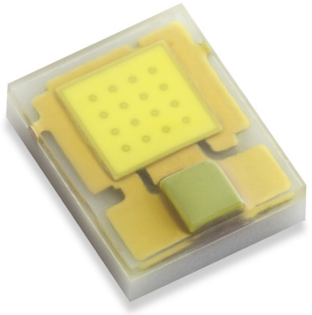
LUXEON C

Power Light Source



Introduction

The LUXEON C is the power LED that enables manufacturers of appliances, portable lighting solutions and power tools to economically incorporate high quality, high performance LEDs in their applications. LUXEON C delivers high lumens per dollar and 70% lumen maintenance at 20K hours in a very compact package that can be easily integrated into the smallest of spaces.

Features

- Typical light output of 95 lumens at 350 mA
- Small un-encapsulated light source simplifies optic design
- Die on ceramic construction reduces thermal management
- Maximum junction temperature of 135°C
- Maximum drive current 500 mA
- Best moisture sensitivity: JEDEC Level1, unlimited floor life—no need for reconditioning
- Small form factor: 2.04 x 1.64 x 0.7 mm

Benefits

- Leading flux density allows you to reduce the number of LEDs used, reducing your manufacturing cost
- Design smaller, sleeker solutions with ultra compact LEDs
- Small source size allows you to create efficient optical designs enabling lighting solutions with fewer LEDs
- Minimized thermal management reduces design complexity for optimized solutions
- High efficacy emitters require less electricity than conventional solutions

Key Applications

- Flash

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General Information

Product Nomenclature

LUXEON C is tested and binned at 350 mA, with current pulse duration of 20 ms. All characteristic charts where the thermal pad is kept at constant temperature (25°C typically) are measured with current pulse duration of 20 ms.

The part number designation is explained as follows:

L X C L – A B C D – E F G H

Where:

A	—	designates package and radiation pattern (value E for lambertian emitter)
B	—	designates off-state color (value Y for yellow)
C	—	designates on-state color (value W for LUXEON C series)
D	—	designates generation
EFGH	—	reserved for future product offerings

Therefore products tested and binned at 350 mA follow the part numbering scheme:

L X C L - E Y W 4

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 C products will deliver, on average, 70% lumen maintenance (L70) at 20,000 hours of operation at a forward current of up to 350 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 C is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, including the RoHS directive and REACH compliance. Philips Lumileds will not intentionally add the following restricted materials to the LUXEON C: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Product Selection Guide

Table 1.

Part Number	Description	Package Quantity
LXCL-EYW4	LUXEON C	5,000

Notes for Table 1:

1. Philips Lumileds maintains a tolerance of ± 10% on luminous flux.
2. LUXEON C products with higher performance levels may become available in the future. Please consult Philips Lumileds for more information.
3. Test current is 350 mA for all LXCL-EYW4 products.

Electrical and Optical Characteristics

LUXEON C at Test Current (350 mA)
Thermal Pad Temperature = 25°C

Table 2.

Parameter	Minimum	Typical	Maximum	Units
Luminous Flux [1]	80	95		lm
Forward Voltage [2]	2.80	2.95	3.57	V
Color Temperature [3]	5028K	5310K	5665K	
CRI		75		
Dynamic Resistance [4]		0.64		Ω
Temp Coefficient of Forward Voltage [5]		-3.0		mV/°C
Thermal Resistance, junction-case		8		°C/W
Viewing Angle		120		deg

Notes for Table 2:
1. Philips Lumileds maintains a tester tolerance of ±10% on flux measurements.
2. Philips Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.

Absolute Maximum Ratings

Table 3.

Parameter	LUXEON C
DC Forward Current (mA) [1]	500
Peak Pulsed Forward Current (mA) [2]	1500
ESD Sensitivity (JEDEC 3b)	< 8000V Human Body Model (HBM) Class 3B JESD22-A114-E
Storage Temperature	-40°C - 120°C
Reflow Soldering Temperature	260 for 40 sec. max
LED Junction Temperature	135°C
Operating CaseTemperature at 350 mA	-40°C - 85°C
Moisture Sensitivity Level (MSL) [3]	1

Notes for Table 3:
1. Operation below 100 mA not recommended.
2. Peak pulse current with a maximum pulse duration not to exceed 500 ms and a maximum duty factor of 10%.
3. Per IPC/JEDEC J-STD-20 MSL.
4. LEDs are not designed to be driven in reverse bias.
5. Stresses in excess of the absolute maximum ratings can cause damage to the emitter. Maximum rating limits apply to each parameter in isolation, all parameters having values within the current derating curves. It should be assumed that limiting values of more than one parameter can be applied to the product at the same time. Exposures to the absolute maximum ratings for extended periods can adversely affect device reliability.

JEDEC Moisture Sensitivity

Table 4.

