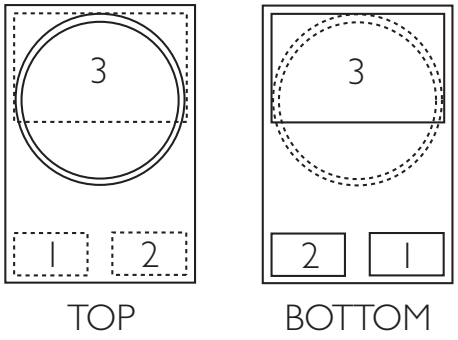


Figure 1. Package outline drawing.

Notes for Figure 1:

- Do not handle the device by the lens --care must 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.

Pad Configuration



PAD	FUNCTION
1	CATHODE
2	ANODE
3	THERMAL

Figure 2. Pad configuration.

Note for Figure 2:

- The Thermal Pad is electrically isolated from the Anode and Cathode contact pads.

Solder Pad Design

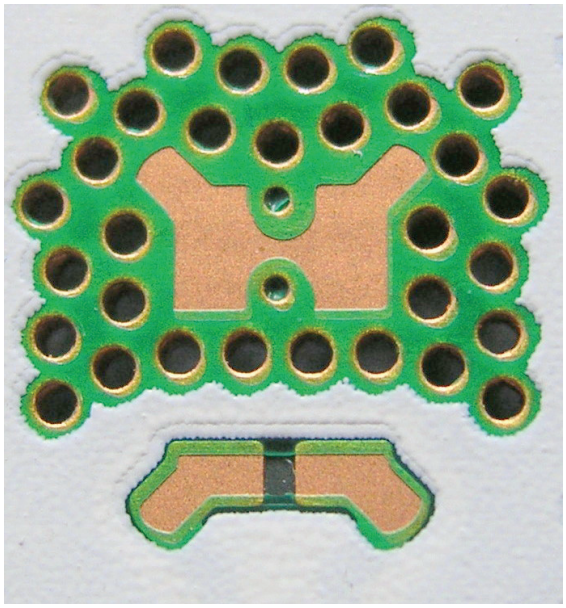


Figure 3. Solder pad layout.

Note for Figure 3:

- The photograph shows the recommended LUXEON A layout on Printed Circuit Board (PCB). This design easily achieves a thermal resistance of 7K/W.
- Application Brief AB32 provides extensive details for this layout. Printed Circuit Board layout files (.dwg) are available at www.philipslumileds.com and www.philipslumileds.cn.com.

Relative Spectral Distribution vs. Wavelength Characteristics

2700K at Test Current, Junction Temperature = 85°C

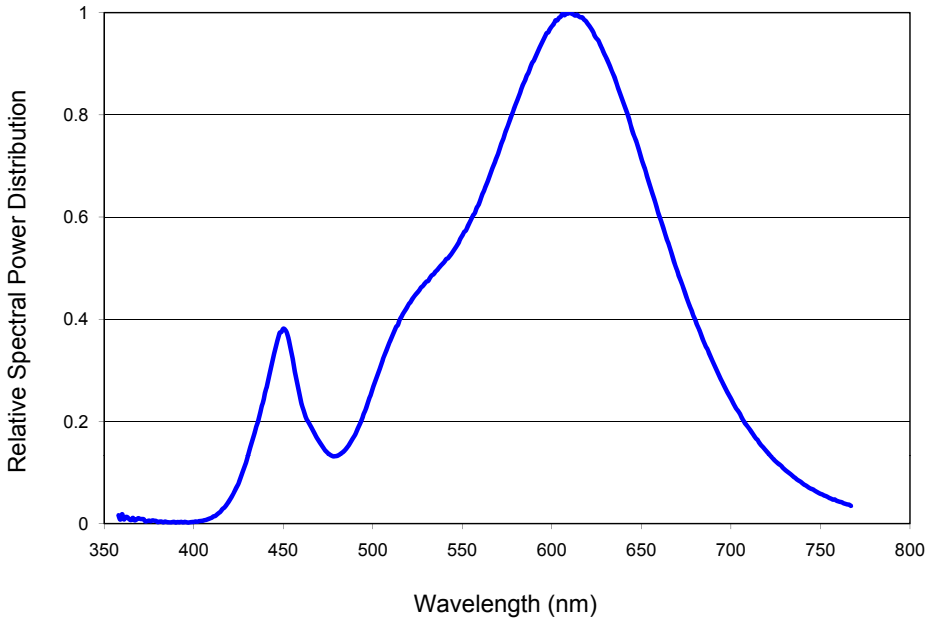


Figure 4. Color spectrum of LXH8-PW27 emitter, integrated measurement.

