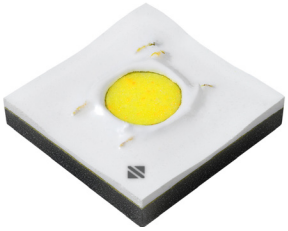
XLamp® XP-GR LEDs



PRODUCT DESCRIPTION

XLamp® XP-GR White LEDs expand the XP-G product family with a round, circular light-emitting surface (LES) version that improves the quality of projected light through optics, compared to traditional LEDs with a square LES. The bottom of the XP-GR maintains the same dimensions and footprint as all other XLamp XP LEDs, so it is an easy upgrade path for XP-based designs.

The compact and proven 3.45-mm XP platform has an excellent ecosystem of optics and system solutions available, enabling lighting manufacturers to simplify their design process and shorten time to market.

XLamp XP-GR LEDs are optimized for directional portable lighting applications where the best possible beam quality is required.

FEATURES

- Available in 70-CRI white
- ANSI-compatible chromaticity bins
- Binned at 85 °C
- Maximum drive current: 6000 mA
- Low thermal resistance: 1.3 °C/W
- Wide viewing angle: 125°
- Unlimited floor life at ≤ 30 ºC/85% RH
- Reflow solderable - JEDEC J-STD-020C
- Electrically neutral thermal path
- RoHS and REACH compliant
- UL® recognized component (E349212)

TABLE OF CONTENTS

Cree LED / 4001 E. Hwy. 54, Suite 2000 / Durham, NC 27709 USA / +1.919.313.5330 / www.cree-led.com

CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point◊	°C/W		1.3	
Viewing angle (FWHM)	degrees		125	
Temperature coefficient of voltage	mV/°C		-1.3	
ESD withstand voltage (HBM per Mil-Std-883D)			Class 3B	
DC forward current	mA			6000
Reverse voltage	V			5
Forward voltage (@ 1500 mA, 85 °C)	V		2.91	3.15
LED junction temperature	°C		85	150

Note:

◊ Thermal resistance measurement was performed per the JEDEC JESD51-14 standard. See the Thermal Resistance Measurement application note for more details.

FLUX CHARACTERISTICS (T_J = 85 °C)

The following table provides order codes for XLamp XP-GR LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 10). For definitions of the chromaticity kits, please see the Cree LED's Standard Chromaticity Kits section (page 9).

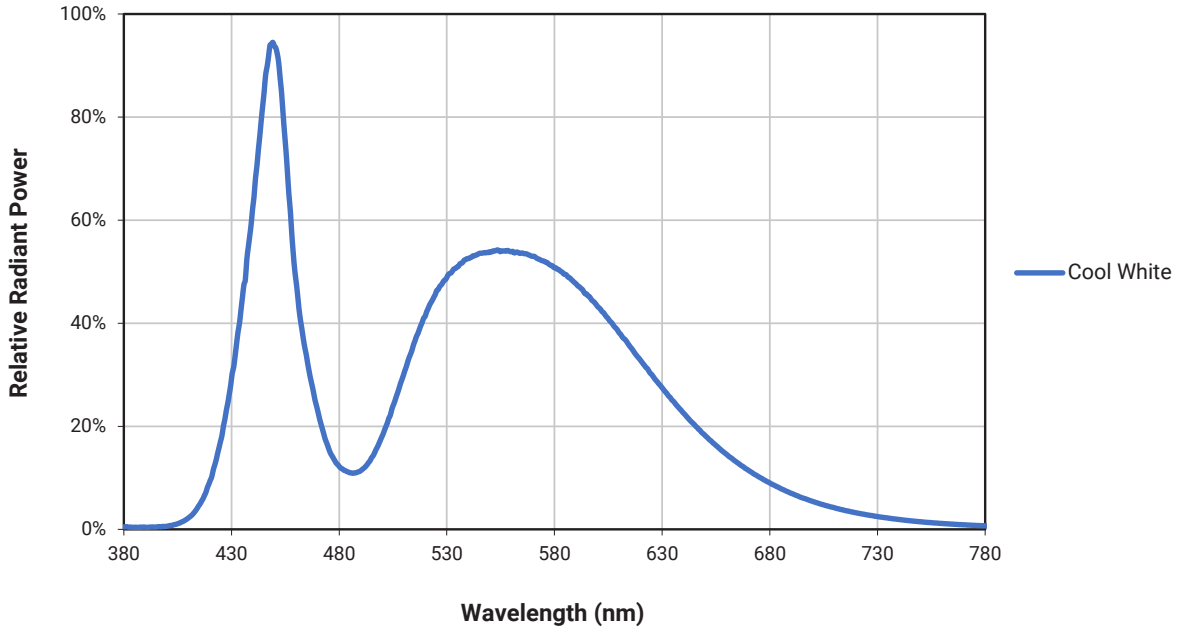
Chromaticity		Minimum Luminous Flux (lm) @ 1500 mA			Order Code
Kit	CCT	Code	Flux (lm) @ 85 °C	Flux (lm) @25 °C*	
E1	6500 K	D2	510	578	XPGRWA-H0-0000-000BD20E1
		C4	440	499	XPGRWA-H0-0000-000BC40E1
E2	5700 K	D2	510	578	XPGRWA-H0-0000-000BD20E2
		C4	440	499	XPGRWA-H0-0000-000BC40E2
E3	5000 K	D2	510	578	XPGRWA-H0-0000-000BD20E3
		C4	440	499	XPGRWA-H0-0000-000BC40E3