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

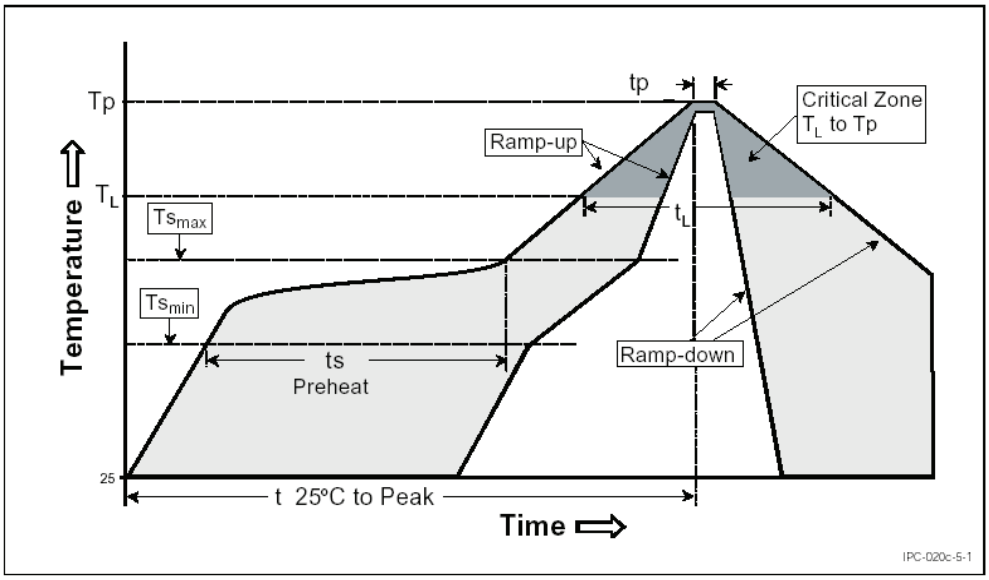

Figure 1. Temperature Profile for Table 5.

Table 5.

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
Time Maintained Above Temperature T_L	217°C
Time Maintained Above Time (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

Note for Table 5:

1. All temperatures refer to the application Printed Circuit Board (PCB), measured on the surface adjacent to the package body.

Mechanical Dimensions

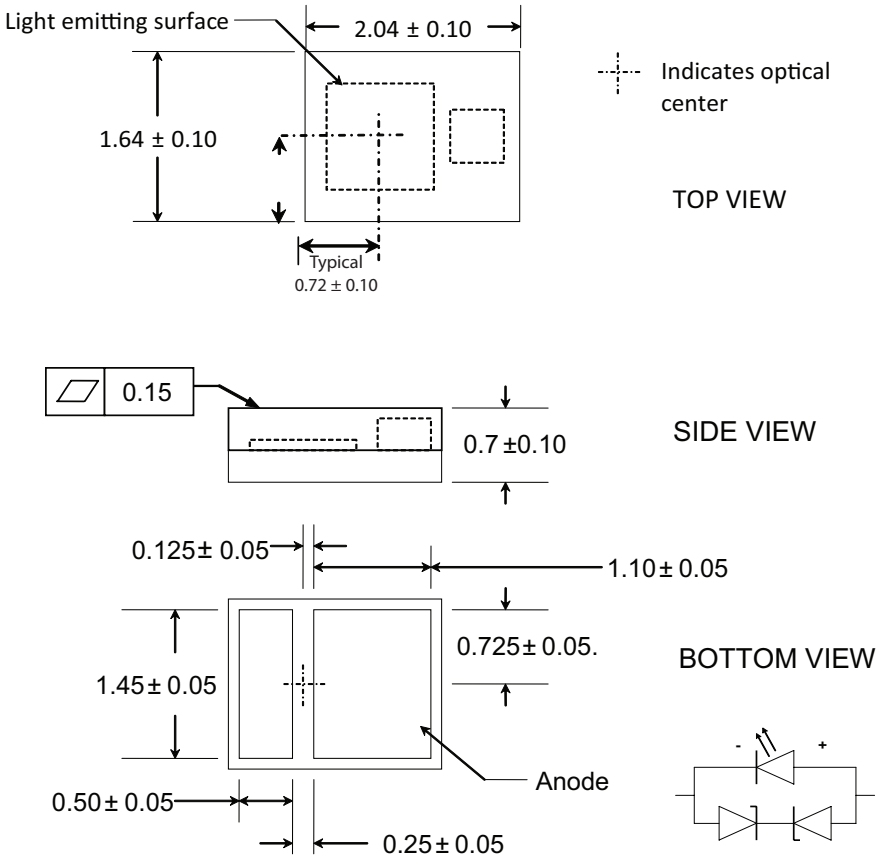

Figure 2. Package outline drawing for LUXEON C.

Notes for Figure 2:
1. Drawings not to scale.
2. All dimensions are in millimeters.