3000K at Test Current, Junction Temperature = 85°C

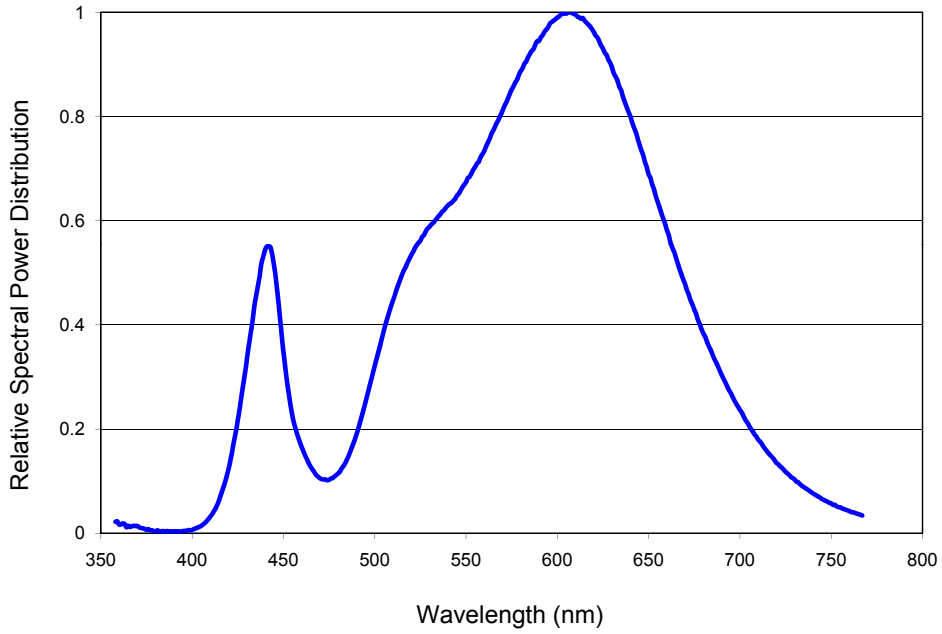


Figure 5. Color spectrum of LXH8-PW30 emitter, integrated measurement.

Typical Light Output Characteristics over Temperature

2700K and 3000K at Test Current

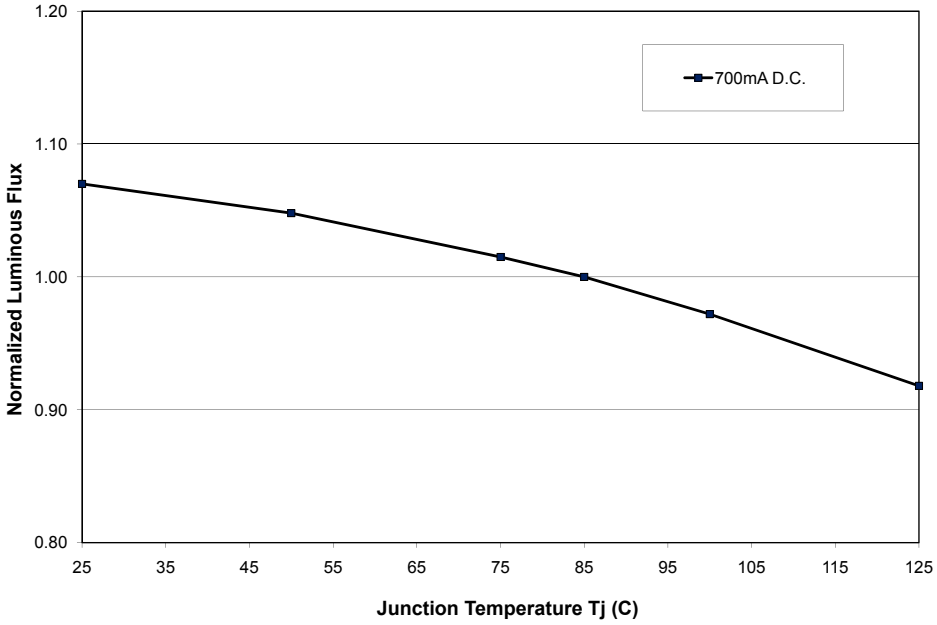


Figure 6. Relative light output vs. junction temperature.

