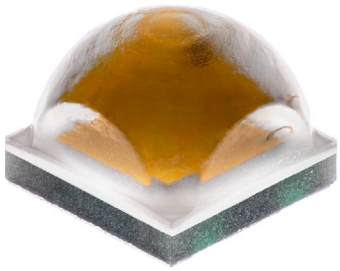
Cree® XLamp® XP-L LEDs



PRODUCT DESCRIPTION

The XLamp® XP-L LED is the highest performing discrete in Cree's High-Density (HD) class of LEDs, delivering the next generation of lumen output and efficacy in the compact 3.45 mm x 3.45 mm XP footprint. Cree's family of HD discrete LEDs offers the industry's highest optical control factor (OCF), a measurement of how LED size and performance benefit directional lighting applications. High-OCF LEDs enable lighting manufacturers to improve the performance of any lighting design, create smaller and less expensive systems, and develop new lighting solutions that were previously not possible.

FEATURES

- Available in white, 70-CRI white, 80-CRI white, 85 CRI white and 90-CRI white
- ANSI-compatible chromaticity bins
- Binned at 85 °C
- Maximum drive current: 3000 mA
- Low thermal resistance: 2.5 °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-compliant
- UL-recognized component (E349212)

TABLE OF CONTENTS

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CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		2.5	
Viewing angle (FWHM)	degrees		125	
Temperature coefficient of voltage	mV/°C		-2	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			3000
Reverse voltage	V			-5
Forward voltage (@ 1050 mA, 85 °C)	V		2.95	3.25
LED junction temperature	°C			150

FLUX CHARACTERISTICS (T_J = 85 °C)

The following table provides several base order codes for XLamp XP-L LEDs. It is important to note that the base order codes listed here are a subset of the total available order codes for the product family. For more order codes, as well as a complete description of the order-code nomenclature, please consult the XLamp XP Family LED Binning and Labeling document.

Color	CCT Range		Base Order Codes Min. Luminous Flux (lm) @ 1050 mA			Calculated Minimum Luminous Flux (lm) @ 85 °C**			Order Code
	Min.	Max.	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	1500 mA	2000 mA	3000 mA	
Cool White	5000 K	8300 K	V5	460	523	620	776	1034	XPLAWT-00-0000-0000V5051
			V4	440	500	593	742	989	XPLAWT-00-0000-0000V4051
			V3	420	478	566	708	944	XPLAWT-00-0000-0000V3051
Neutral White	3700 K	5000 K	V4	440	500	593	741	989	XPLAWT-00-0000-000LV40E5
			V3	420	478	566	708	944	XPLAWT-00-0000-000LV30E5
			V2	400	455	539	675	899	XPLAWT-00-0000-000LV20E5
			U6	380	432	512	641	854	XPLAWT-00-0000-000LU60E5
Warm White	2700 K	3500 K	U6	380	432	512	641	854	XPLAWT-00-0000-000LU60E7
			U5	360	409	485	607	809	XPLAWT-00-0000-000LU50E7
			U4	340	387	458	573	764	XPLAWT-00-0000-000LU40E7
70-CRI White	4000 K	6000 K	V4	440	500	593	741	989	XPLAWT-00-0000-000BV40E3
			V3	420	478	566	708	944	XPLAWT-00-0000-000BV30E3
			V2	400	455	539	675	899	XPLAWT-00-0000-000BV20E3
80-CRI White	2700 K	4000 K	U6	380	432	512	641	854	XPLAWT-00-0000-000HU60E7
			U5	360	409	485	607	809	XPLAWT-00-0000-000HU50E7
			U4	340	387	458	573	764	XPLAWT-00-0000-000HU40E7
85-CRI White	2700 K	3000 K	U3	320	364	431	540	719	XPLAWT-00-0000-000PU30E7
			U2	300	341	404	506	674	XPLAWT-00-0000-000PU20E7
			T6	280	318	377	472	629	XPLAWT-00-0000-000PT60E7
90-CRI White	2700 K	3000 K	U3	320	364	431	540	719	XPLAWT-00-0000-000UU30E7
			U2	300	341	404	506	674	XPLAWT-00-0000-000UU20E7
			T6	280	318	377	472	629	XPLAWT-00-0000-000UT60E7