Pad Configuration

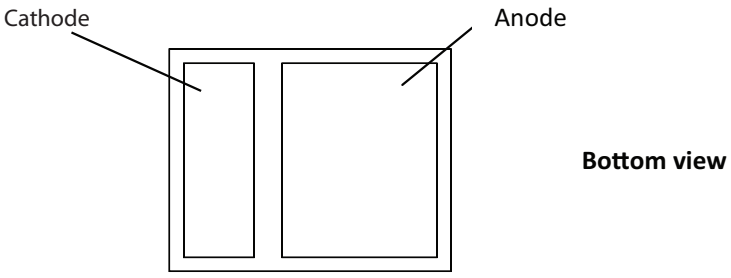

Figure 3. Pad configuration.

Solder Pad Design

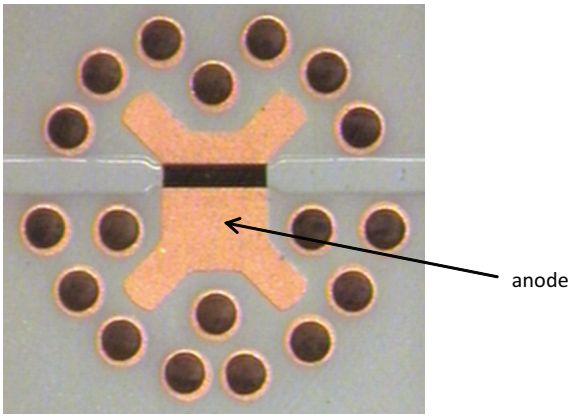

Figure 4. Solder pad layout.

Notes for Figures 3 and 4:

1. The photograph shows the recommended LUXEON C layout on Printed Circuit Board (PCB) with white solder mask.
2. Application brief AB36 provides extensive details of this layout including the solder stencil mask design. In addition, the .dwg files are available at www.philipslumileds.com and www.philipslumileds.cn.com.

Wavelength Characteristics

LUXEON C at Test Current, Case Temperature = 25°C
Typical Spectral Power Distribution

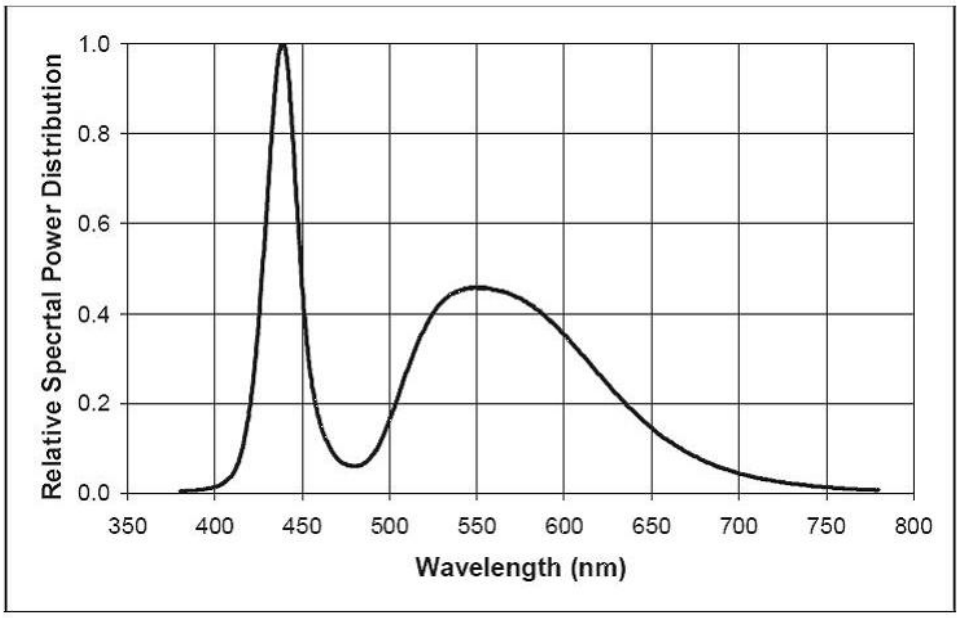

Figure 5. Color spectrum of 5000K to 7000K emitters, integrated measurement.

