

# Table of Contents

General Information .....	2
Product Nomenclature .....	2
Average Lumen Maintenance Characteristics .....	2
Environmental Compliance .....	2
Electrical and Optical Characteristics .....	3
Absolute Maximum Ratings .....	3
JEDEC Moisture Sensitivity .....	3
Reflow Soldering Characteristics .....	4
Mechanical Dimensions .....	5
Pad Configuration .....	6
Solder Pad Design .....	6
Wavelength Characteristics .....	7
Light Output Characteristics over Temperature .....	8
Typical Forward Current Characteristics .....	9
Current Derating Curves .....	10
Typical Spatial Radiation Pattern .....	11
Emitter Pocket Tape Packaging .....	12
Emitter Reel Packaging .....	13
Product Binning and Labeling .....	14
LUXEON C Bin Structure .....	14
LUXEON C Bin Coordinates .....	15
Luminous Flux Bins .....	15

# 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  $\pm 10\%$  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 <sup>1</sup>	80	95		lm
Forward Voltage <sup>2</sup>	2.80	2.95	3.57	V
Color Temperature <sup>3</sup>	5028K	5310K	5665K	
CRI		75		
Dynamic Resistance <sup>4</sup>		0.64		$\Omega$
Temp Coefficient of Forward Voltage <sup>5</sup>		-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  $\pm 10\%$  on flux measurements.
2. Philips Lumileds maintains a tolerance of  $\pm 0.06\text{V}$  on forward voltage measurements.

## Absolute Maximum Ratings

Table 3.

Parameter	LUXEON C
DC Forward Current (mA) <sup>[1]</sup>	500
Peak Pulsed Forward Current (mA) <sup>[2]</sup>	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 Case Temperature at 350 mA	-40°C - 85°C
Moisture Sensitivity Level (MSL) <sup>[3]</sup>	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	$\leq 30^\circ\text{C}$ / 85% RH	168h + 5 / - 0	85°C / 85% RH

# Reflow Soldering Characteristics

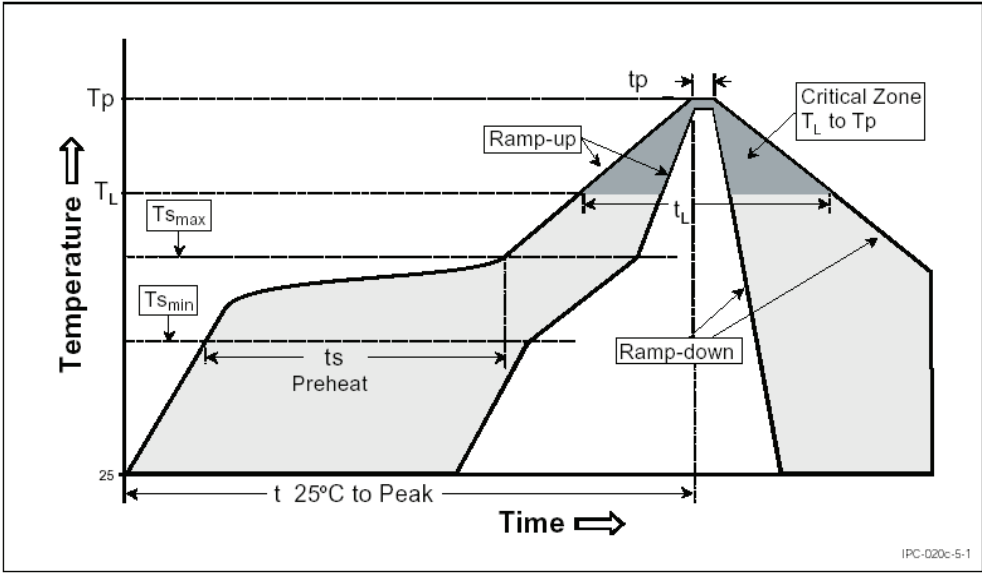


Figure 1. Temperature Profile for Table 5.

Table 5.

