

# Cree® XLamp® MX-6S LEDs



## PRODUCT DESCRIPTION

The Cree XLamp MX-6S LED provides the proven lighting-class performance and reliability of Cree XLamp LEDs in a high voltage, PLCC configuration. All members of the MX-family of LEDs have wide viewing angle, uniform light output without secondary optics, unlimited floor life, and electrically neutral thermal path.

The XLamp MX-6S LED brings high performance and quality of light to a range of lighting applications that require near-line-voltage configuration, including LED light bulbs, fluorescent retrofits and retail-display lighting.

## FEATURES

- Available in white (2,600 K to 8,300 K CCT)
- Wide viewing angle: 120°
- 20 VDC nominal with voltage binning available
- Electrically neutral thermal path
- Qualification at max drive current
- RoHS-compliant
- Unlimited floor life at  $\leq 30^{\circ}\text{C}/85\% \text{ RH}$

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## FLUX CHARACTERISTICS (T<sub>j</sub> = 25°C)

The following table provides several base order codes for XLamp MX-6S 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 MX Family LED Binning and Labeling document.

Color	CCT Range		Base Order Codes Min Luminous Flux (lm) @ 60 mA		Order Code
	Min.	Max.	Group	Flux (lm)	
Cool White	5,000 K	8,300 K	R3	122	MX6SWT-A1-0000-000F51
			R4	130	MX6SWT-A1-0000-000G51
			R2	114	MX6SWT-A1-0000-000EE3
			R3	122	MX6SWT-A1-0000-000FE3
80-CRI White	2,600K	4,300K	Q4	100	MX6SWT-H1-0000-000CE5
			Q5	107	MX6SWT-H1-0000-000DE5
			Q3	93.9	MX6SWT-H1-0000-000BE7
			Q4	100	MX6SWT-H1-0000-000CE7
Warm White	3,700 K	4,300 K	Q5	107	MX6SWT-A1-0000-000DE5
			R2	114	MX6SWT-A1-0000-000EE5
	2,600 K	3,700 K	Q4	100	MX6SWT-A1-0000-000CE7
			Q5	107	MX6SWT-A1-0000-000DE7

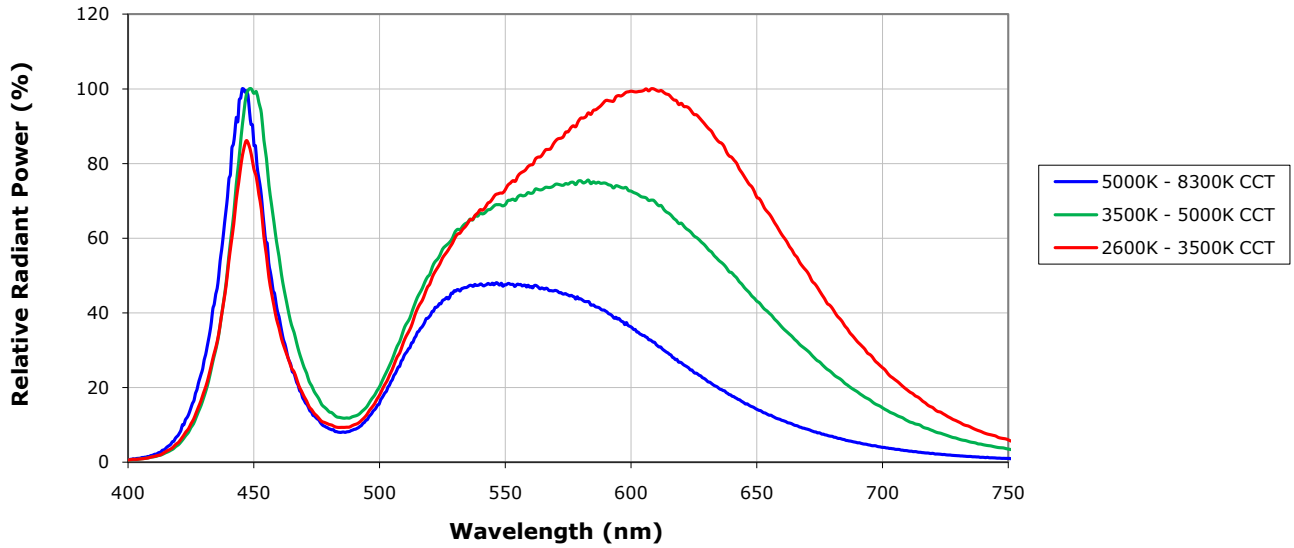
### Notes:

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements and  $\pm 2$  on CRI measurements.
- Typical CRI for Cool White (4,300 K – 8,300 K CCT) is 75.
- Typical CRI for Warm White (2,600 K – 4,300 K CCT) is 80.
- Minimum CRI for 80-CRI White is 80.