Light Output Characteristics over Temperature

Typical Relative Luminous Flux vs. Case Temperature

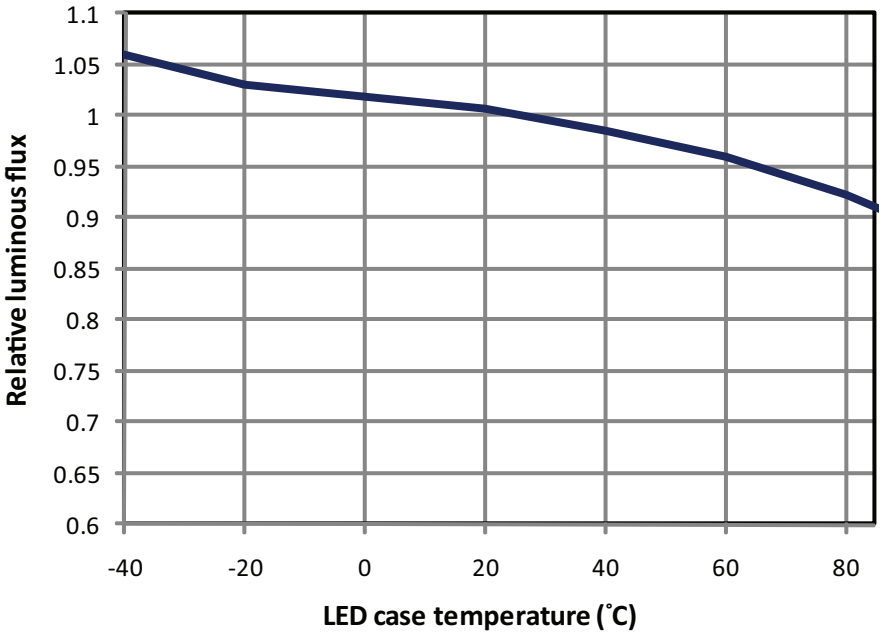

Figure 6. Relative light output vs. temperature.

Typical Forward Current Characteristics

Typical Forward Current vs. Forward Voltage, T_a = 25°C Thermal Pad Temperature = 25°C

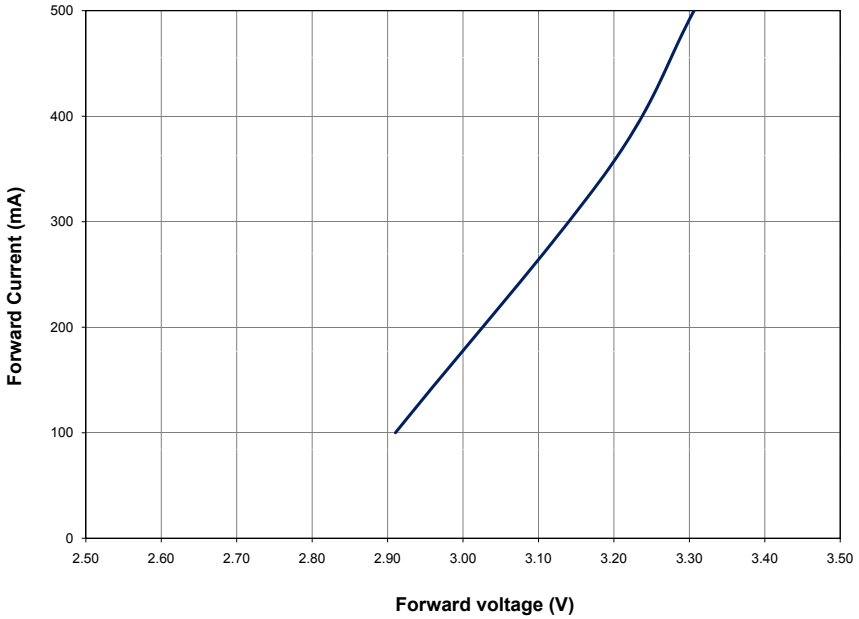

Figure 7. Typical forward current vs. forward volatage.

Typical Relative Luminous Flux vs. Forward Current T_a = 25°C

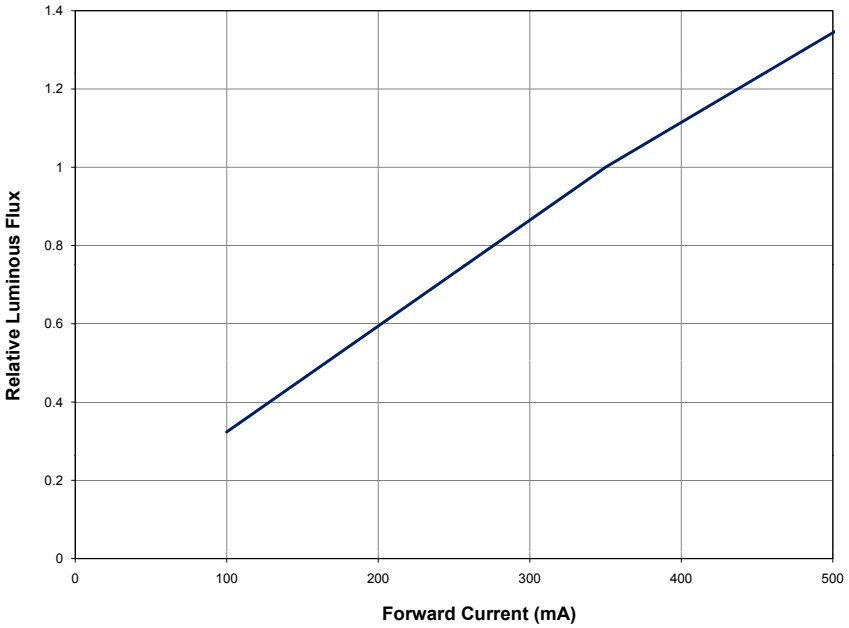

Figure 8. Typical relative luminous flux vs. forward current.