Profile Feature	Lead Free Assembly
Average Ramp-Up Rate ( $T_{s_{max}}$ to $T_p$ )	3°C / second max
Preheat Temperature Min ( $T_{s_{min}}$ )	150°C
Preheat Temperature Max ( $T_{s_{max}}$ )	200°C
Preheat Time ( $t_{s_{min}}$ to $t_{s_{max}}$ )	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

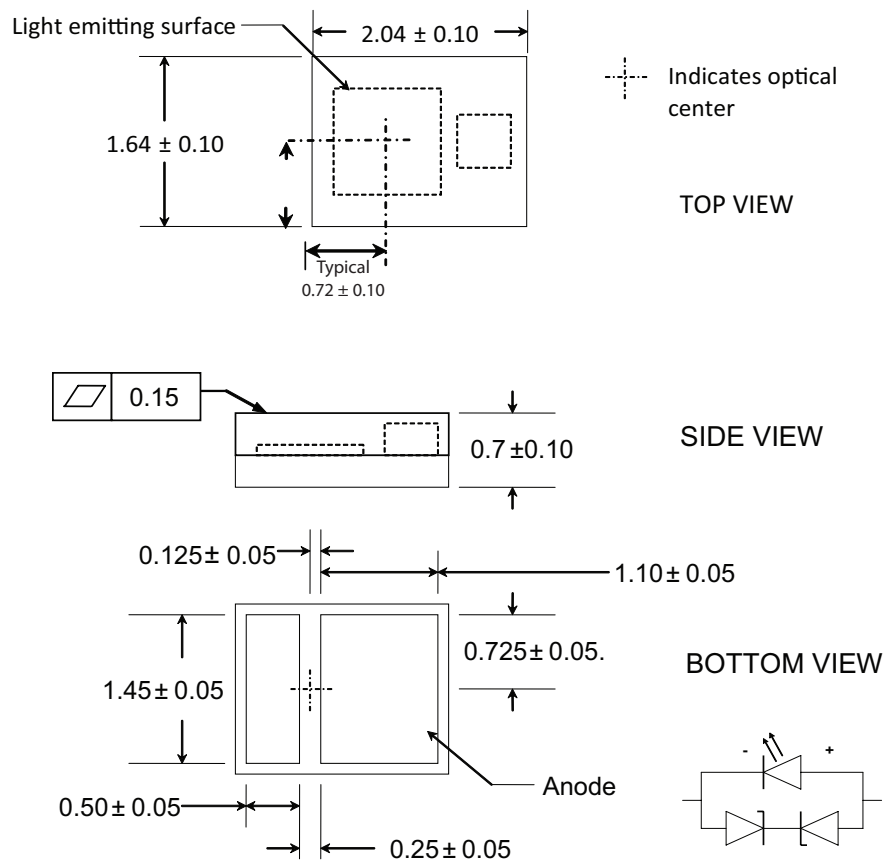


Figure 2. Package outline drawing for LUXEON C.

Notes for Figure 2:

1. Drawings not to scale.
2. All dimensions are in millimeters.

## Pad Configuration

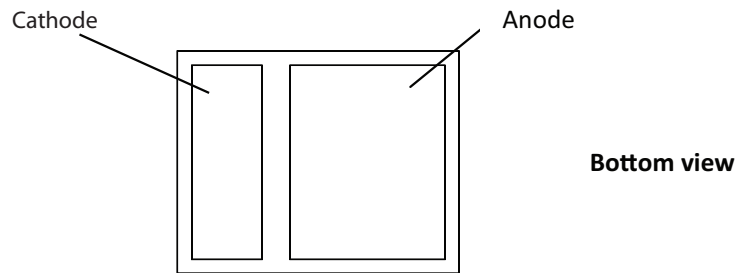


Figure 3. Pad configuration.

## Solder Pad Design

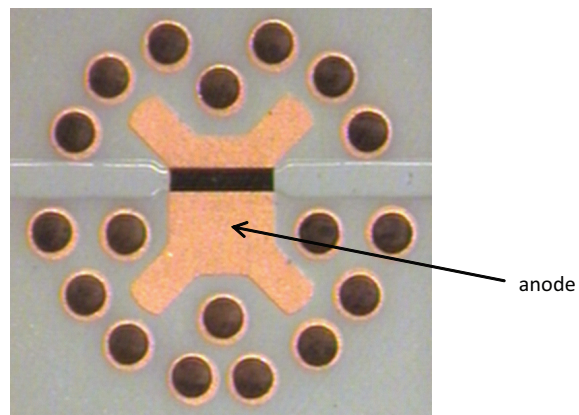


Figure 4. Solder pad layout.