Typical Forward Current Characteristics

2700K and 3000K, Junction Temperature = 85°C

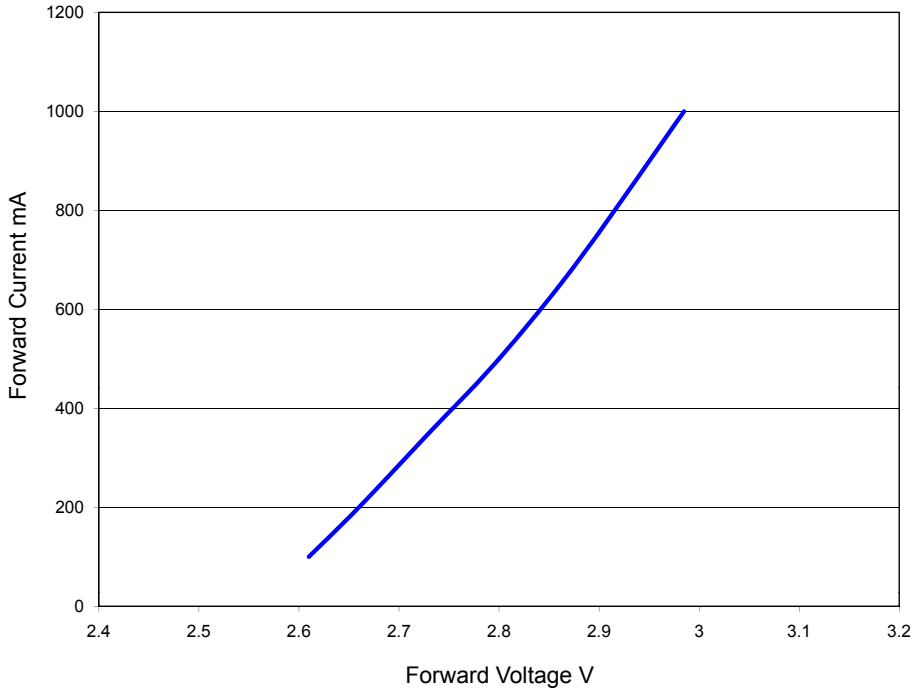


Figure 7. Forward current vs. forward voltage.

Typical Relative Luminous Flux vs. Forward Current for 2700K and 3000K Emitters, Junction Temperature = 85°C

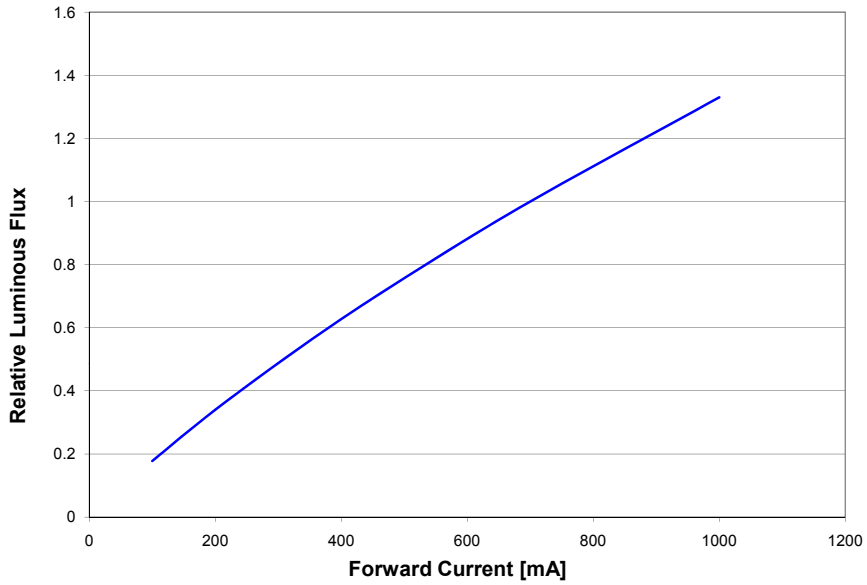


Figure 8. Typical relative luminous flux vs. forward current, junction temperature = 85°C.

Current Derating Curves

Current Derating Curve for 350 mA Drive Current 2700K and 3000K Emitters

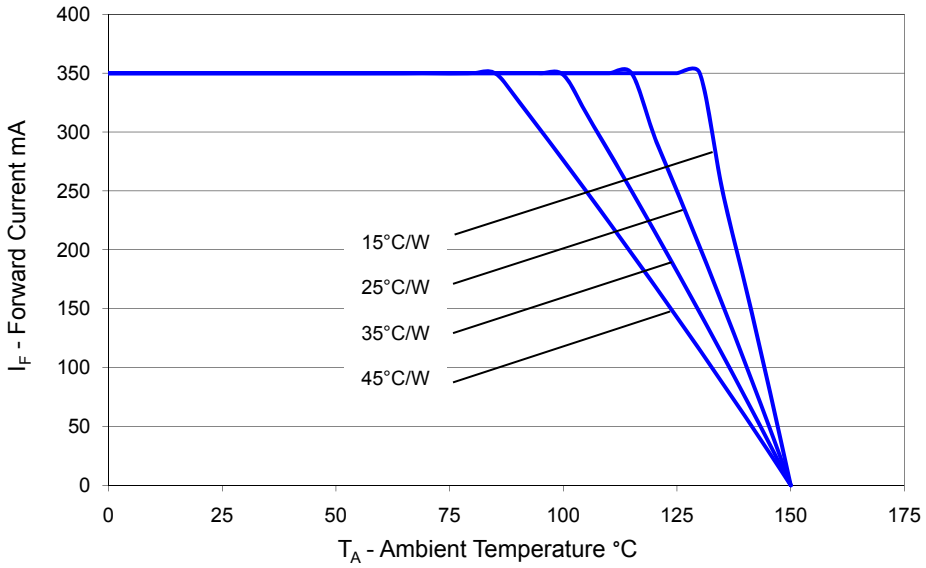


Figure 9. Maximum forward current vs. ambient temperature, based on T_{JMAX} = 150°C.