Current Derating Curves

Current Derating Curve for 350 mA Drive Current

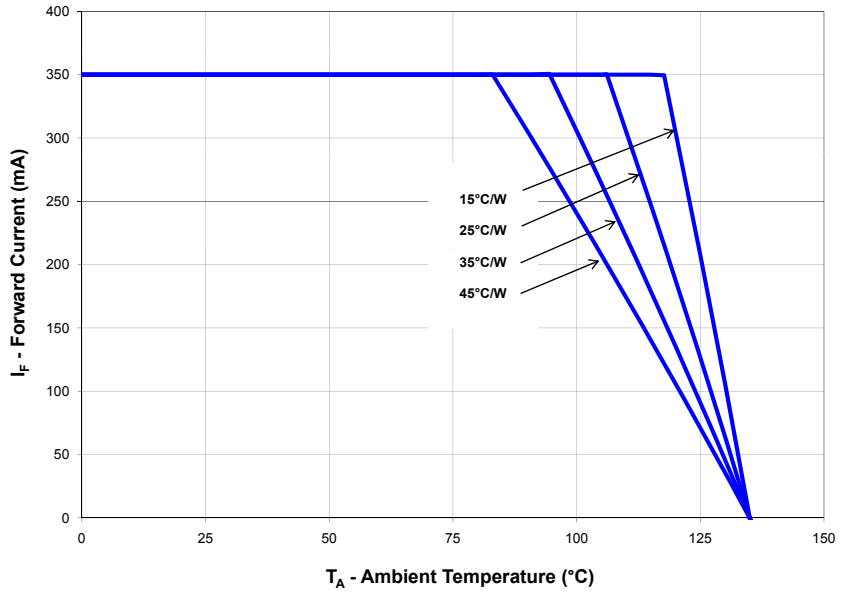

Figure 9. Maximum forward current vs. ambient temperature, based on T_{JMAX} = 135°C.

Current Derating Curve for 500 mA Drive Current

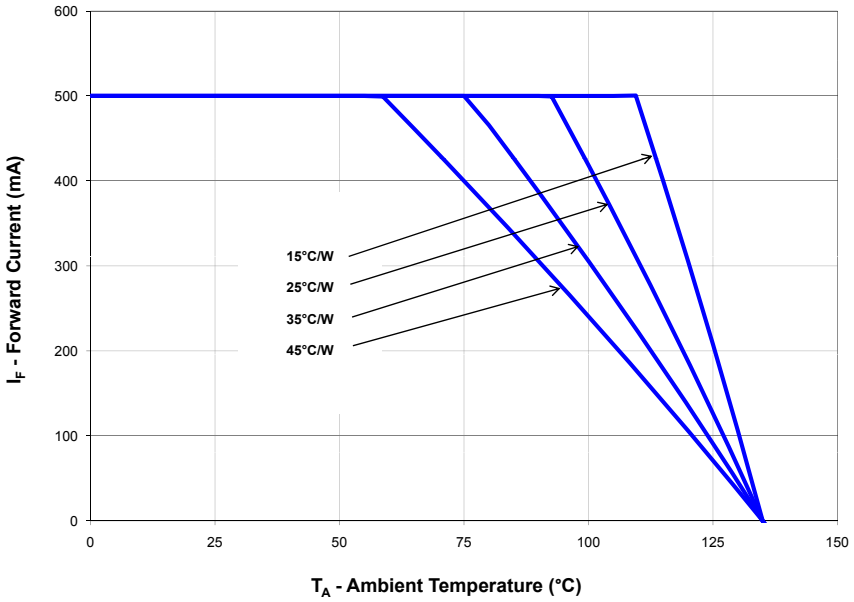

Figure 10. Maximum forward current vs. ambient temperature, based on T_{JMAX} = 135°C.