Notes

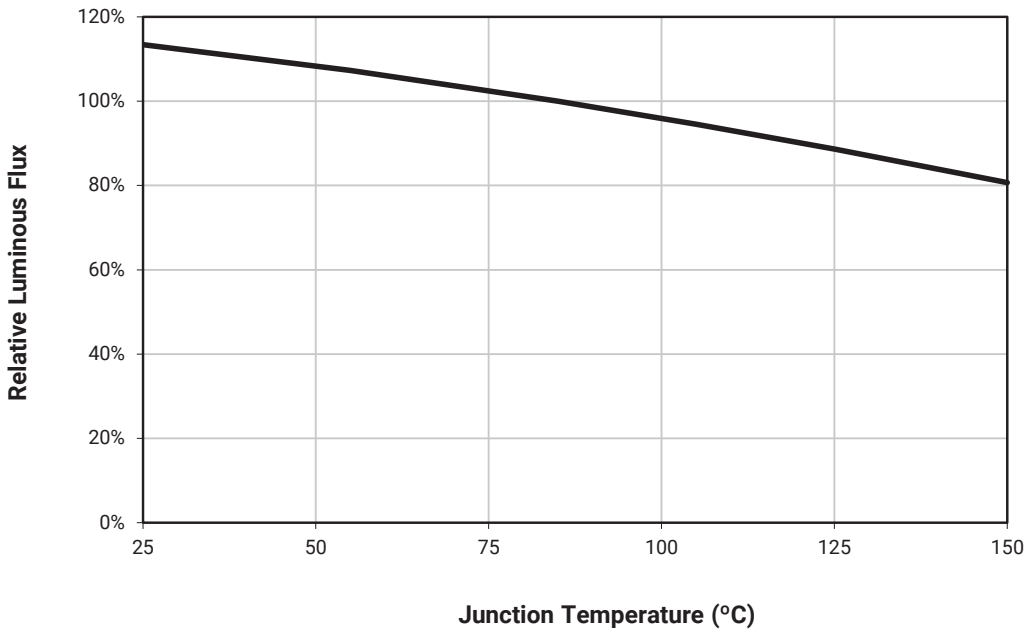
- Cree LED maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ±2 on CRI measurements. See the Measurements section (page 12).
- XLamp XP-GR LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.

* Flux values @ 25 °C are calculated and for reference only.