Current Derating Curve for 700 mA Drive Current 2700K and 3000K Emitters

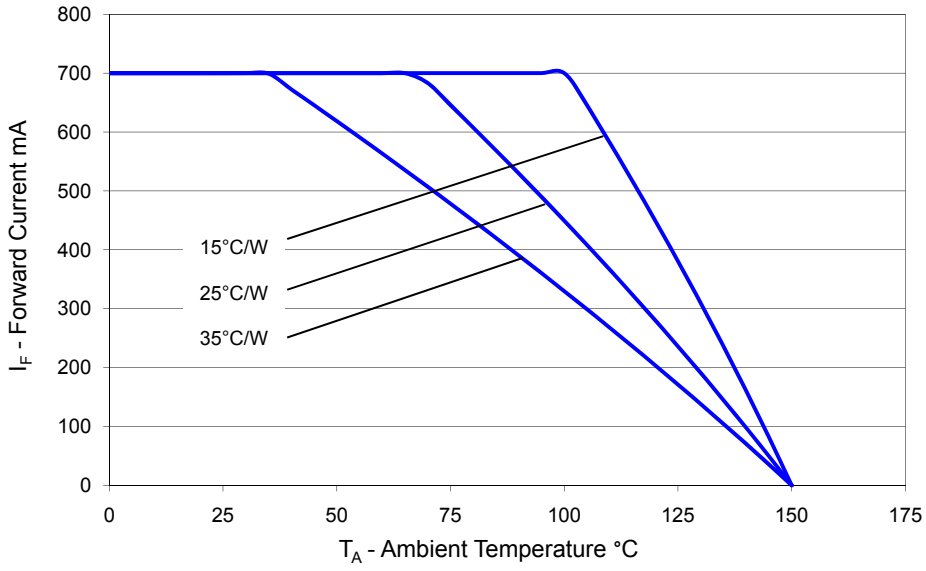


Figure 10. Maximum forward current vs. ambient temperature, based on T_{JMAX} = 150°C.

Current Derating Curve for 1000 mA Drive Current 2700K and 3000K Emitters

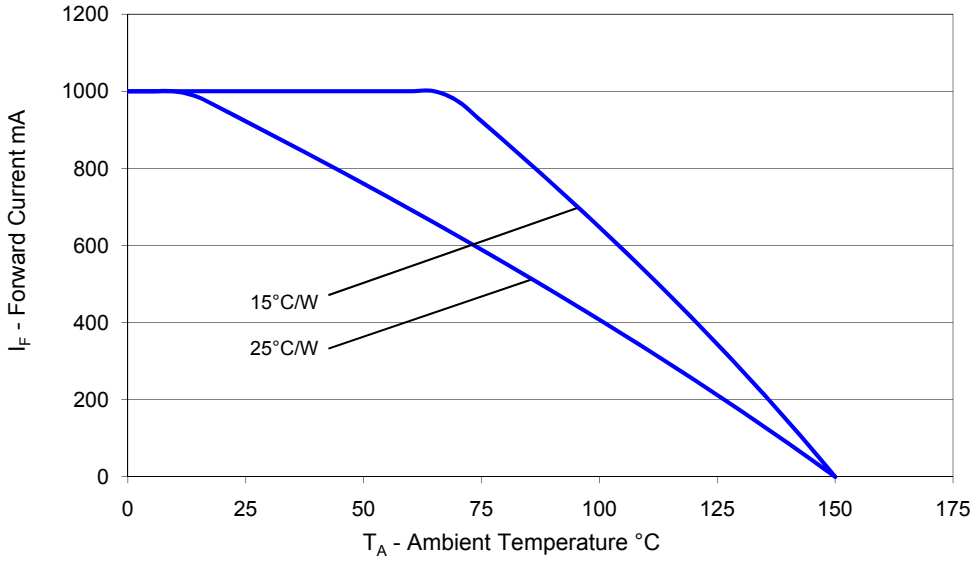


Figure 11. Maximum forward current vs. ambient temperature, based on T_{JMAX} = 150°C.