Typical Spatial Radiation Pattern

Typical Angular Intensity Distribution

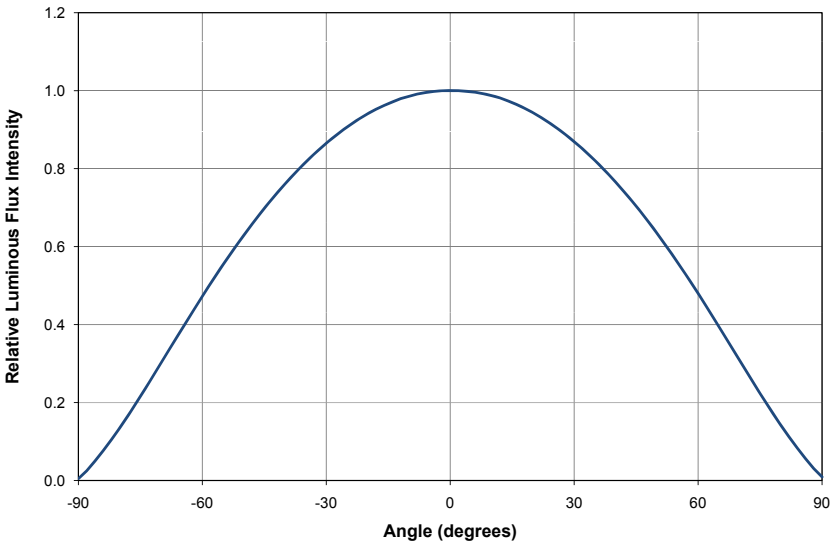

Figure 11. Typical angular intensity distribution.

Typical Polar Radiation Pattern

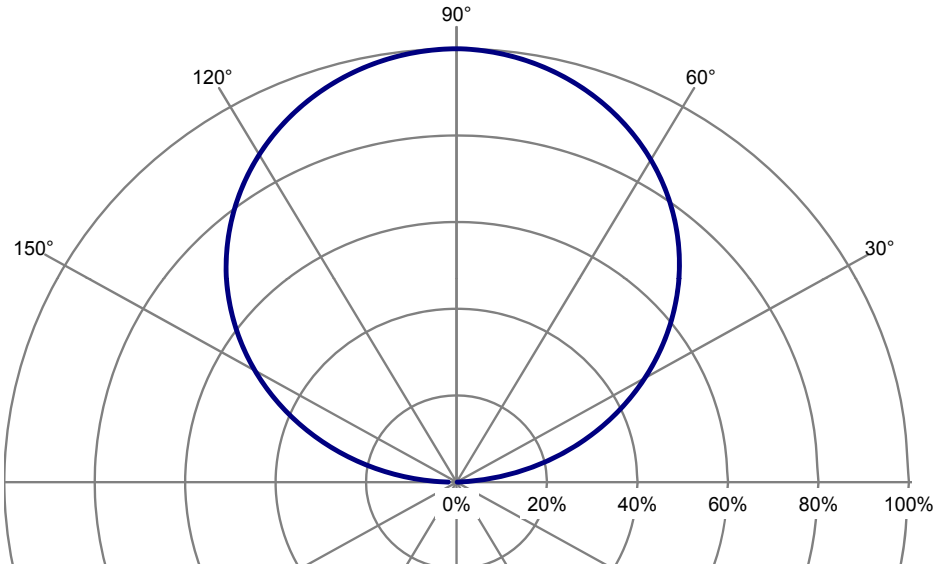

Figure 12. Typical polar radiation pattern.

Emitter Pocket Tape Packaging

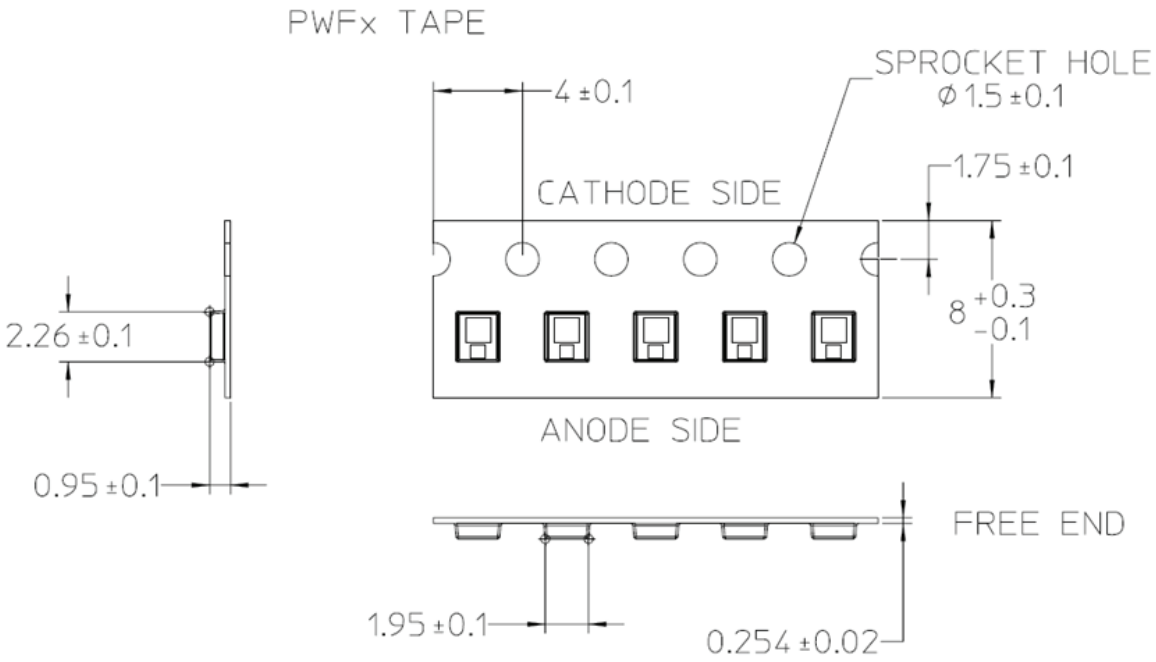

Figure 13. Emitter pocket tape packaging.