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](http://www.philipslumileds.com) and [www.philipslumileds.cn.com](http://www.philipslumileds.cn.com).

# Wavelength Characteristics

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

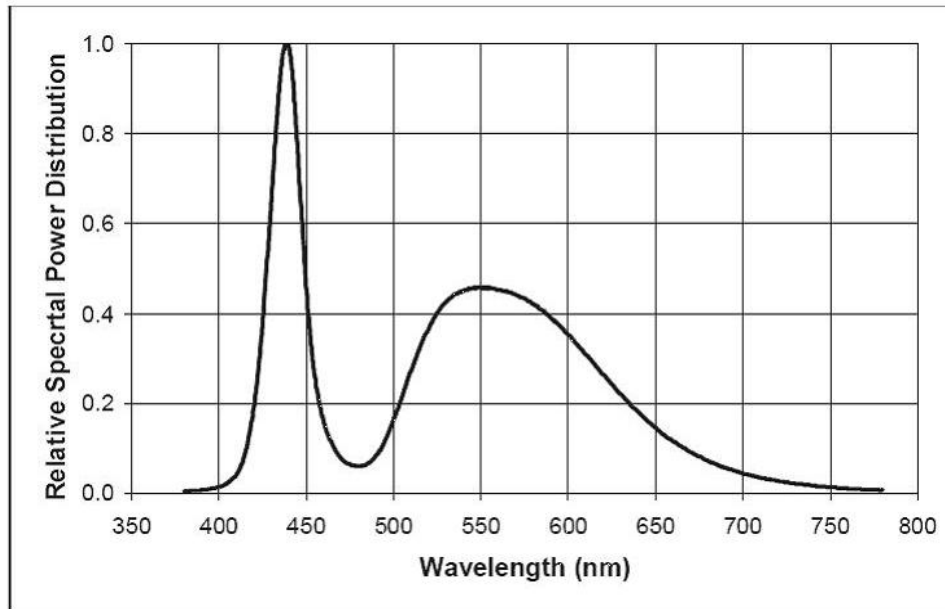


Figure 5. Color spectrum of 5000K to 7000K emitters, integrated measurement.

# Light Output Characteristics over Temperature

## Typical Relative Luminous Flux vs. Case Temperature

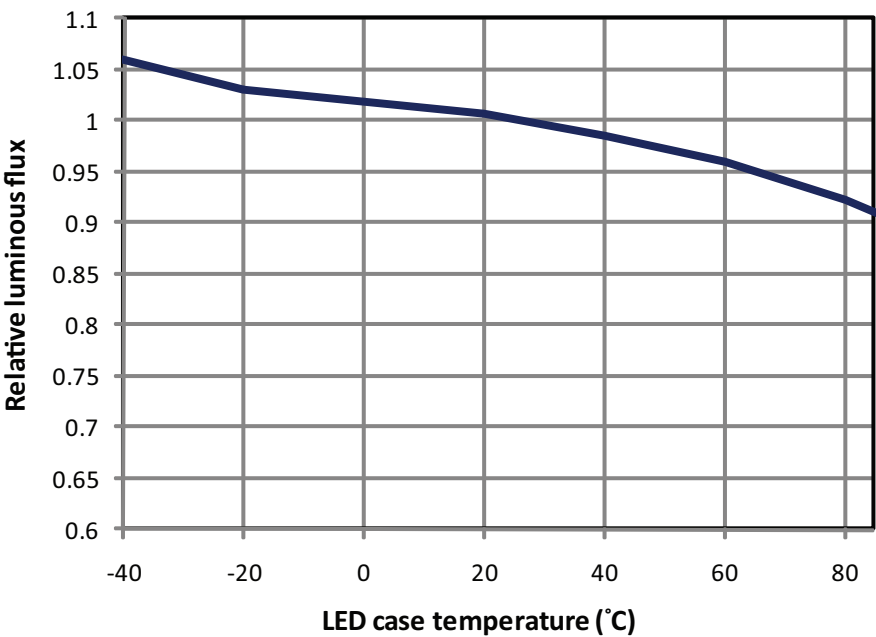


Figure 6. Relative light output vs. temperature.