Typical Radiation Patterns

Typical Spatial Radiation Pattern for 2700K and 3000K Emitters

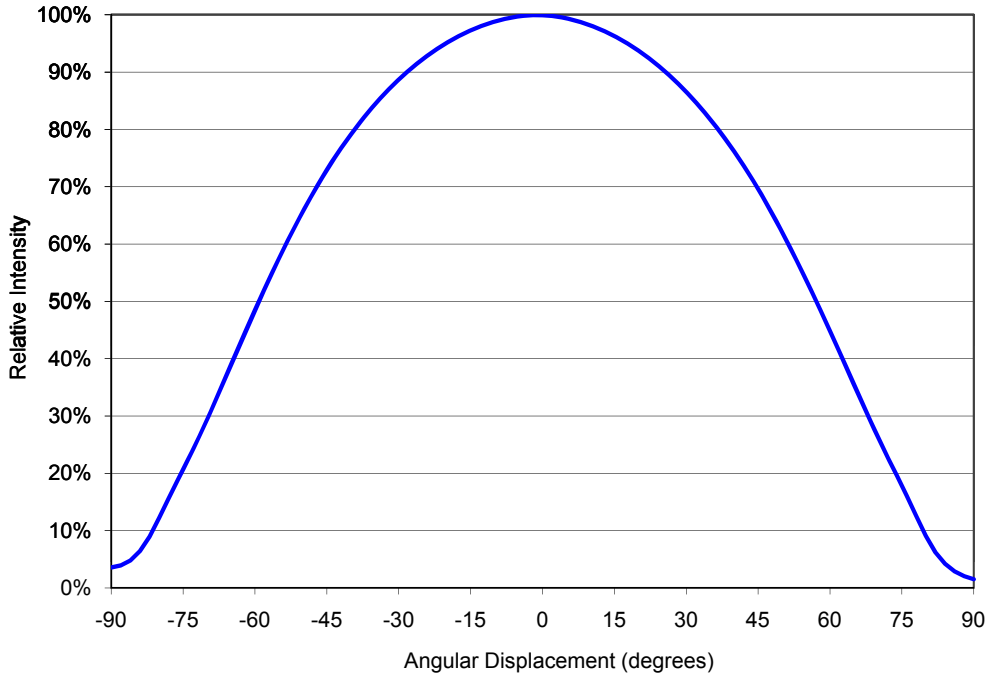


Figure 12. Typical representative spatial radiation pattern for 2700K and 3000K emitters.

Typical and Maximum du' and dv' Color Variation vs. Viewing Angle for 2700K LUXEON A

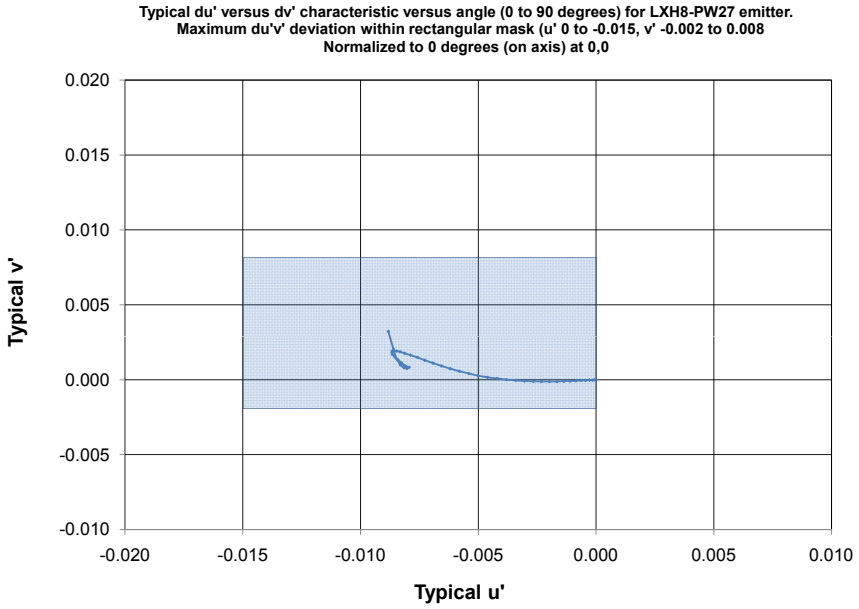


Figure 13. Applicable for LXH8-PW27 emitter.

Typical and Maximum du' and dv' Color Variation vs. Viewing Angle for 3000K LUXEON A