Emitter Reel Packaging

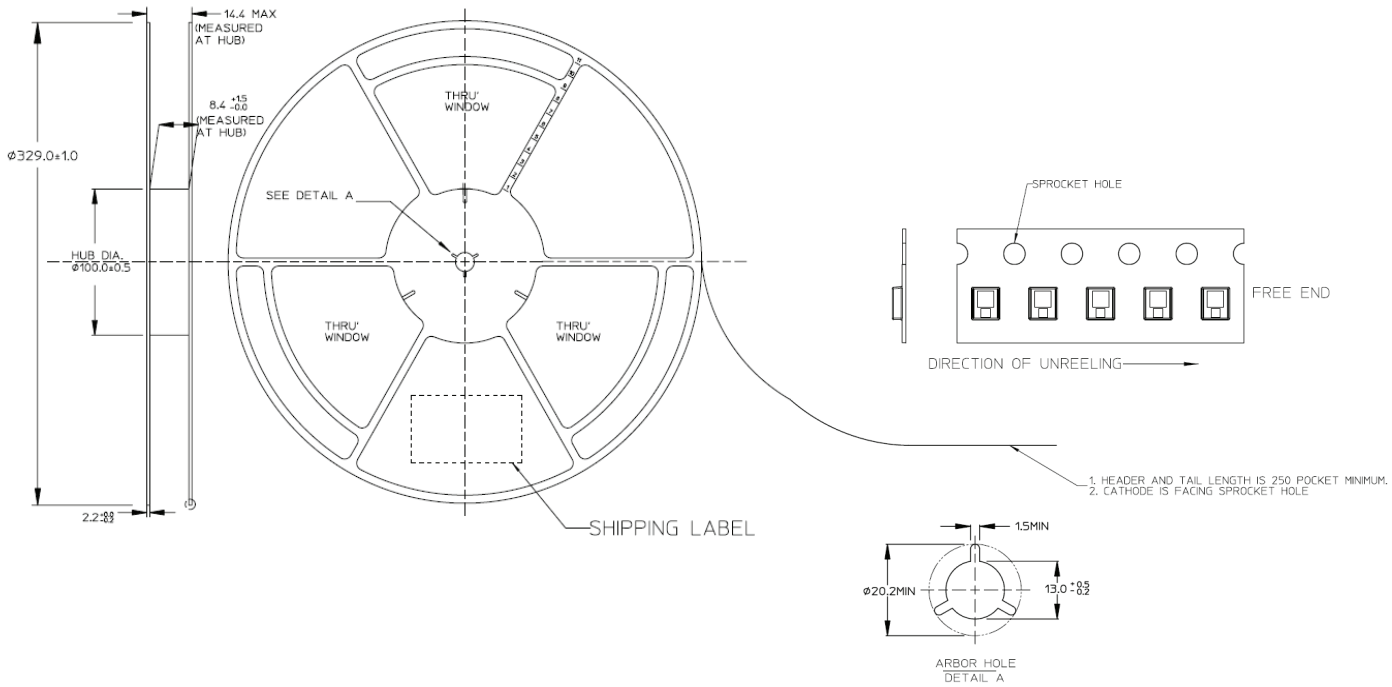

Figure 14. Emitter reel packaging.

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, color and forward voltage (V_f).

Decoding Product Bin Labeling

LUXEON C emitters are labeled using a four digit alphanumeric code (CAT code) depicting the bin values for emitters packaged on a single reel. At this time LUXEON C is binned for color and luminous flux. All emitters packaged within a reel are of the same 2-variable bin combination. Using these codes, it is possible to determine the optimum mixing and matching of products for consistency in a given application. Reels are labeled with a four digit alphanumeric CAT code following the format below.

ABCD

A, B & C = Color bin (84A, 85A, etc.)