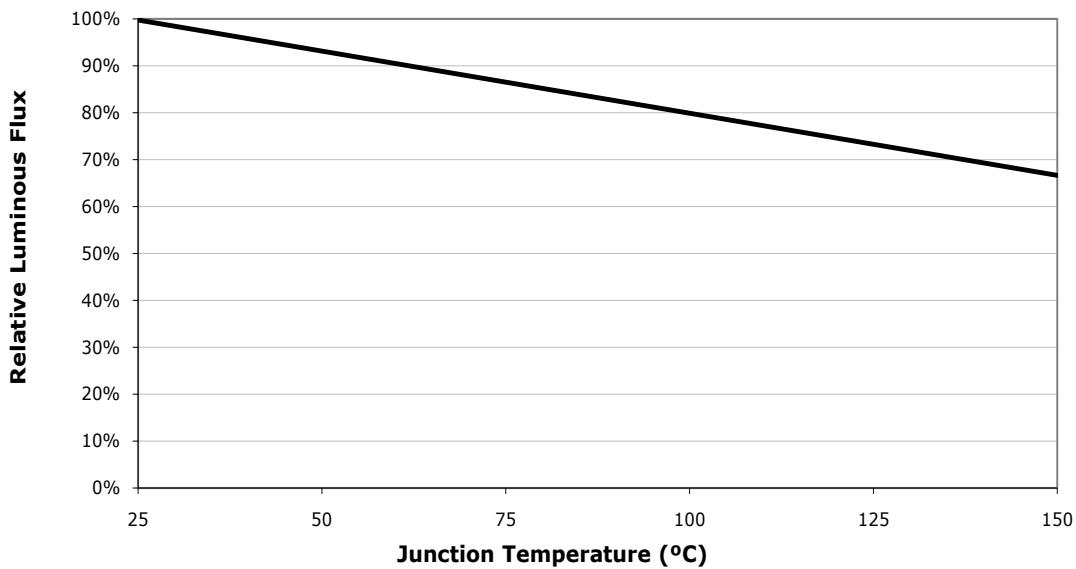
## CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		5	
Viewing angle (FWHM)	degrees		120	
Temperature coefficient of voltage	mV/°C		-20	
ESD classification (HBM per Mil-Std-883D)			Class 2	
DC forward current	mA			175
Forward voltage (@ 60 mA)	V		20.0	22.0
LED junction temperature	°C			150

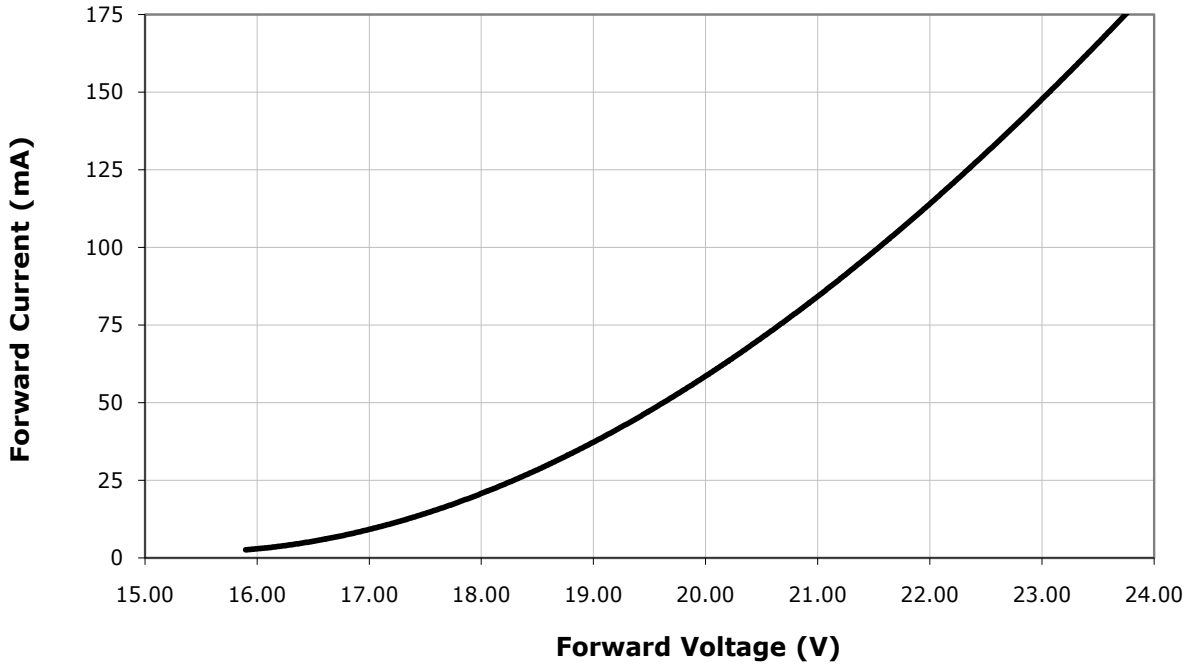
**RELATIVE SPECTRAL POWER DISTRIBUTION**