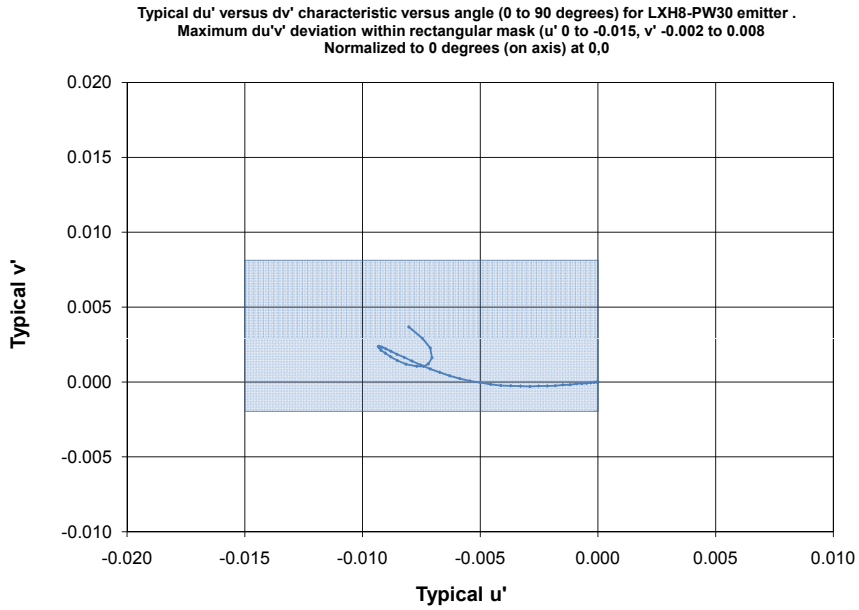
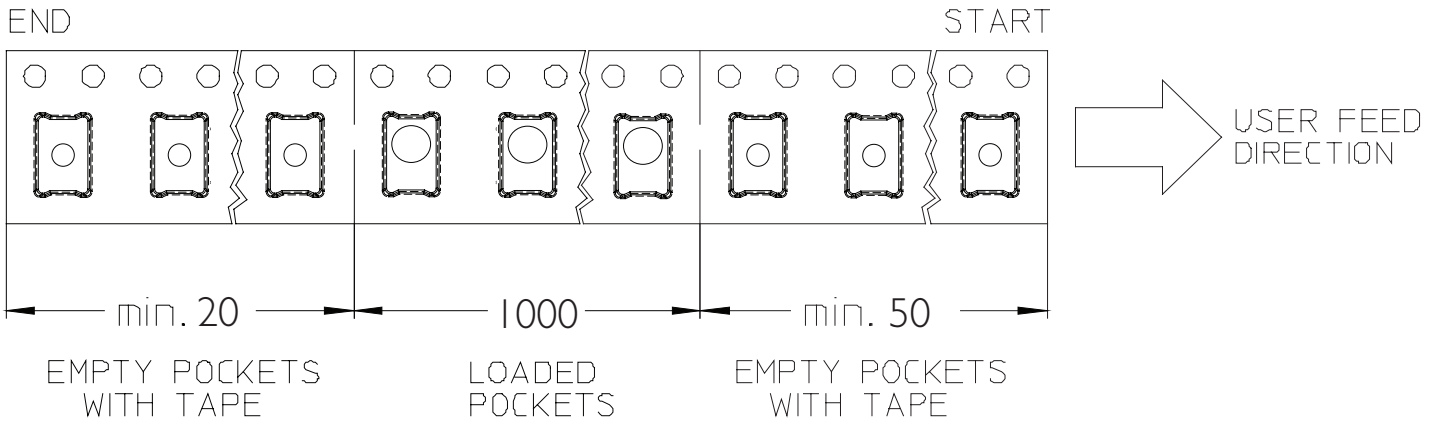
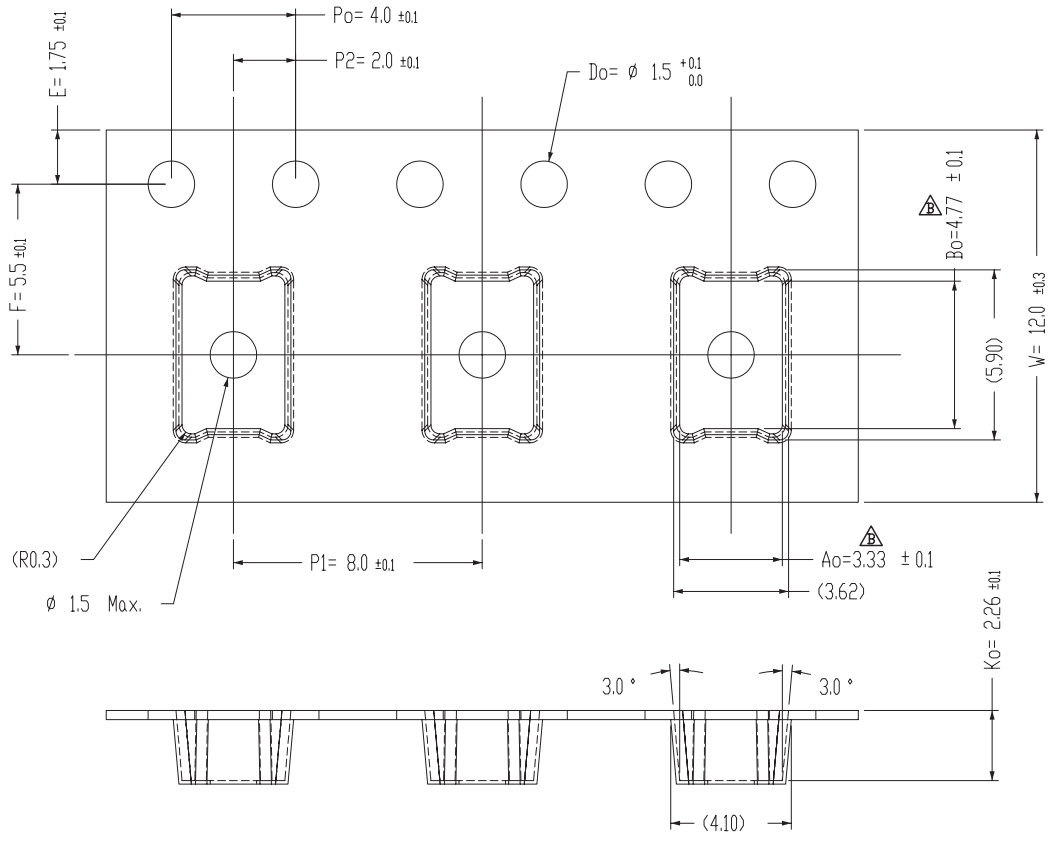
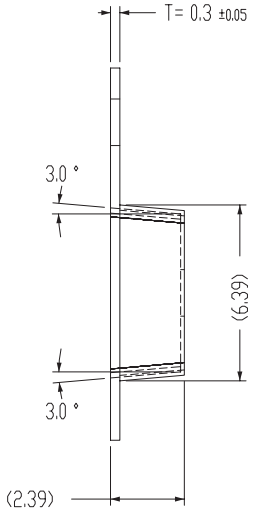


Figure 14. Applicable for LXH8-PW30 emitter.