# Typical Forward Current Characteristics

Typical Forward Current vs. Forward Voltage,  $T_a = 25^\circ\text{C}$   
Thermal Pad Temperature =  $25^\circ\text{C}$

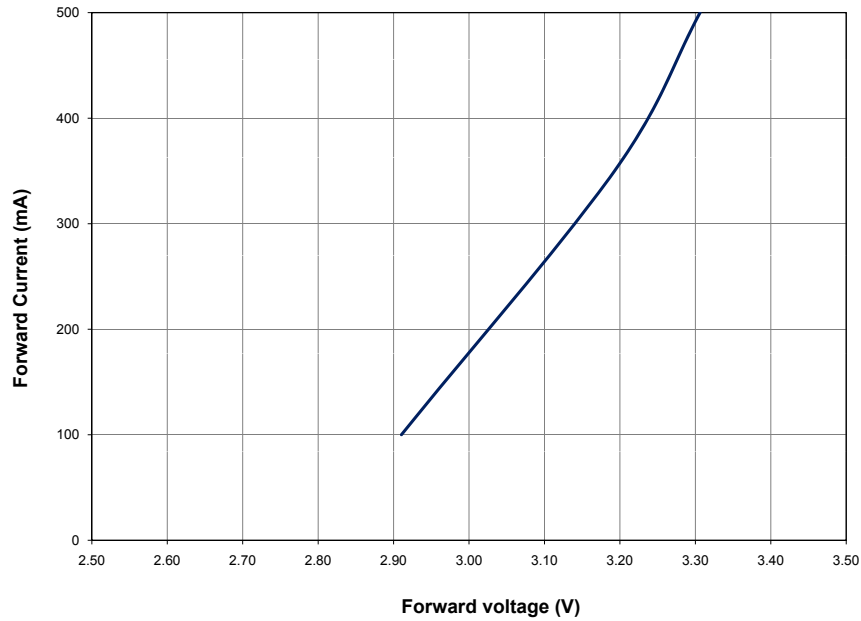


Figure 7. Typical forward current vs. forward volatage.

Typical Relative Luminous Flux vs. Forward Current  
 $T_a = 25^\circ\text{C}$

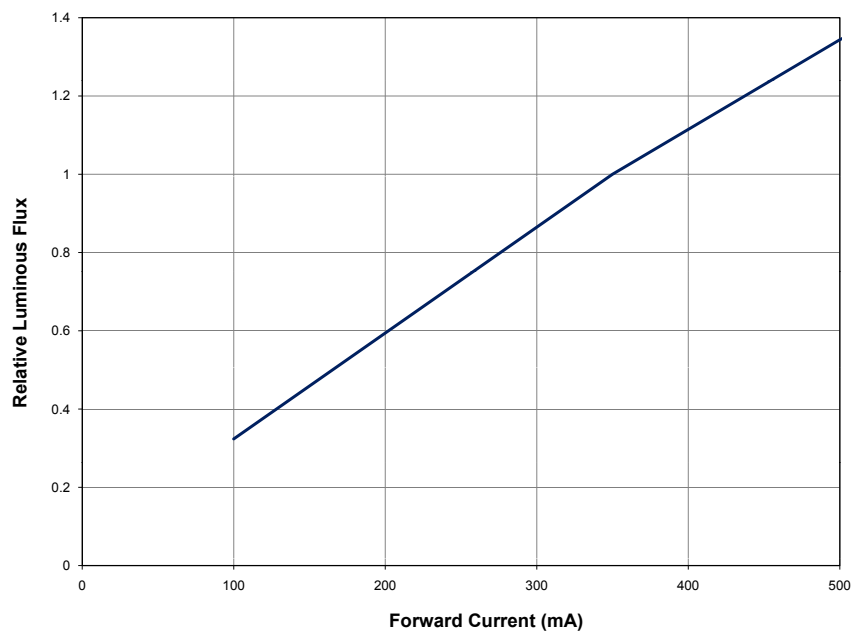


Figure 8. Typical relative luminous flux vs. forward current.