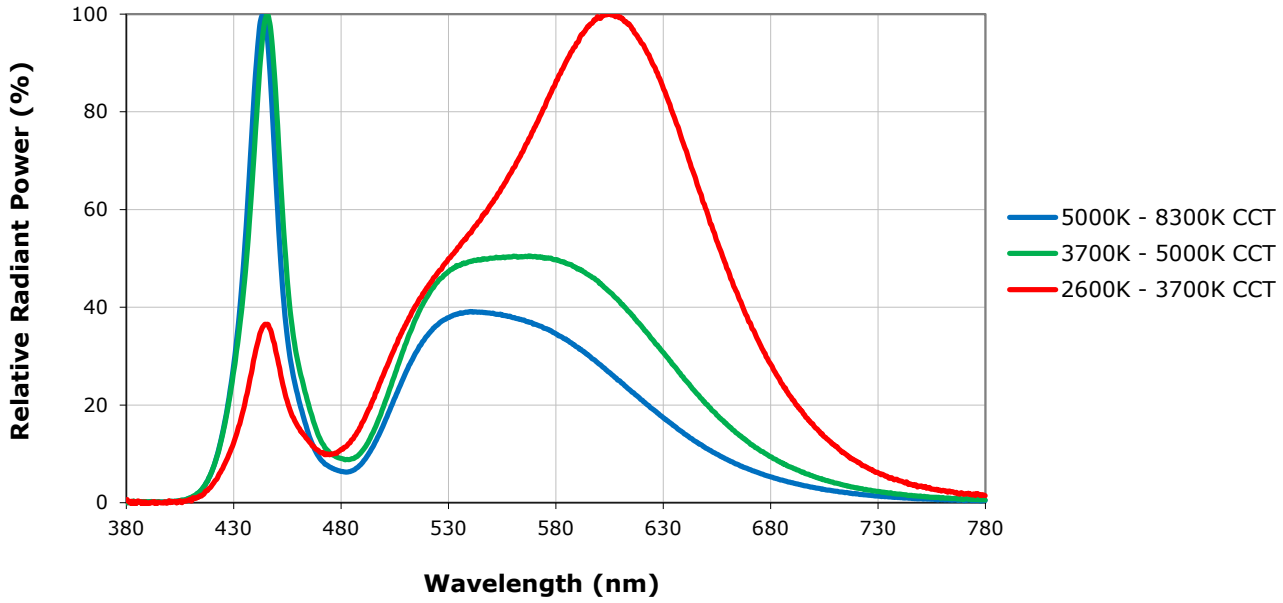
Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 9).
- Typical CRI for Cool White (5000 K – 8300 K CCT) is 65.
- Typical CRI for Neutral White (3700 K – 5000 K CCT) is 75.
- Typical CRI for Warm White (2600 K – 3700 K CCT) is 80.
- Minimum CRI for 70-CRI White is 70.
- Minimum CRI for 80-CRI White is 80.
- Minimum CRI for 85-CRI White is 85.
- Minimum CRI for 90-CRI White is 90

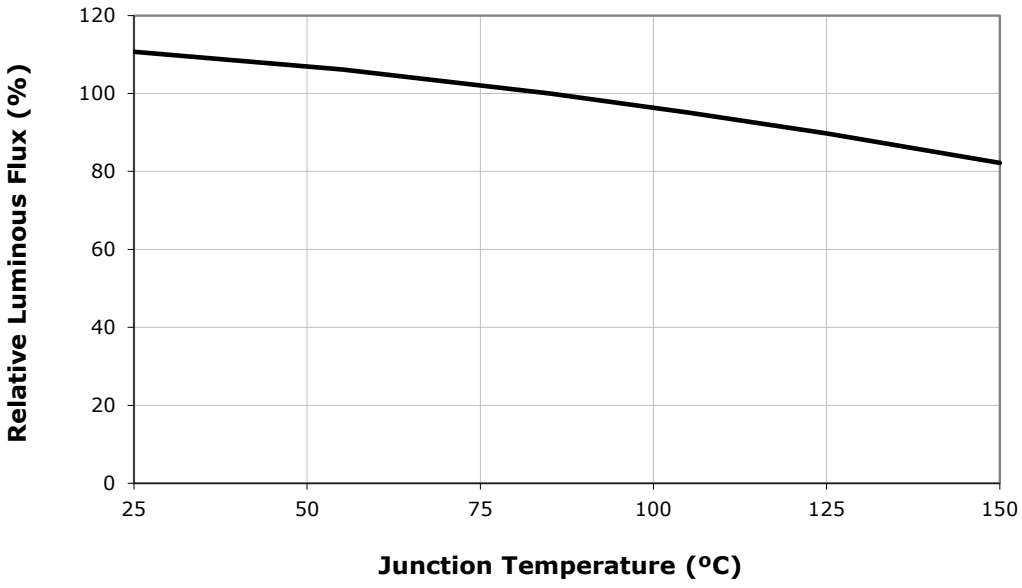
* Flux values @ 25 °C are calculated and are for reference only.