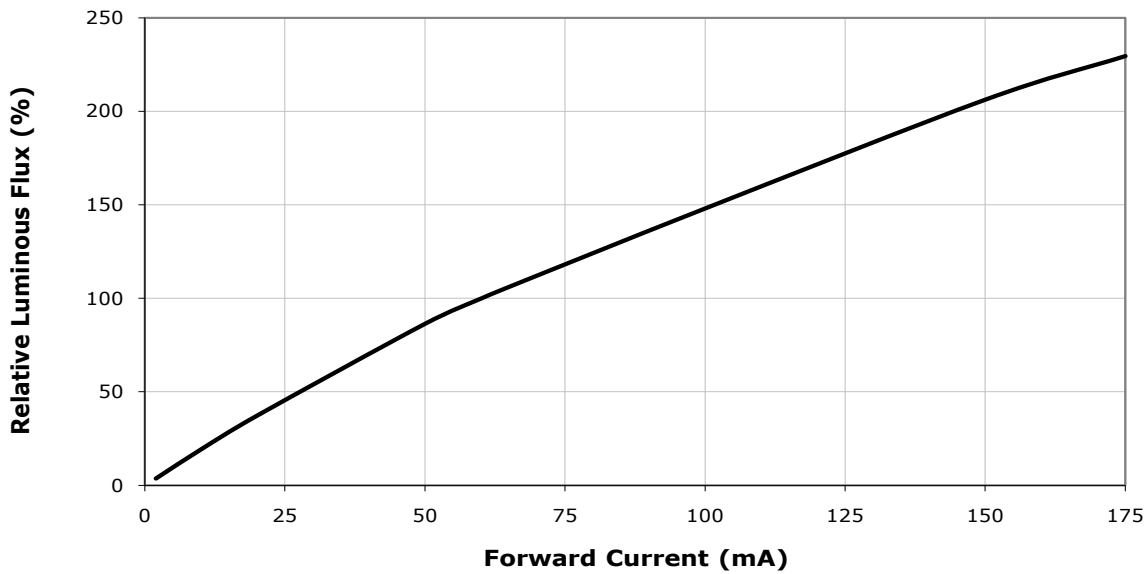
**RELATIVE FLUX VS. JUNCTION TEMPERATURE ( $I_F = 60$  MA)**