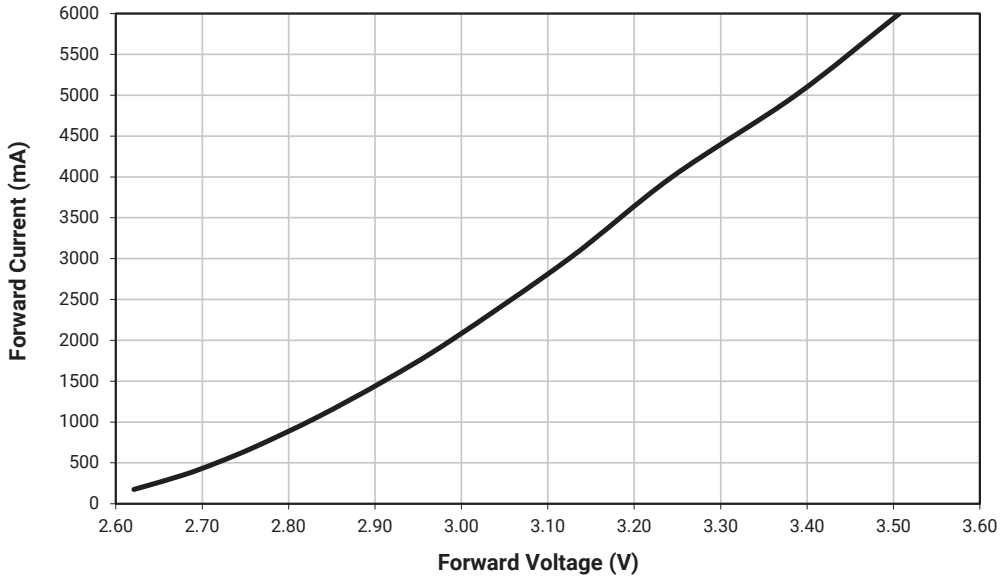
RELATIVE SPECTRAL POWER DISTRIBUTION



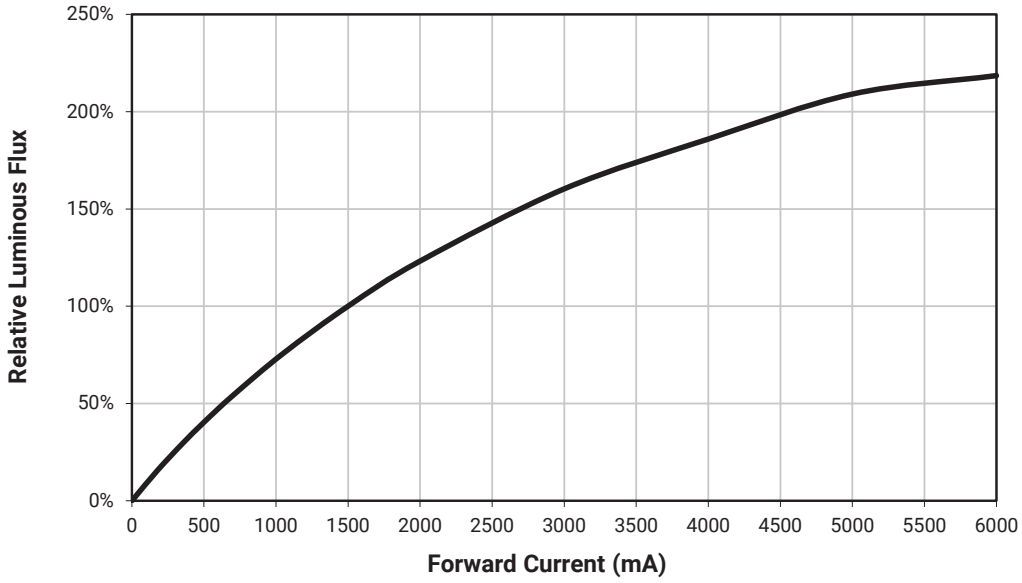
RELATIVE FLUX VS. JUNCTION TEMPERATURE



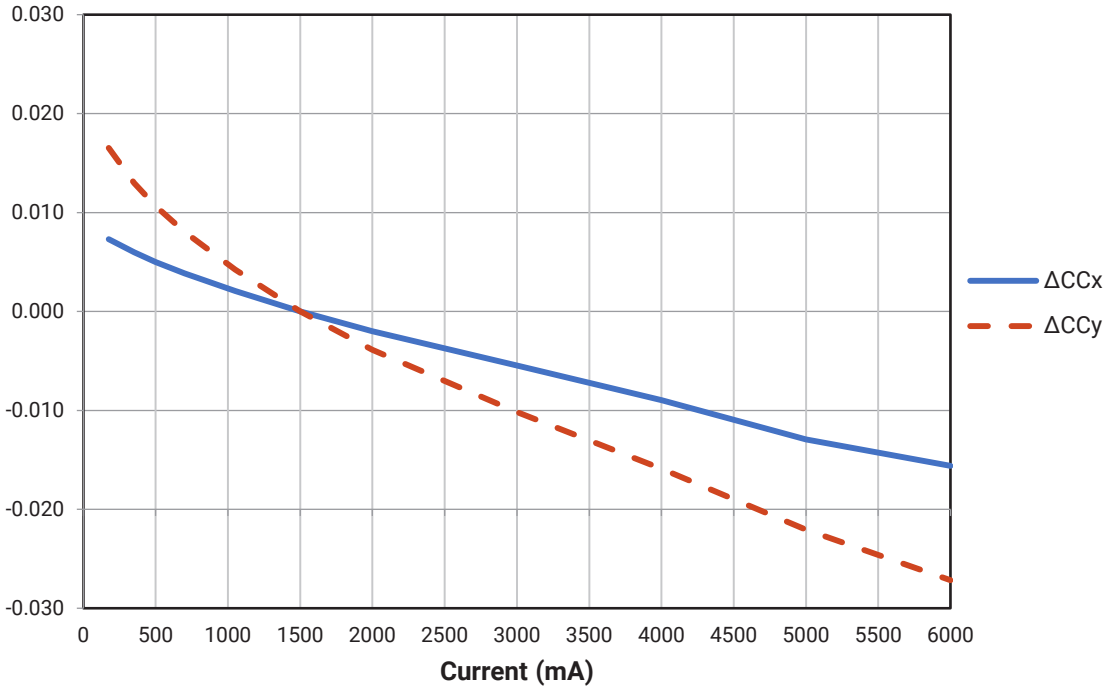
ELECTRICAL CHARACTERISTICS (T_J = 85 °C)

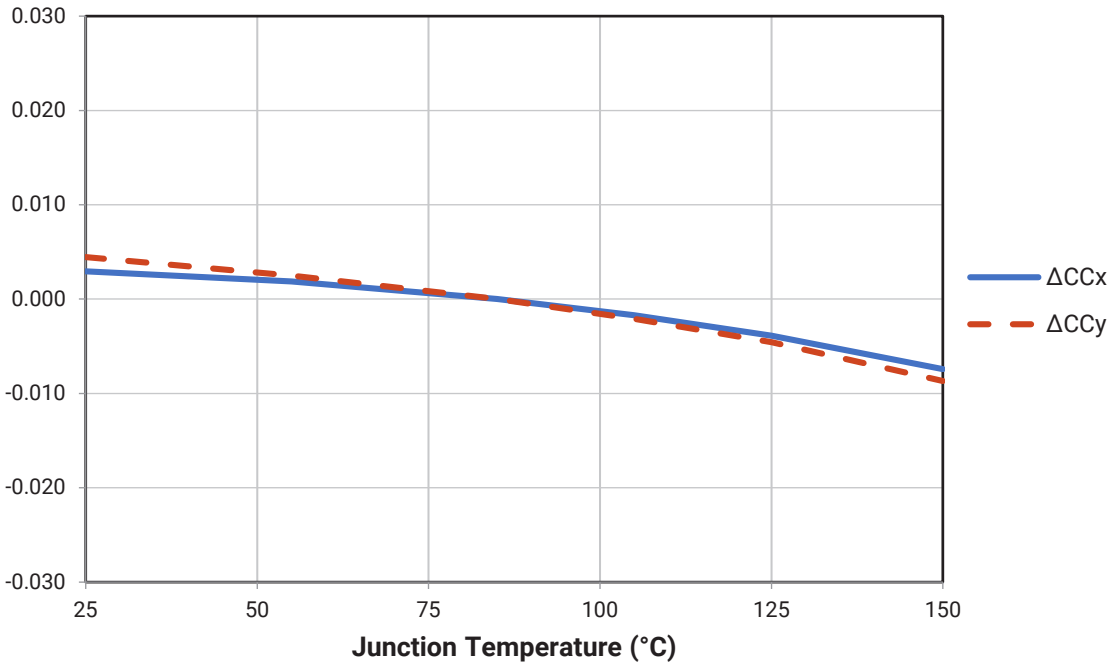


RELATIVE LUMINOUS FLUX VS. CURRENT (T_J = 85 °C)