** Calculated flux values at 1500 mA, 2000 mA and 3000 mA are for reference only.

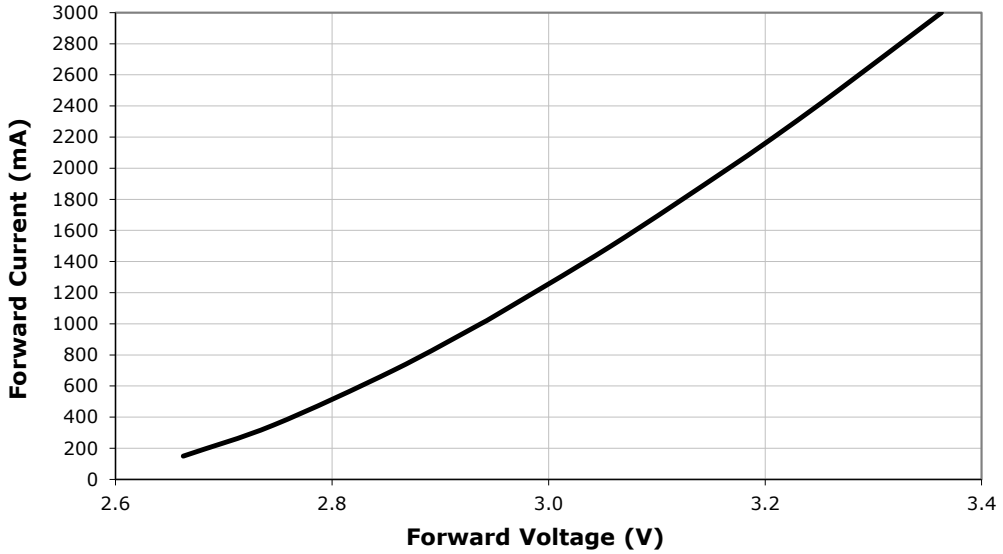
RELATIVE SPECTRAL POWER DISTRIBUTION



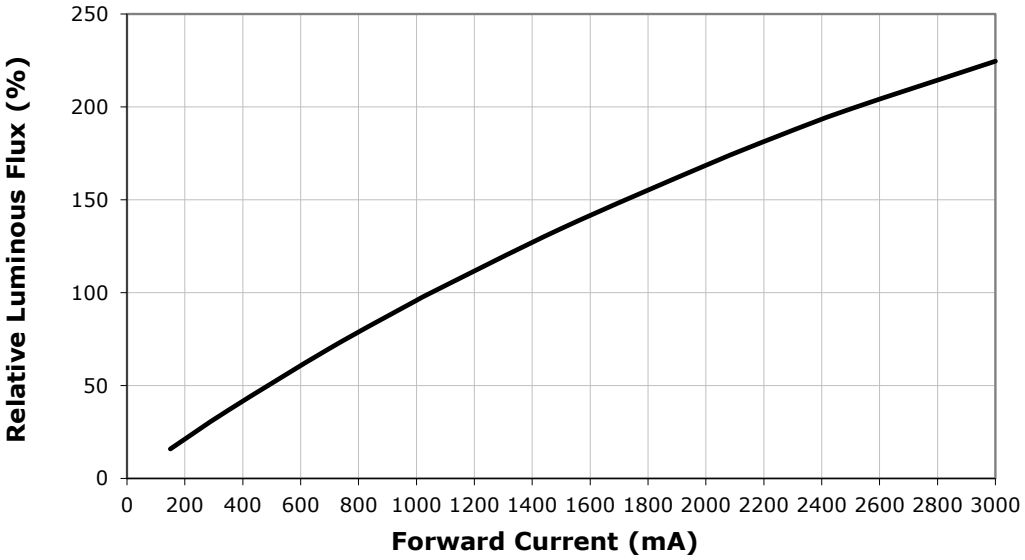
RELATIVE FLUX VS. JUNCTION TEMPERATURE (I_F = 1050 mA)



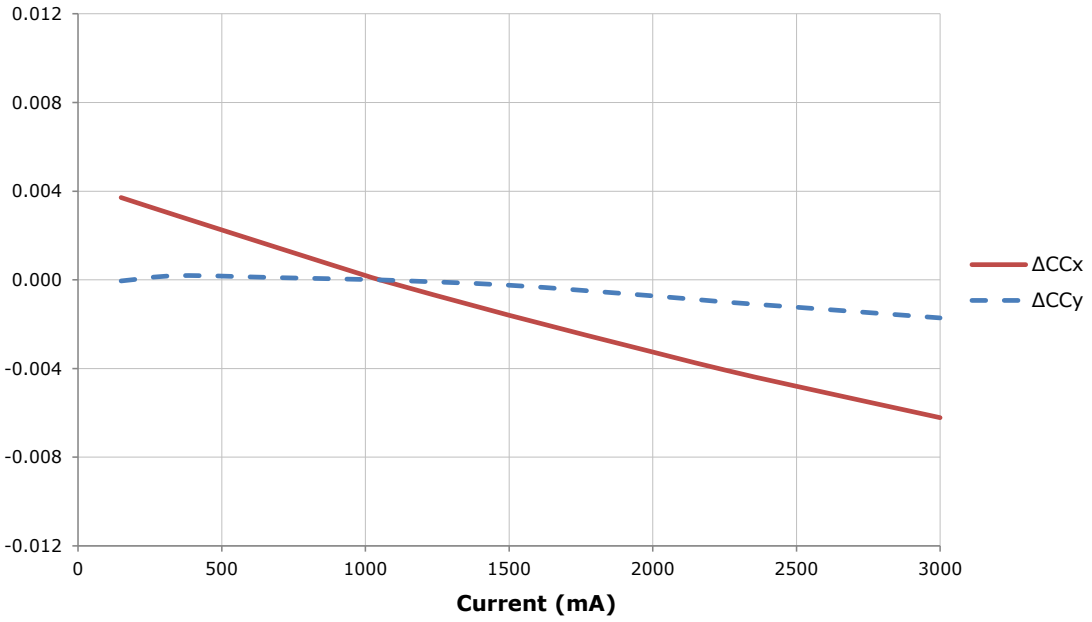
ELECTRICAL CHARACTERISTICS (T_J = 85 °C)