# Current Derating Curves

## Current Derating Curve for 350 mA Drive Current

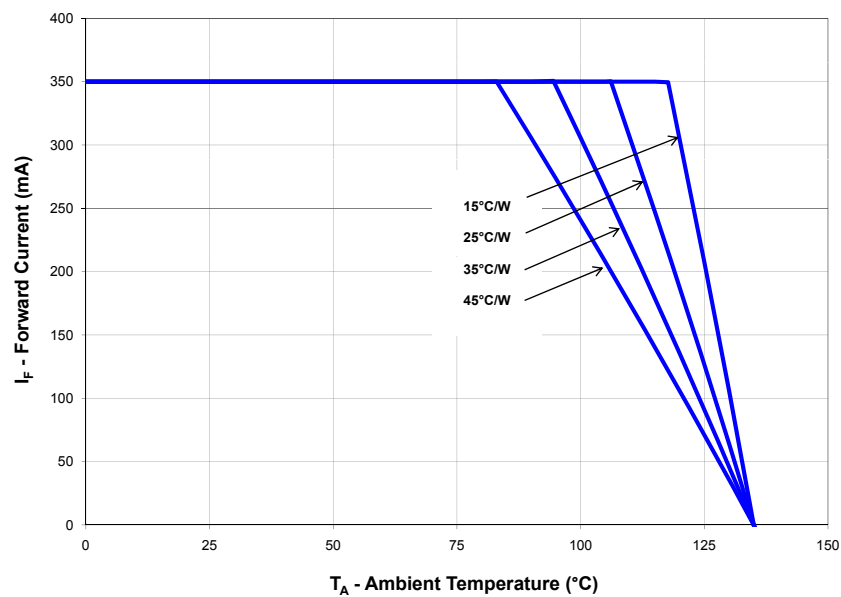


Figure 9. Maximum forward current vs. ambient temperature, based on  $T_{JMAX} = 135^{\circ}\text{C}$ .

## Current Derating Curve for 500 mA Drive Current

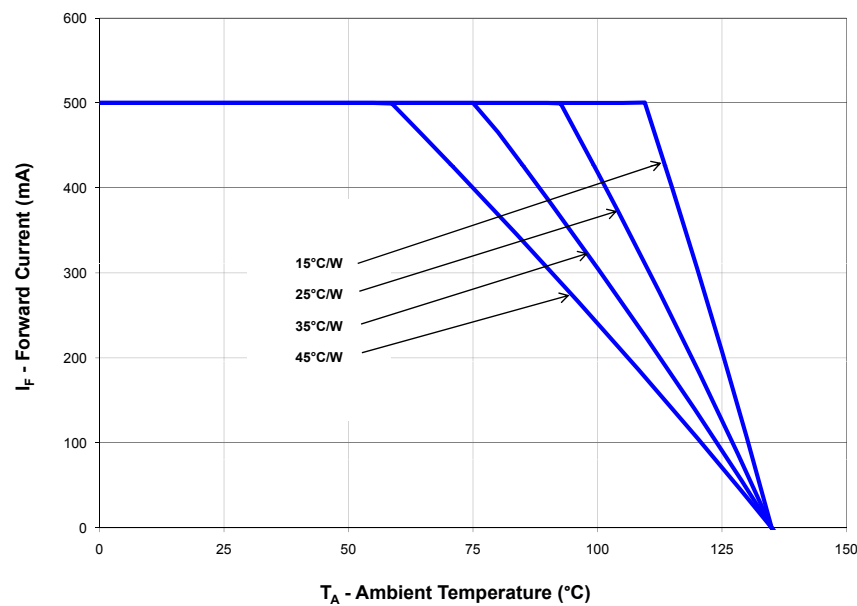


Figure 10. Maximum forward current vs. ambient temperature, based on  $T_{JMAX} = 135^{\circ}\text{C}$ .

# Typical Spatial Radiation Pattern

## Typical Angular Intensity Distribution

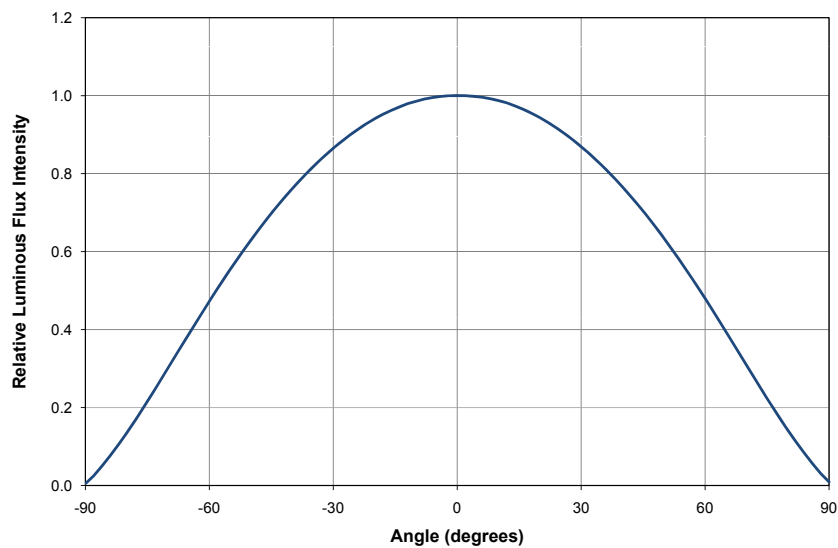


Figure 11. Typical angular intensity distribution.