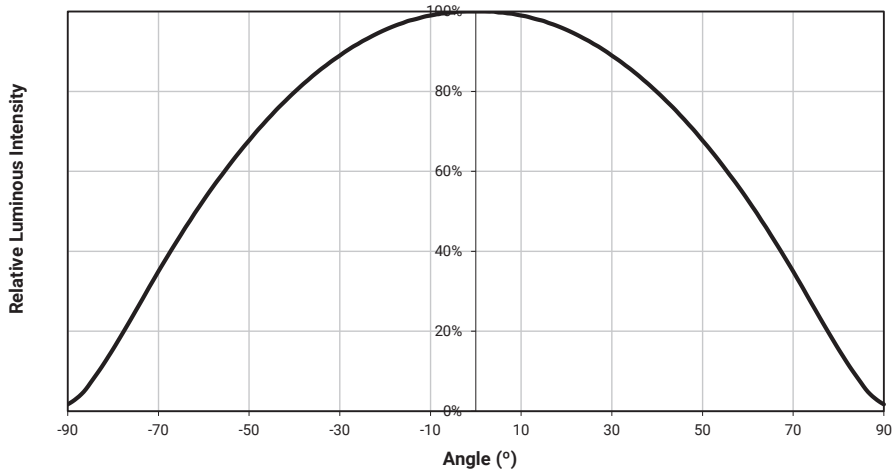


RELATIVE CHROMATICITY VS. CURRENT AND TEMPERATURE



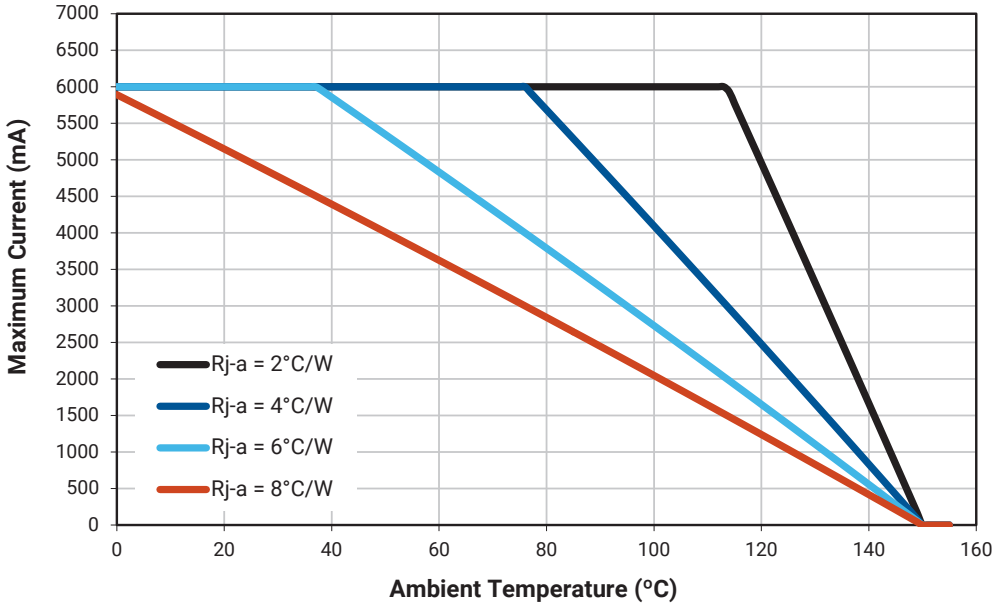


TYPICAL SPATIAL DISTRIBUTION



THERMAL DESIGN

The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.



PERFORMANCE GROUPS - LUMINOUS FLUX

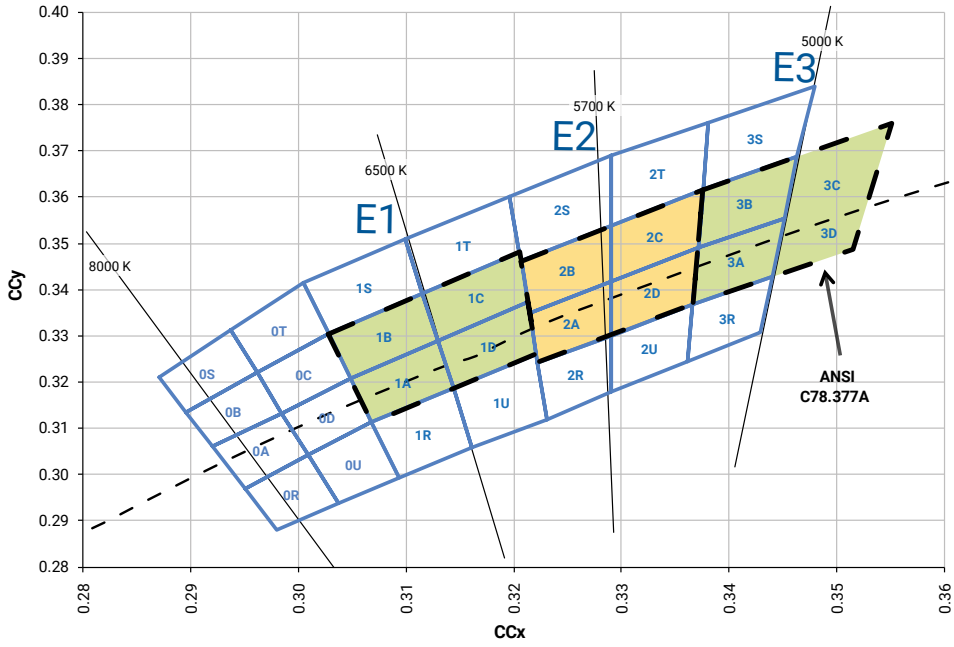
XLamp XP-GR LEDs are tested for luminous flux and placed into one of the following luminous-flux groups.