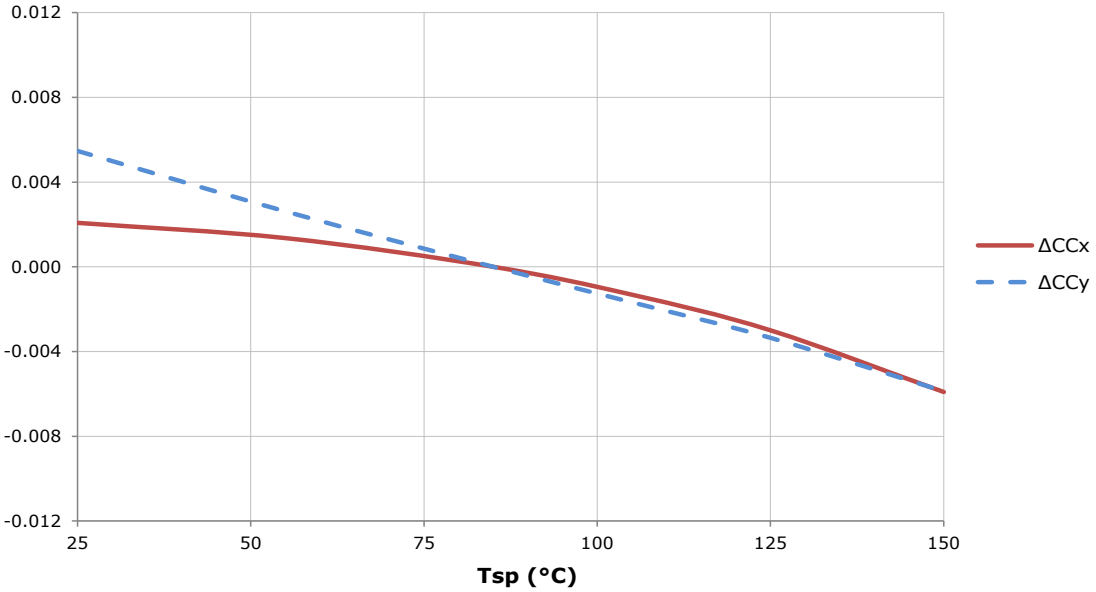
RELATIVE FLUX VS. CURRENT (T_J = 85 °C)



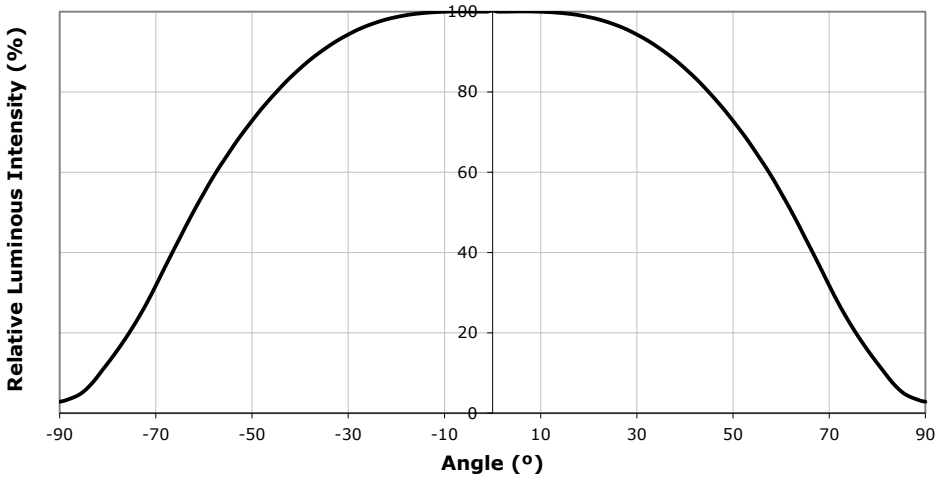
RELATIVE CHROMATICITY VS. CURRENT (WARM WHITE)



RELATIVE CHROMATICITY VS. TEMPERATURE (WARM WHITE)