**ELECTRICAL CHARACTERISTICS ( $T_j = 25^\circ\text{C}$ )**

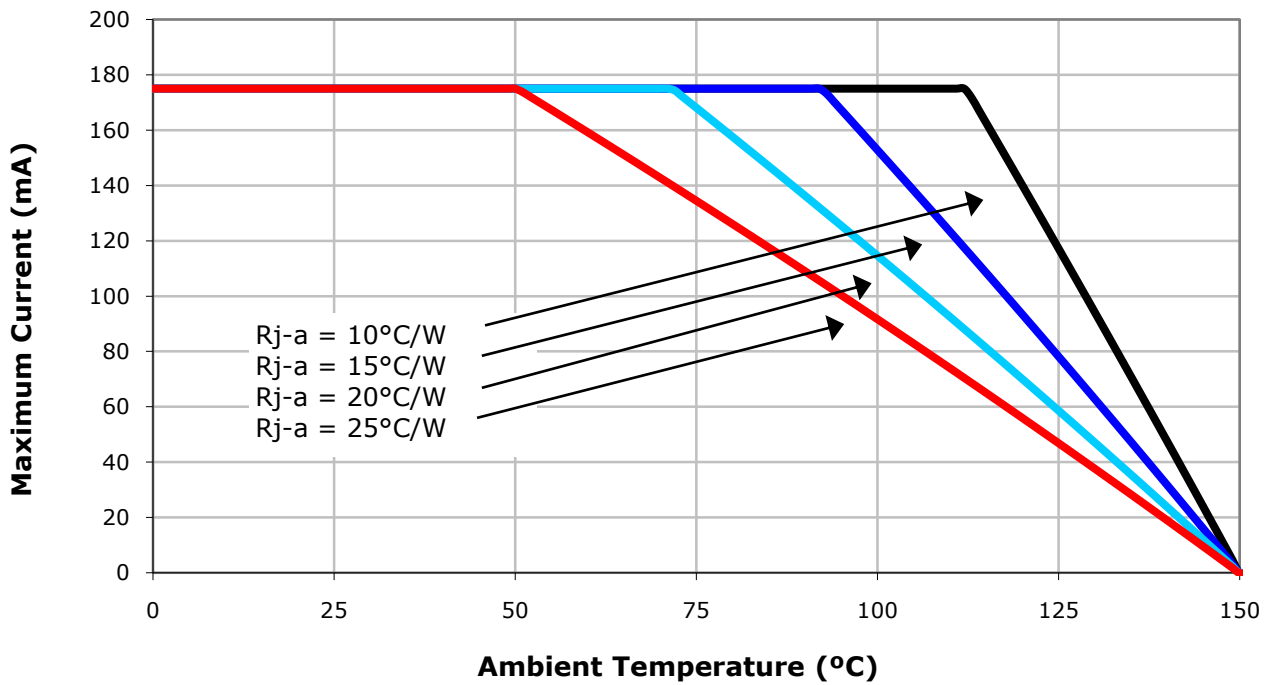


**RELATIVE FLUX VS. CURRENT ( $T_j = 25^\circ\text{C}$ )**

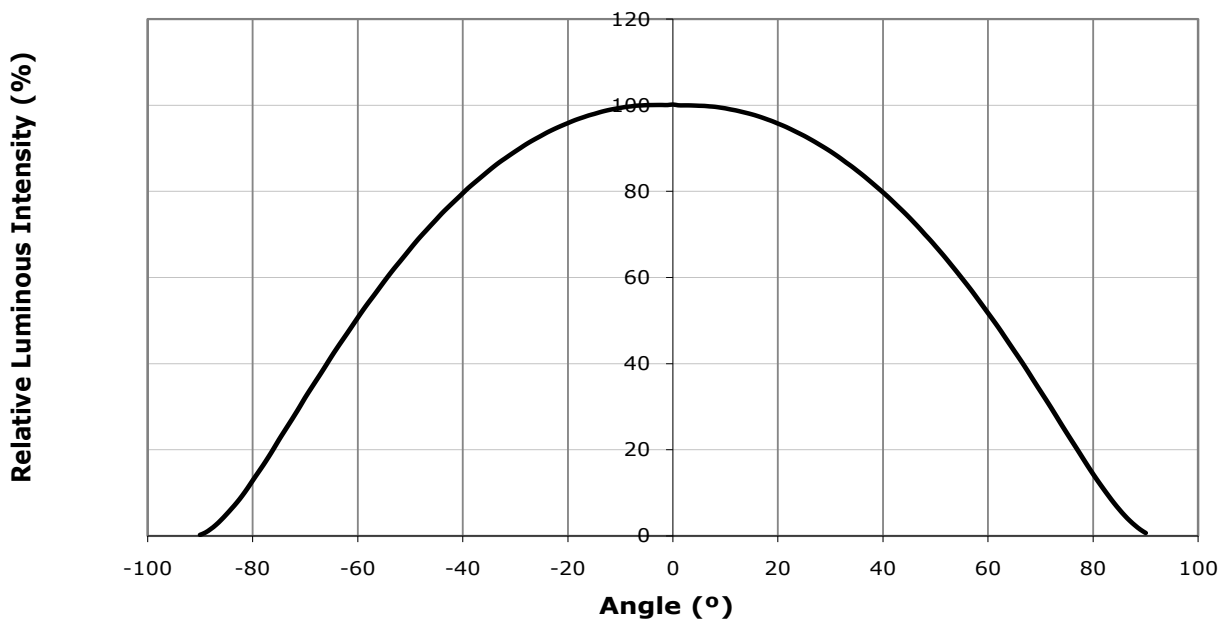


**THERMAL DESIGN**

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.