Group Code	Minimum Luminous Flux (lm) @ 1500 mA	Maximum Luminous Flux (lm) @ 1500 mA
C4	440	475
D2	510	550
D4	550	590

PERFORMANCE GROUPS - CHROMATICITY

Region	x	y	Region	x	y	Region	x	y	Region	x	y
1A	0.3048	0.3207	1B	0.3028	0.3304	1C	0.3115	0.3391	1D	0.3130	0.3290
	0.3130	0.3290		0.3115	0.3391		0.3205	0.3481		0.3213	0.3373
	0.3144	0.3186		0.3130	0.3290		0.3213	0.3373		0.3221	0.3261
	0.3068	0.3113		0.3048	0.3207		0.3130	0.3290		0.3144	0.3186
2A	0.3215	0.3350	2B	0.3207	0.3462	2C	0.3290	0.3538	2D	0.3290	0.3417
	0.3290	0.3417		0.3290	0.3538		0.3376	0.3616		0.3371	0.3490
	0.3290	0.3300		0.3290	0.3417		0.3371	0.3490		0.3366	0.3369
	0.3222	0.3243		0.3215	0.3350		0.3290	0.3417		0.3290	0.3300
3A	0.3371	0.3490	3B	0.3376	0.3616	3C	0.3463	0.3687	3D	0.3451	0.3554
	0.3451	0.3554		0.3463	0.3687		0.3551	0.3760		0.3533	0.3620
	0.3440	0.3427		0.3451	0.3554		0.3533	0.3620		0.3515	0.3487
	0.3366	0.3369		0.3371	0.3490		0.3451	0.3554		0.3440	0.3427

CREE LED'S STANDARD COOL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS



CREE LED'S STANDARD CHROMATICITY KITS

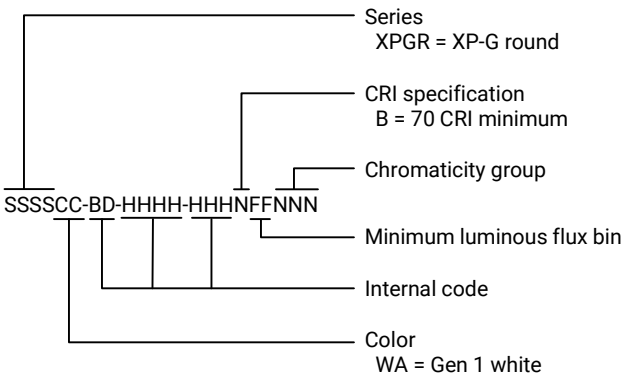
The following table provides the chromaticity bins associated with chromaticity kits.

Color	CCT	Kit	Chromaticity Bins
Cool White	6500 K	E1	1A, 1B, 1C, 1D
	5700 K	E2	2A, 2B, 2C, 2D
	5000 K	E3	3A, 3B, 3C, 3D

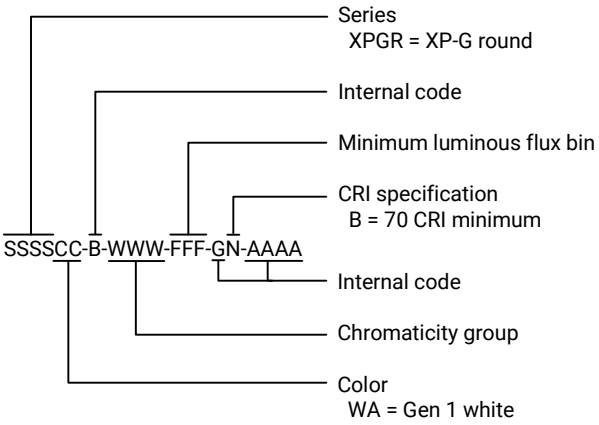
BIN AND ORDER CODE FORMATS

XP-GR bin codes and order codes are configured in the following manner:

Order Code



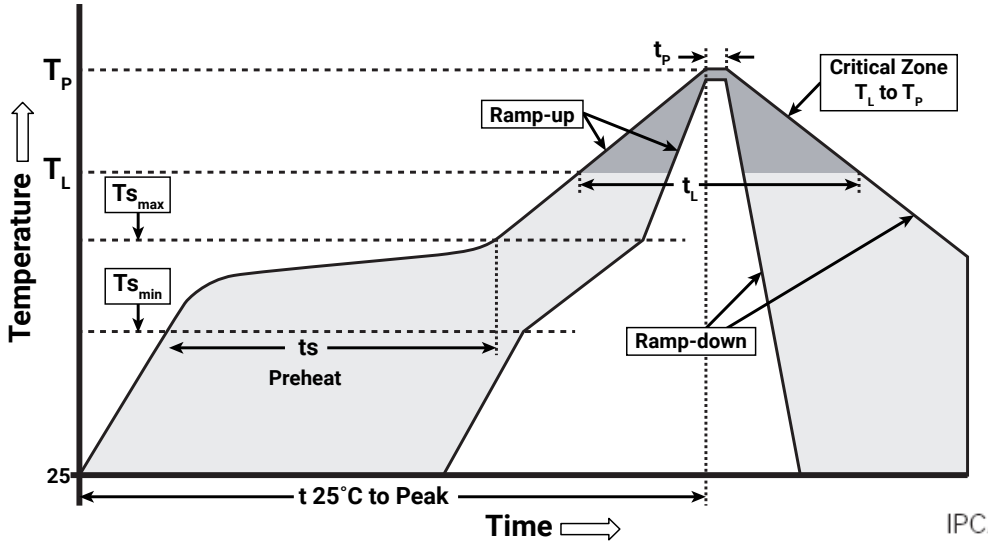
Bin Code



REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp XP-GR LEDs to be compatible with JEDEC J-STD-020C, with the exception of the peak temperature requirements listed in the table below. As a general guideline, Cree LED recommends that users follow the recommended soldering profile provided by the manufacturer of the solder paste used, and therefore it is the lamp or luminaire manufacturer's responsibility to determine applicable soldering requirements.

Note that this general guideline may not apply to all PCB designs and configurations of reflow soldering equipment.



IPC/JEDEC J-STD-020C

Profile Feature	Lead-Free Solder
Average Ramp-Up Rate (Ts_{max} to T_p)	1.2 °C/second
Preheat: Temperature Min (Ts_{min})	120 °C
Preheat: Temperature Max (Ts_{max})	170 °C
Preheat: Time (ts_{min} to ts_{max})	65-150 seconds
Time Maintained Above: Temperature (T_L)	217 °C
Time Maintained Above: Time (t_L)	45-90 seconds
Peak/Classification Temperature (Tp)	235 - 245 °C
Time Within 5 °C of Actual Peak Temperature (tp)	20-40 seconds
Ramp-Down Rate	1 - 6 °C/second
Time 25 °C to Peak Temperature	4 minutes max.

Note: All temperatures refer to topside of the package, measured on the package body surface.

NOTES

Measurements

The luminous flux, radiant power, chromaticity, forward voltage and CRI measurements in this document are binning specifications only and solely represent product measurements as of the date of shipment. These measurements will change over time based on a number of factors that are not within Cree LED's control and are not intended or provided as operational specifications for the products. Calculated values are provided for informational purposes only and are not intended or provided as specifications.

Pre-Release Qualification Testing

Please read the LED Reliability Overview for details on the qualification testing performed on XP-GR LEDs.

Moisture Sensitivity

Cree LED recommends keeping XLamp LEDs in the provided, resealable moisture-barrier packaging (MBP) until immediately prior to soldering. Unopened MBPs that contain XLamp LEDs do not need special storage for moisture sensitivity.

Once the MBP is opened, XLamp XP-GR LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of ≤ 30 ºC/85% relative humidity (RH). Regardless of the storage condition, Cree LED recommends sealing any unsoldered LEDs in the original MBP.

RoHS Compliance

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented January 2, 2013. RoHS Declarations for this product can be obtained from your Cree LED representative or from the Product Ecology section of the Cree LED website.

REACH Compliance

REACH substances of very high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, please contact a Cree LED representative to insure you get the most up-to-date REACH Declaration. REACH banned substance information (REACH Article 67) is also available upon request.

UL® Recognized Component

This product meets the requirements to be considered a UL Recognized Component with Level 4 enclosure consideration. The LED package or a portion thereof has been investigated as a fire and electrical enclosure per ANSI/UL 8750.

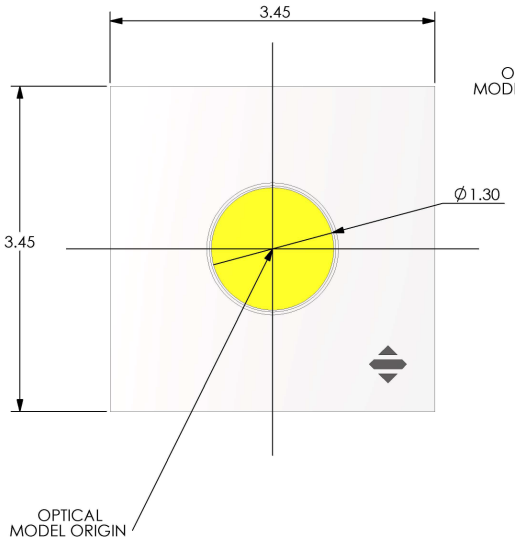
Vision Advisory

WARNING: Do not look at an exposed lamp in operation. Eye injury can result. For more information about LEDs and eye safety, please refer to the LED Eye Safety application note.

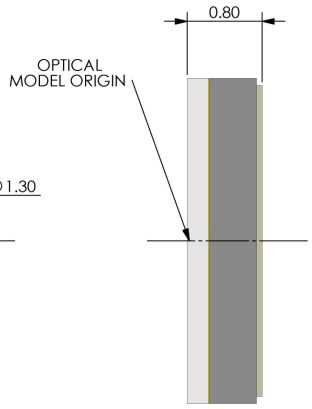
MECHANICAL DIMENSIONS (T_A = 85 °C)

Thermal vias, if present, are not shown on these drawings.