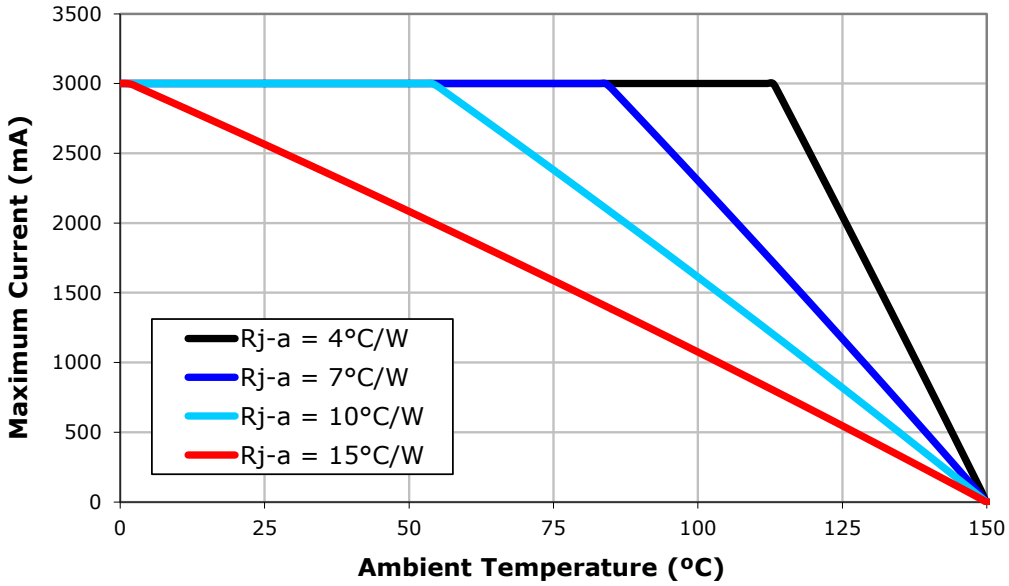


TYPICAL SPATIAL DISTRIBUTION



THERMAL DESIGN

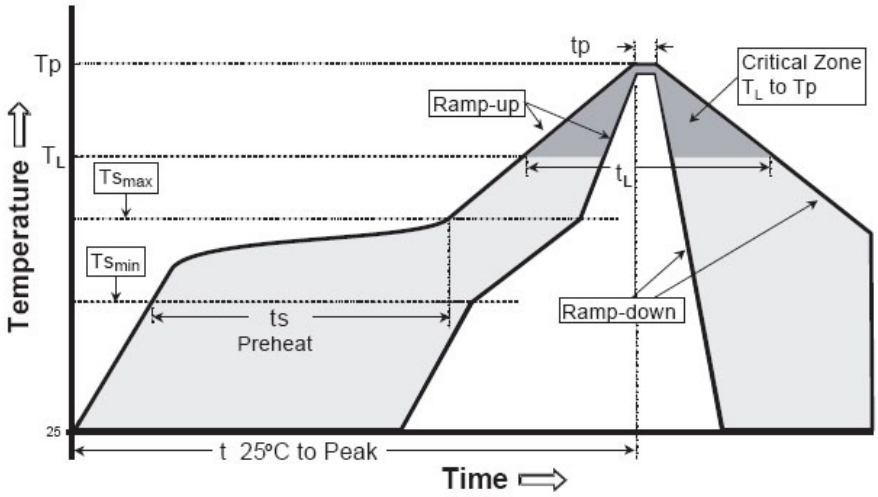
The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.



REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XP-L LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline, Cree recommends that users follow the recommended soldering profile provided by the manufacturer of solder paste used.

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-Based Solder	Lead-Free Solder
Average Ramp-Up Rate (Ts_{max} to Tp)	3 °C/second max.	3 °C/second max.
Preheat: Temperature Min (Ts_{min})	100 °C	150 °C
Preheat: Temperature Max (Ts_{max})	150 °C	200 °C
Preheat: Time (ts_{min} to ts_{max})	60-120 seconds	60-180 seconds
Time Maintained Above: Temperature (T_L)	183 °C	217 °C
Time Maintained Above: Time (t_L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (Tp)	215 °C	260 °C
Time Within 5 °C of Actual Peak Temperature (tp)	10-30 seconds	20-40 seconds
Ramp-Down Rate	6 °C/second max.	6 °C/second max.
Time 25 °C to Peak Temperature	6 minutes max.	8 minutes max.

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

NOTES

Measurements

The luminous flux, radiant power, chromaticity 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'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 as specifications.

Lumen Maintenance

Cree now uses standardized IES LM-80-08 and TM-21-11 methods for collecting long-term data and extrapolating LED lumen maintenance. For information on the specific LM-80 data sets available for this LED, refer to the public LM-80 results document.

Please read the Long-Term Lumen Maintenance application note for more details on Cree's lumen maintenance testing and forecasting. Please read the Thermal Management application note for details on how thermal design, ambient temperature, and drive current affect the LED junction temperature.

Moisture Sensitivity

Cree 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-L 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 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 representative or from the Product Documentation sections of www.cree.com.