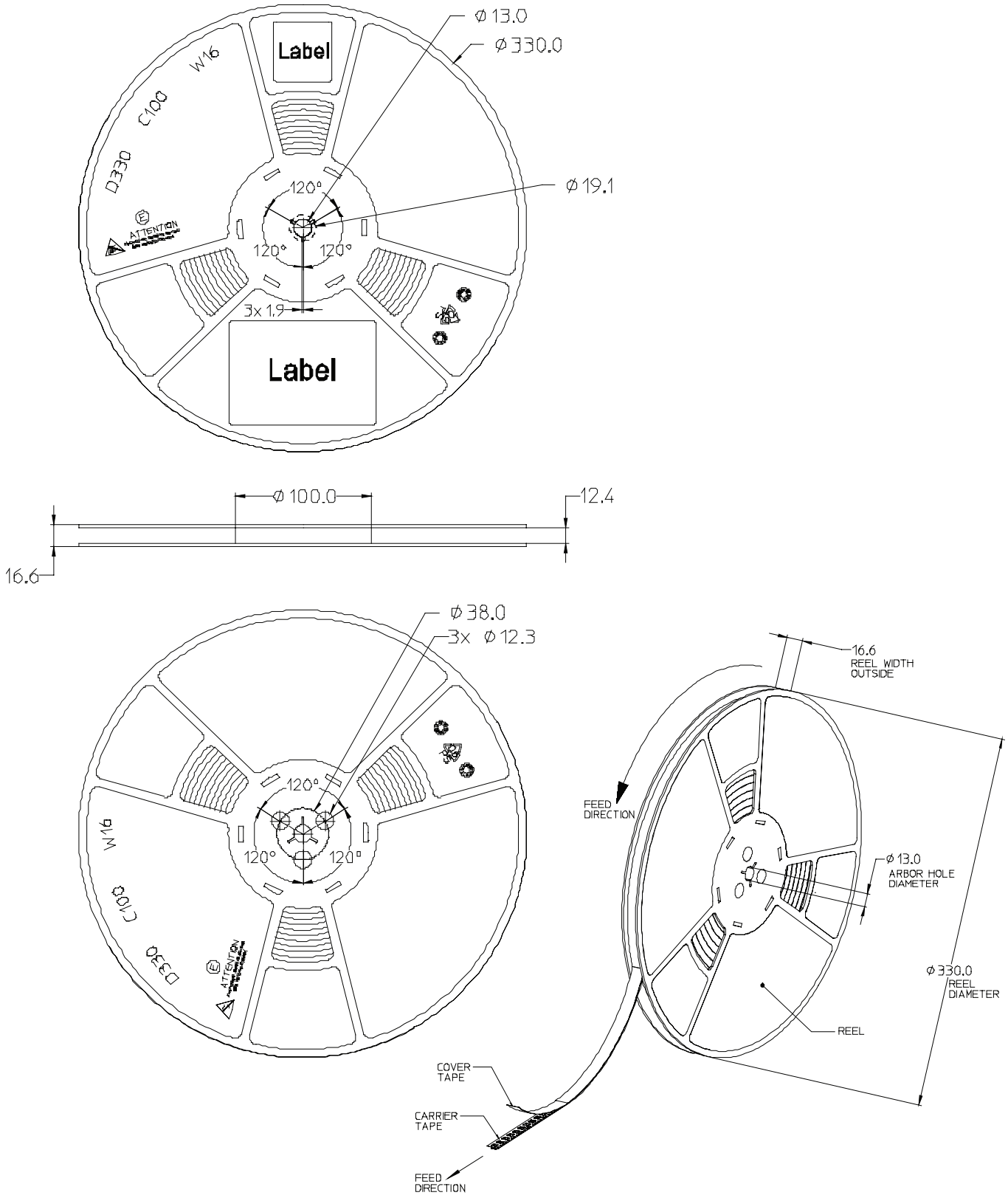
Emitter Pocket Tape Packaging







Emitter Reel Packaging



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 and forward voltage (V_f). Color is offered in a single 3-step MacAdam ellipse color space centered on the ANSI CCT color bins; 2725K for nominal 2700K and 3045K for nominal 3000K. For additional information please review the MacAdam ellipse technical definition section.

Decoding Product Bin Labeling

LUXEON A emitters are labeled using a two digit alphanumeric code (CAT code) depicting the bin values for emitters packaged on a single reel. All emitters packaged within a reel are of the same 2-variable bin combination. Using these codes, it is possible to determine optimum mixing and matching of products for consistency in a given application.

Reels of LUXEON A emitters are labeled with a two digit alphanumeric CAT code following the format below.

AB

A = Flux bin (Q, R and S)
B = V_f bin (P, R, S and T)

Luminous Flux Bins

Table 9 lists the standard photometric luminous flux bins for LUXEON A emitters (tested and binned at 700 mA D.C., Junction Temperature = 85°C.

Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.
Not all bins are available in all CCT's.

Table 9.