## Typical Polar Radiation Pattern

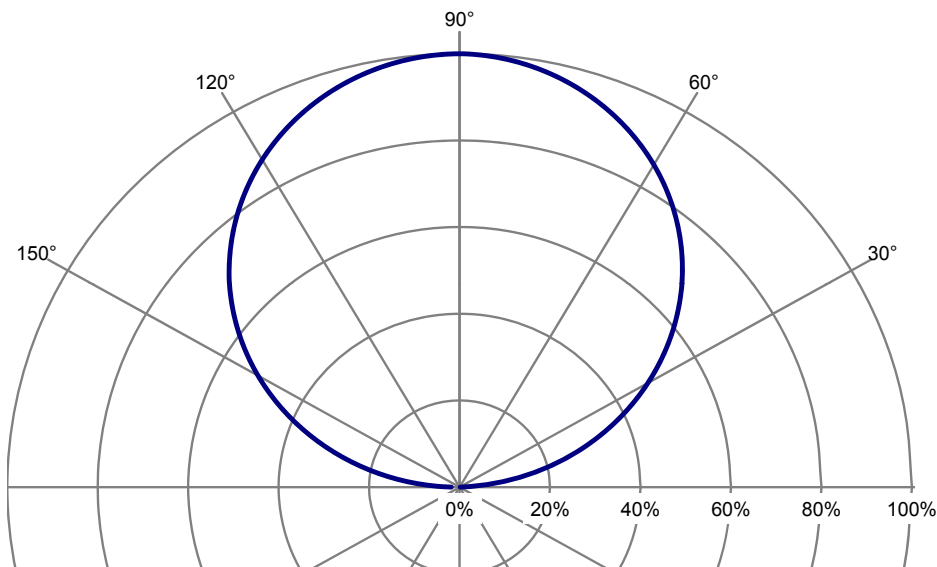


Figure 12. Typical polar radiation pattern.