UL Recognized Component

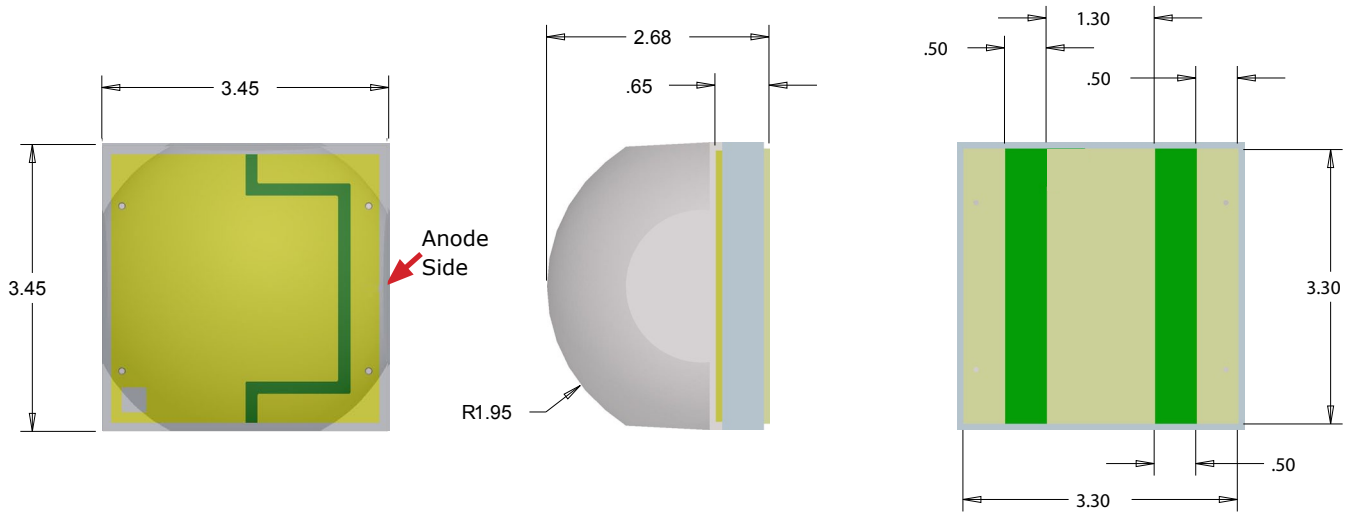
Level 4 enclosure consideration. The LED package or a portion thereof has been investigated as a fire and electrical enclosure per ANSI/UL 8750.

Vision Advisory

WARNING: Do not look at 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.

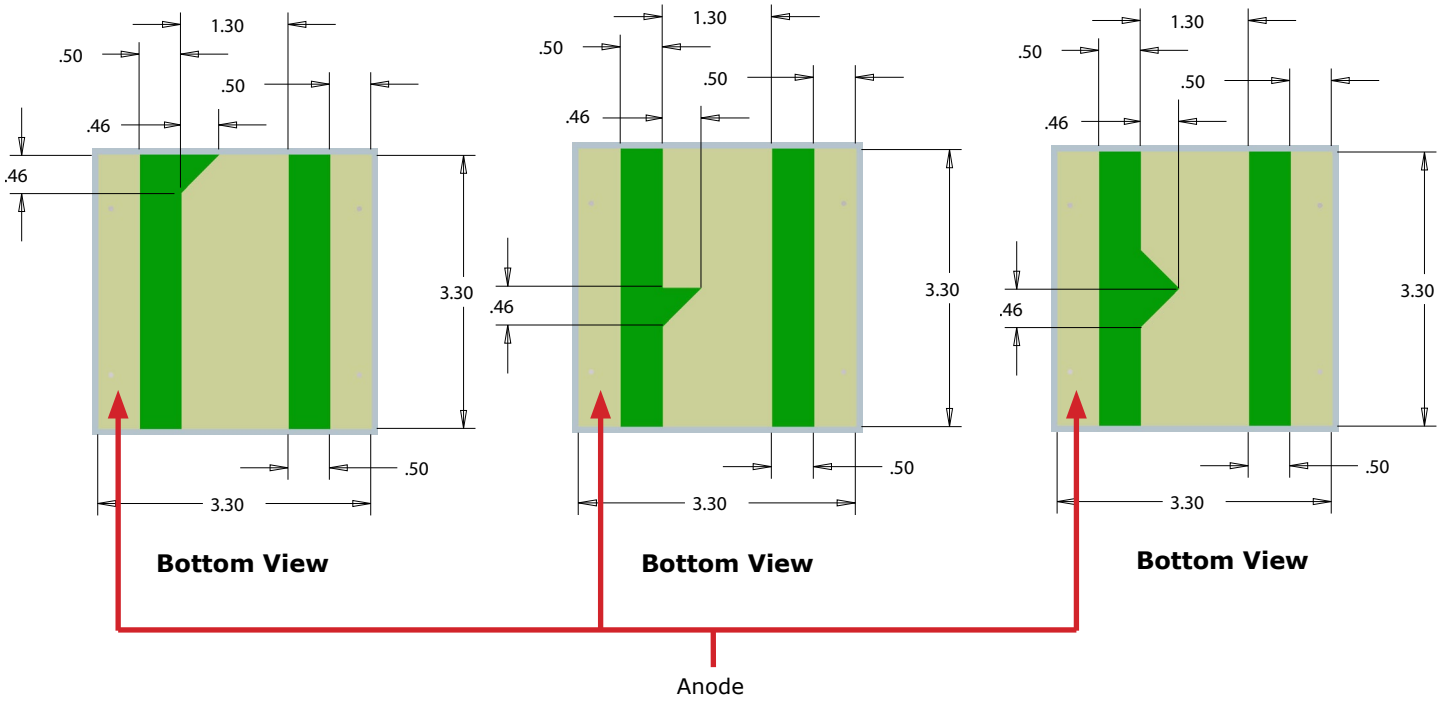
MECHANICAL DIMENSIONS

All measurements are ± .25 mm unless otherwise indicated.