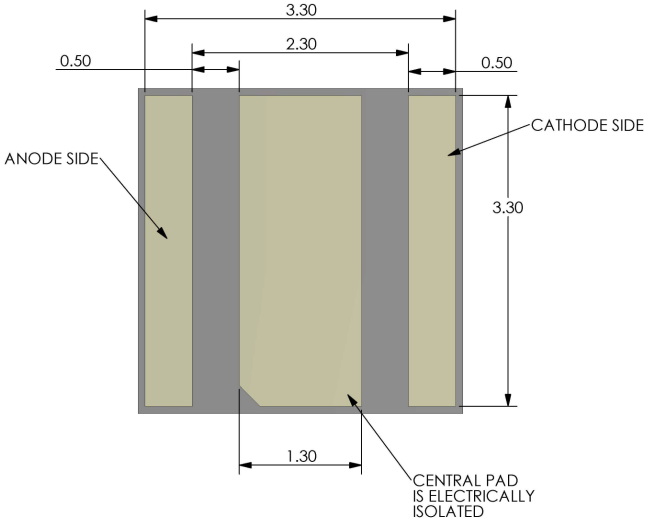
All measurements are ±.13 mm unless otherwise indicated.



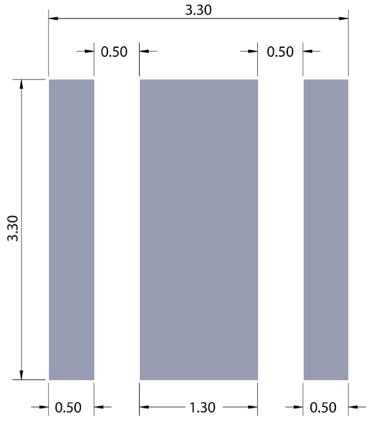
Top View



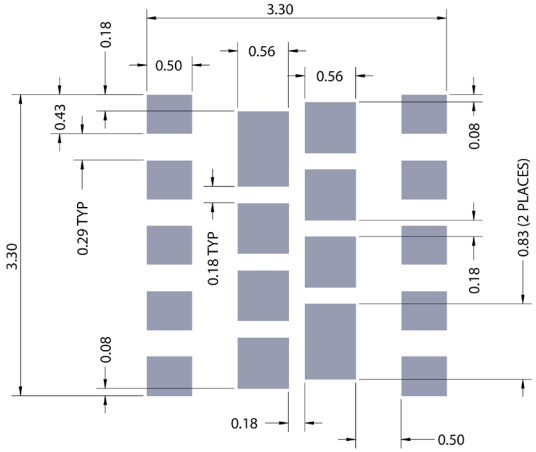
Side View



Bottom View



Recommended PCB Footprint



Recommended Stencil Openings*

Notes:

- Cree LED recommends using thermal pad kickouts to maximize component thermal performance.
- Cree LED recommends using white solder mask material to minimize system optical loss.

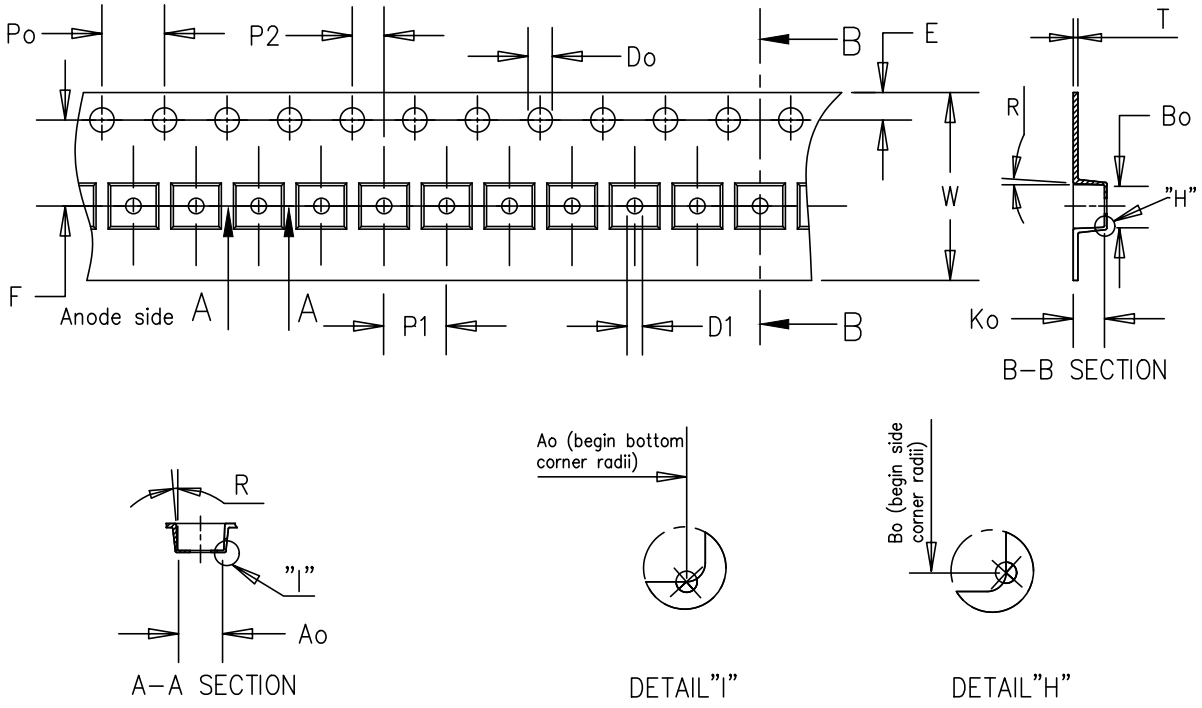
* This stencil has been tested and optimized for the avoidance of voiding when using ALPHA® LUMET® P30 Maxrel solder paste. For other solder pastes, a "window pane" design for the thermal pad stencil may result in a lower voiding percentage. Contact your local Cree LED Field Applications Engineer for consultation regarding your specific application.