# Emitter Pocket Tape Packaging

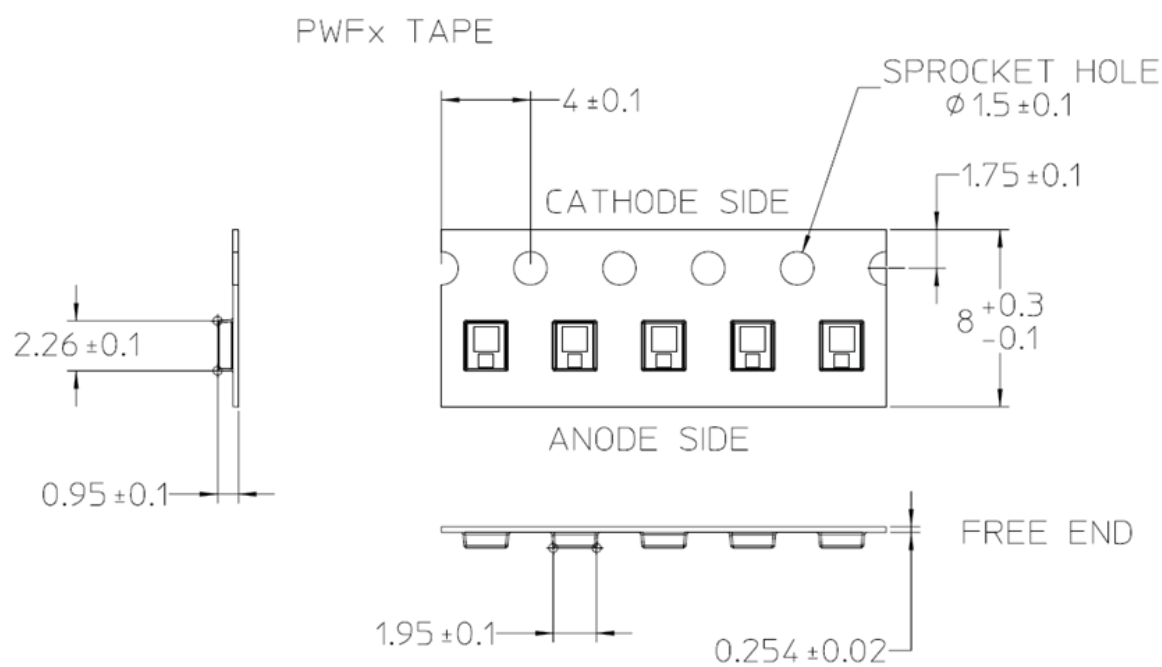


Figure 13. Emitter pocket tape packaging.

# Emitter Reel Packaging

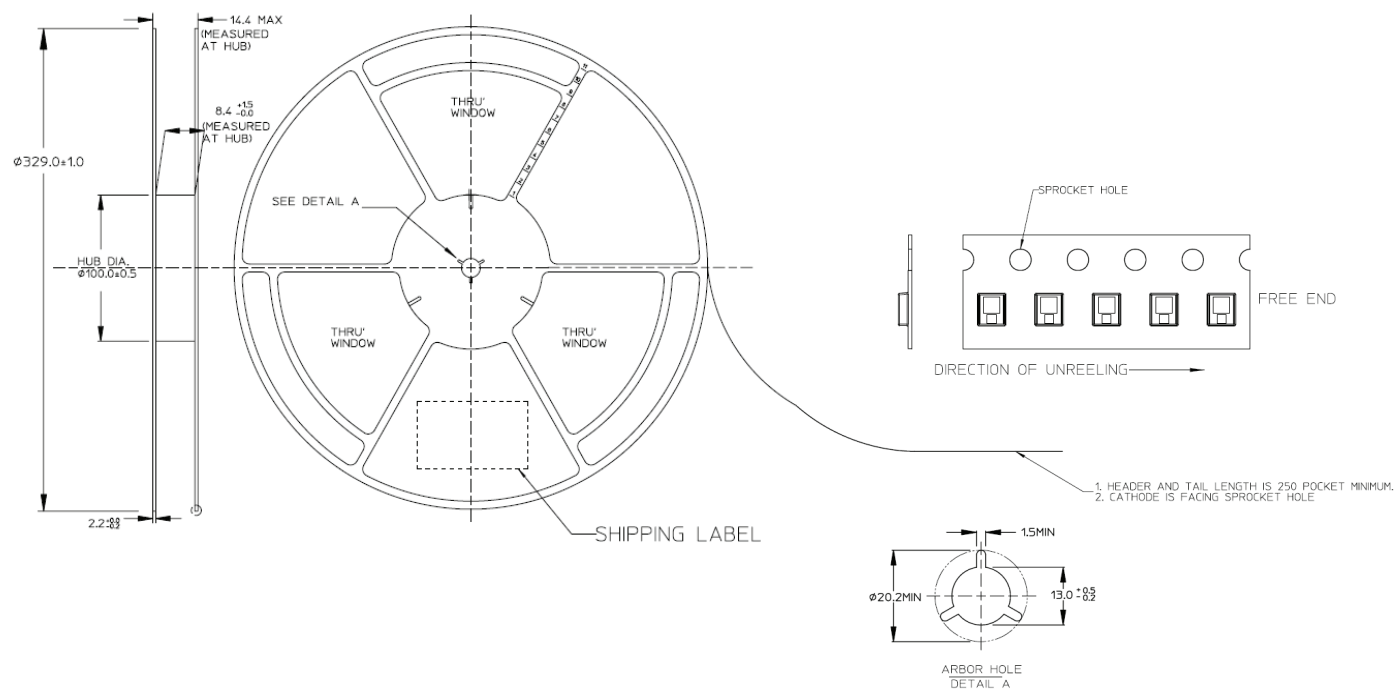


Figure 14. Emitter reel packaging.