Flux Bins		
Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)
Q	140*	160
R	160	180
S	180	200

* 150 lm for LXH8-PW30

LUXEON A 2700K and 3000K 3-step MacAdam Ellipse Color Definition

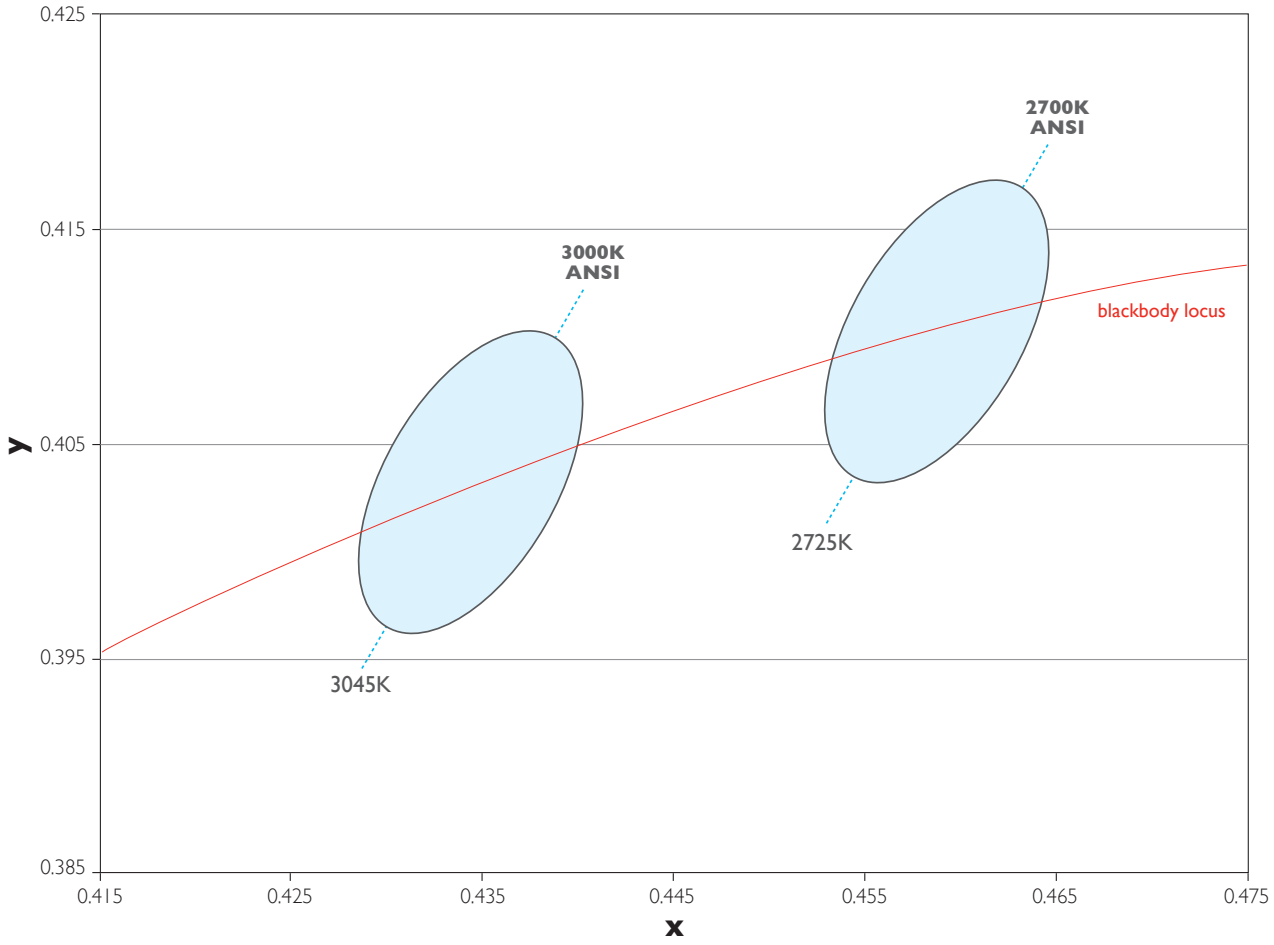
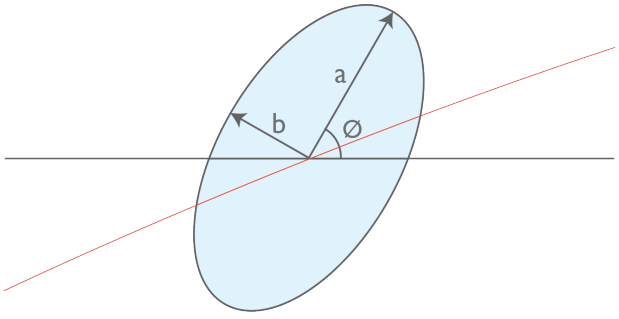


Figure 15. LUXEON A 2700K and 3000K 3-step MacAdam Ellipse color definition.



	2700K	3000K
Center point (cx, cy)	(0.4578, 0.4101)	(0.4338, 0.4030)
Major axis, a	0.00810	0.00834
Minor axis, b	0.00420	0.00408
Ellipse rotation angle	53.70°	53.22°

Forward Voltage Bins

Table 10 lists minimum and maximum V_f bin values per emitter (tested and binned at 700 mA). Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

Table 10.

V_f Bins

Bin Code	Minimum Forward Voltage (V)	Maximum Forward Voltage (V)
P	2.50	2.75
R	2.75	3.00
S	3.00	3.25
T	3.25	3.50

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, digital imaging, display 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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