TAPE AND REEL

All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

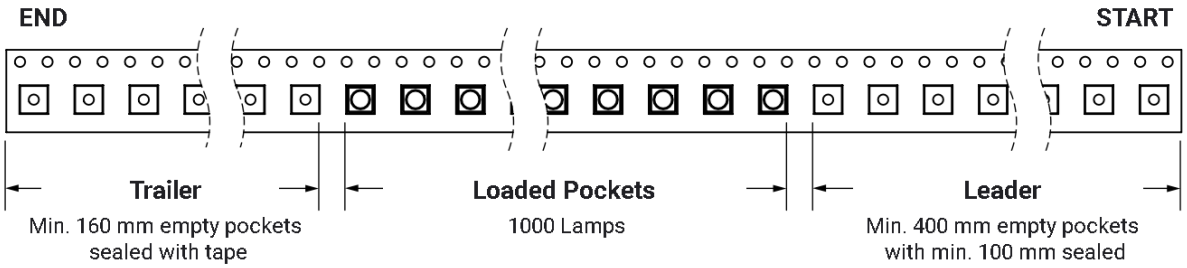
All dimensions in mm.

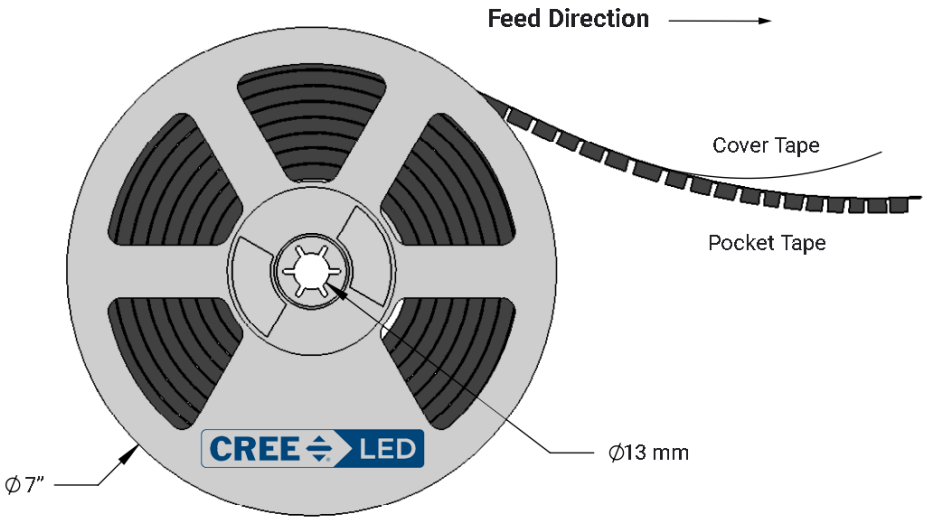
All measurements are ±.15 mm unless otherwise indicated.



Item	Ao	Bo	Ko	Po	P1	P2	T	E	F	Do	D1	W	R
Dimension	3.70	3.70	1.20	4.00	8.00	2.00	0.30	1.75	5.50	1.50	1.50	12.00	3°

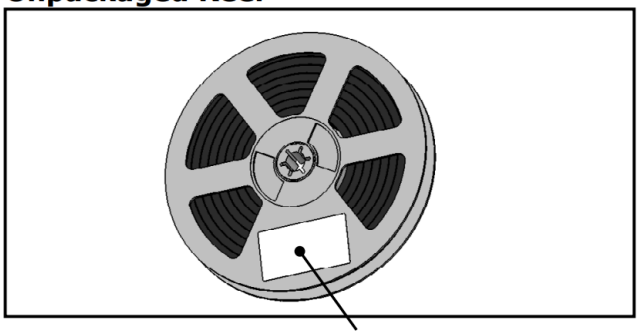
TAPE AND REEL - CONTINUED



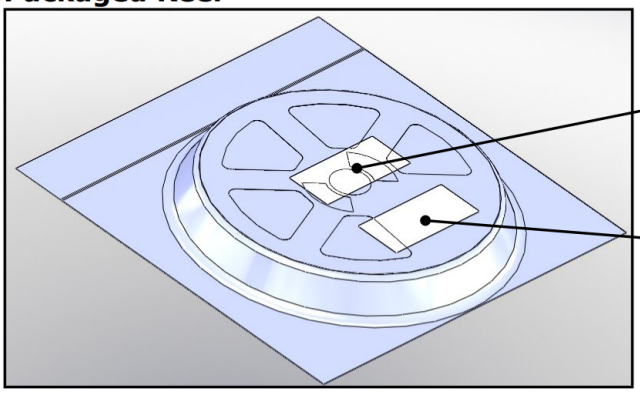


PACKAGING

Unpackaged Reel



Packaged Reel



Boxed Reel