# 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

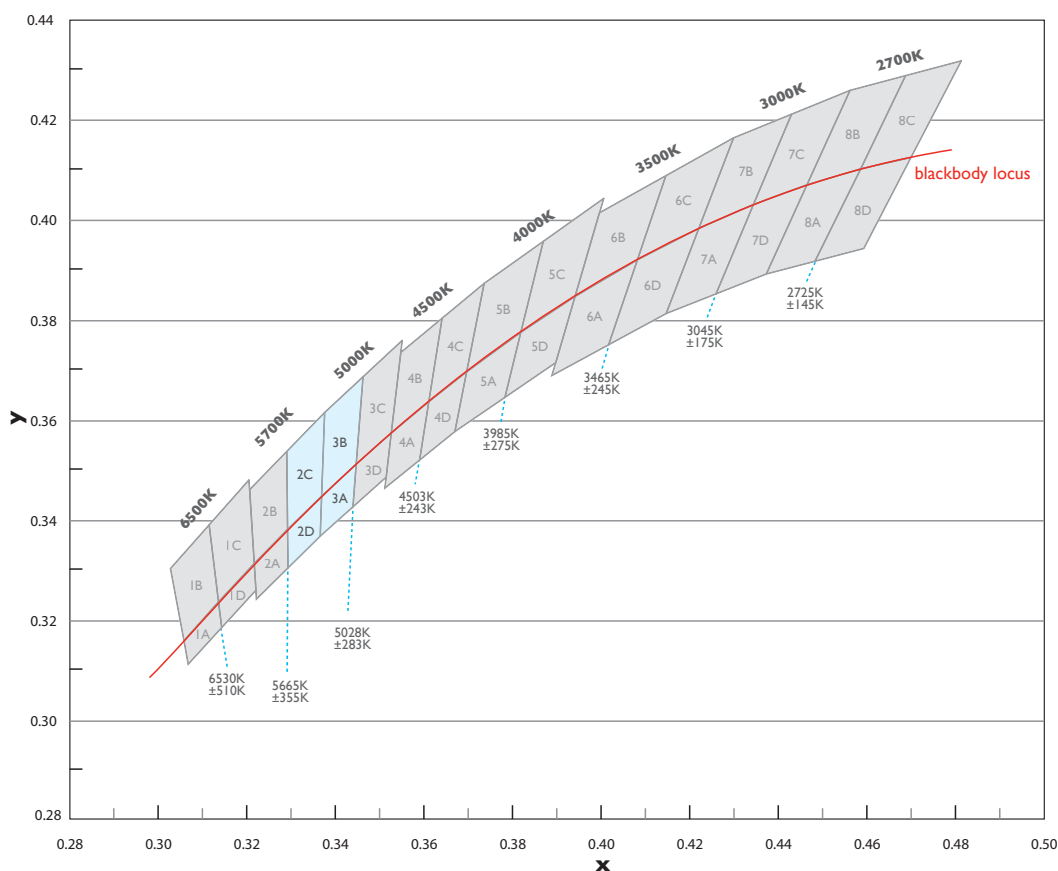


Figure 15. LUXEON C bin structure.

# 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	0.351301
			0.336916	0.344873
			0.336600	0.336900
			0.343985	0.342749
5000K	3B	84A	0.346260	0.368726
			0.337600	0.361600
			0.336916	0.344873
			0.344719	0.351301
5700K	2C	85A	0.337600	0.361600
			0.329053	0.353812
			0.329231	0.338266
			0.336916	0.344873
5700K	2D	87A	0.336916	0.344873
			0.329231	0.338226
			0.329330	0.330539
			0.336600	0.336900

Notes for Table 6:

- Philips Lumileds maintains a tester tolerance of  $\pm 0.005$  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

## 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](http://www.philipslumileds.com).



Philips Lumileds Lighting Company shall not be liable for any kind of loss of data or any other damages, direct, indirect or consequential, resulting from the use of the provided information and data. Although Philips Lumileds Lighting Company has attempted to provide the most accurate information and data, the materials and services information and data are provided "as is" and Philips Lumileds Lighting Company neither warranties, nor guarantees the contents and correctness of the provided information and data. Philips Lumileds Lighting Company reserves the right to make changes without notice. You as user agree to this disclaimer and user agreement with the download or use of the provided materials, information and data.



©2014 Philips Lumileds Lighting Company. All rights reserved.  
LUXEON is a registered trademark of the Philips Lumileds Lighting Company in the United States and other countries.

[www.philipslumileds.com](http://www.philipslumileds.com)  
[www.philipslumileds.cn.com](http://www.philipslumileds.cn.com)

LUXEON C Datasheet DS41 20140604