D = Flux bin (7 or 8)

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

LUXEON C Bin Structure

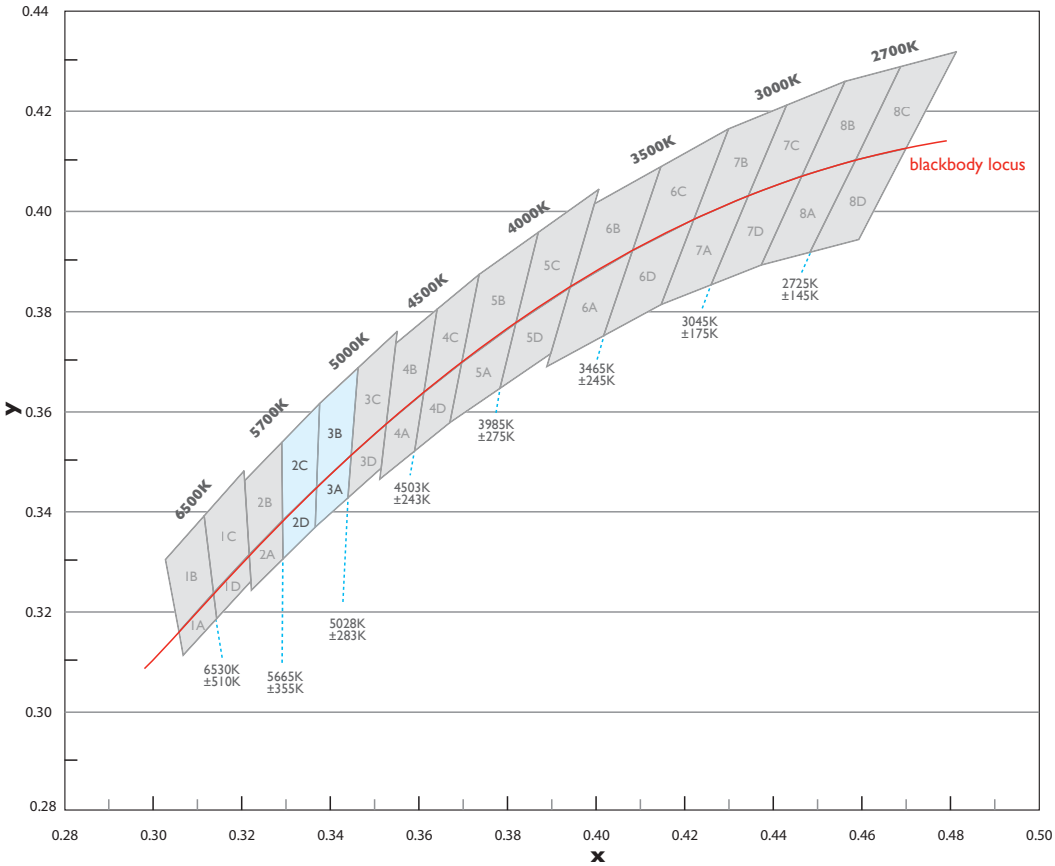

Figure 15. LUXEON C bin structure.

LUXEON C Bin Coordinates

LUXEON C emitters are tested and binned by x, y coordinates. Four ANSI fine bins cover the CCT range 5028K to 5665K.

Table 6. Flux Bins

Nominal CCT	ANSI Bins	CAT Bin Codes	X	Y
5000K	3A	86A	0.344719 0.336916 0.336600 0.343985	0.351301 0.344873 0.336900 0.342749
5000K	3B	84A	0.346260 0.337600 0.336916 0.344719	0.368726 0.361600 0.344873 0.351301
5700K	2C	85A	0.337600 0.329053 0.329231 0.336916	0.361600 0.353812 0.338266 0.344873
5700K	2D	87A	0.336916 0.329231 0.329330 0.336600	0.344873 0.338226 0.330539 0.336900

Notes for Table 6:

1. Philips Lumileds maintains a tester tolerence of ±0.005 on x,y color coordinates.

Luminous Flux Bins

Table 7 lists the standard photometric luminous flux bins for LUXEON C emitters (tested and binned at 350 mA).

Table 7. Flux Bins - All Colors

Bin Code	Minimum Photometric Flux (lm)	Maximum Photometric Flux (lm)
7	80	90
8	90	100
9	100	110

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Who We Are

Philips Lumileds focuses on one goal: Creating the world's highest performing LEDs. The company pioneered the use of solid-state lighting in breakthrough products such as the first LED backlit TV, the first LED flash in camera phones, and the first LED daytime running lights for cars. Today we offer the most comprehensive portfolio of high quality LEDs and uncompromising service.

Philips Lumileds brings LED's qualities of energy efficiency, digital control and long life to spotlights, downlights, high bay and low bay lighting, indoor area lighting, architectural and specialty lighting as well as retrofit lamps. Our products are engineered for optimal light quality and unprecedented efficacy at the lowest overall cost. By offering LEDs in chip, packaged and module form, we deliver supply chain flexibility to the inventors of next generation illumination.

Philips Lumileds understands that solid state lighting is not just about energy efficiency. It is about elegant design. Reinventing form. Engineering new materials. Pioneering markets and simplifying the supply chain. It's about a shared vision. Learn more about our comprehensive portfolio of LEDs at www.philipslumileds.com.

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