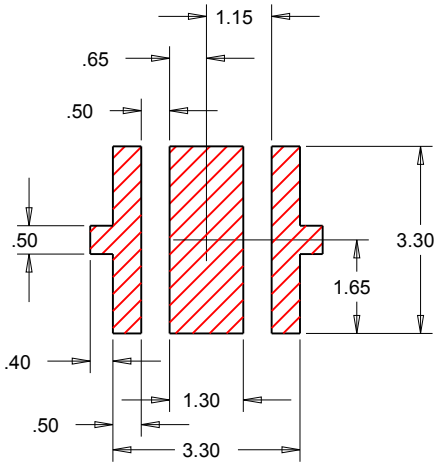
Top View **Side View** **Bottom View**

Alternate bottom views of the XP-L LED are shown in the diagrams below.

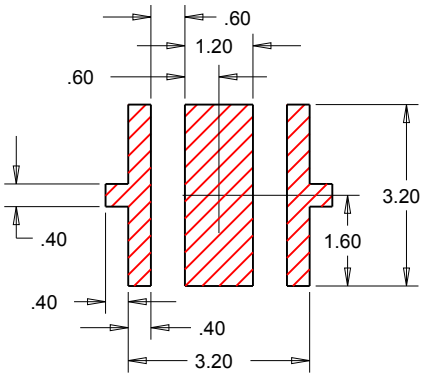


Bottom View **Bottom View** **Bottom View**

MECHANICAL DIMENSIONS - CONTINUED



Recommended PCB Solder Pad

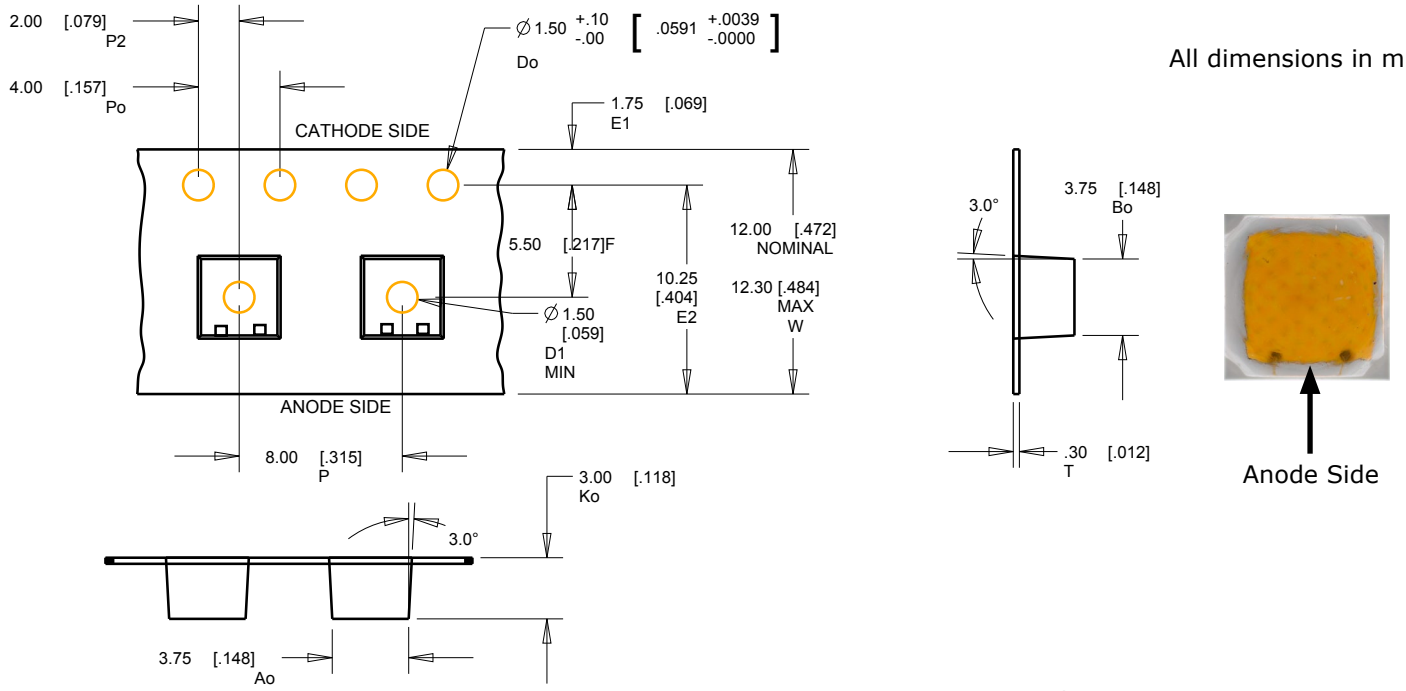


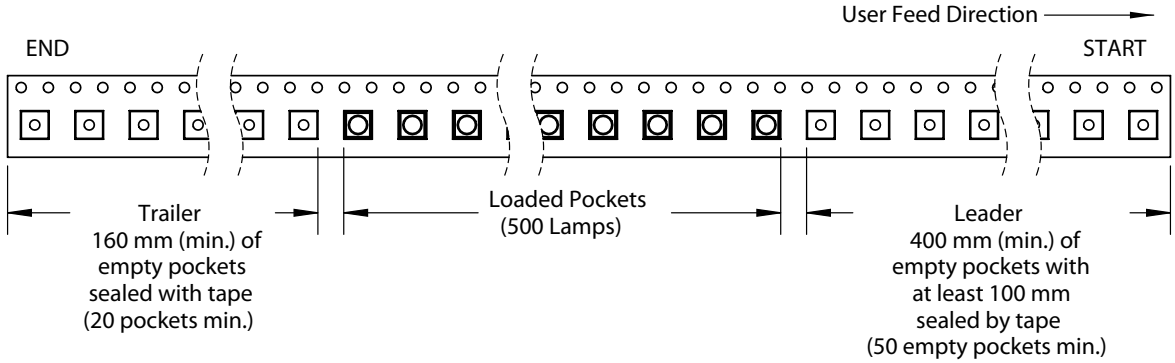
Recommended Stencil Pattern (Hatched Area Is Open)

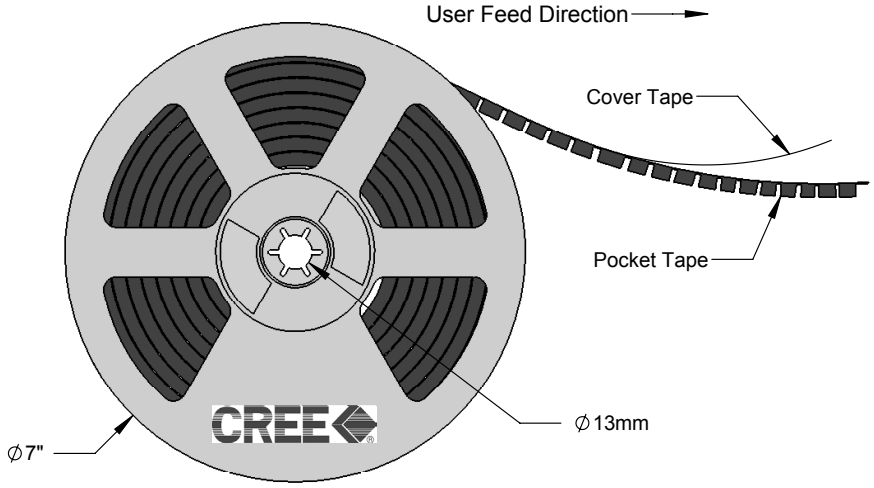
TAPE AND REEL

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

All dimensions in mm.

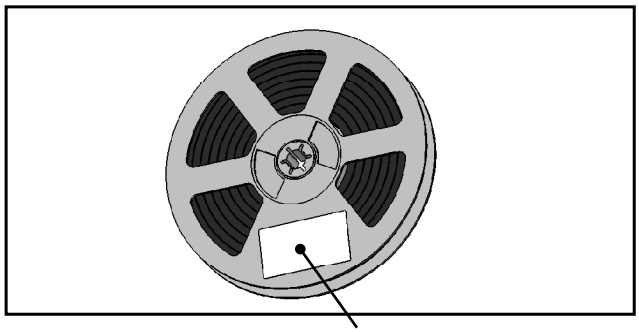




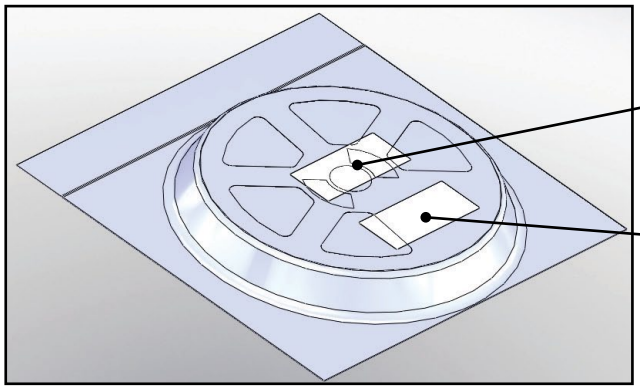


PACKAGING

Unpackaged Reel



Packaged Reel



Boxed Reel