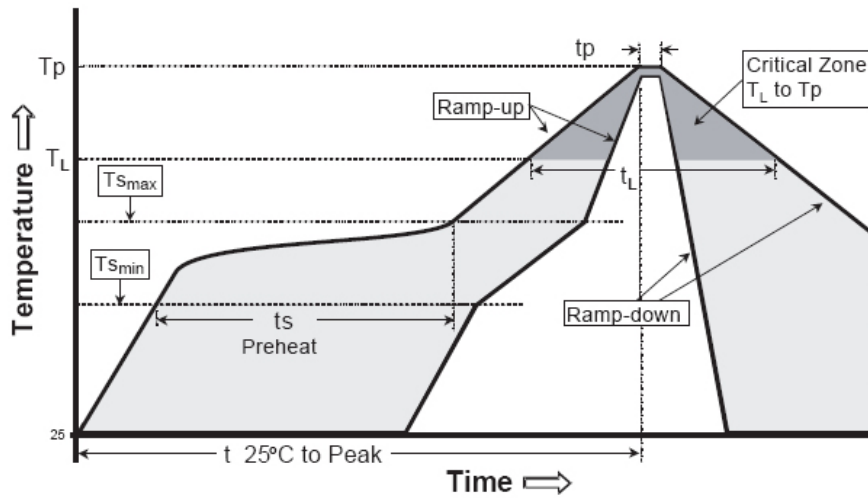
**TYPICAL SPATIAL DISTRIBUTION**



### REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp MX-6S 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 <sub>max</sub> to Tp)	3°C/second max.	3°C/second max.
Preheat: Temperature Min (Ts <sub>min</sub> )	100°C	150°C
Preheat: Temperature Max (Ts <sub>max</sub> )	150°C	200°C
Preheat: Time (ts <sub>min</sub> to ts <sub>max</sub> )	60-120 seconds	60-180 seconds
Time Maintained Above: Temperature (T <sub>l</sub> )	183°C	217°C
Time Maintained Above: Time (t <sub>l</sub> )	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

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### Lumen Maintenance Projections

Based on internal long-term reliability testing, Cree projects XLamp MX-6S LEDs will maintain an average of 70% or higher lumen maintenance after 35,000 hours, provided the LED is operated with a constant current of not more than 100 mA and ambient air temperature around the LED is maintained at or below 85°C.

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

### Moisture Sensitivity

In testing, Cree has found XLamp MX-6S LEDs to have unlimited floor life in conditions  $\leq 30^{\circ}\text{C}$  / 85% relative humidity (RH). Moisture testing included a 168 hour soak at 85°C / 85% RH followed by 3 reflow cycles, with visual and electrical inspections at each stage.

### RoHS Compliance

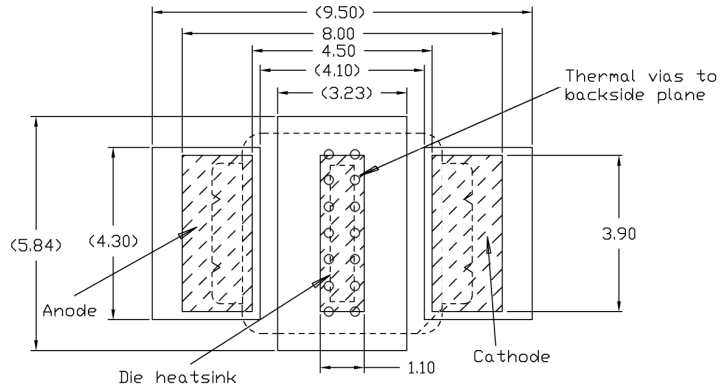
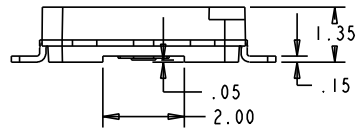
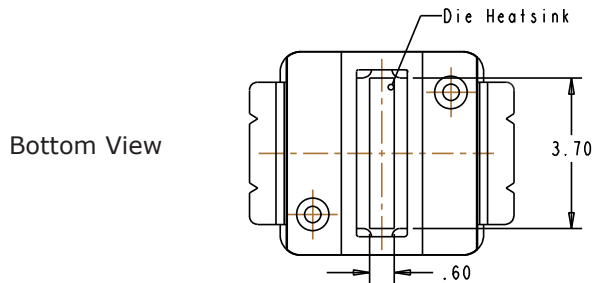
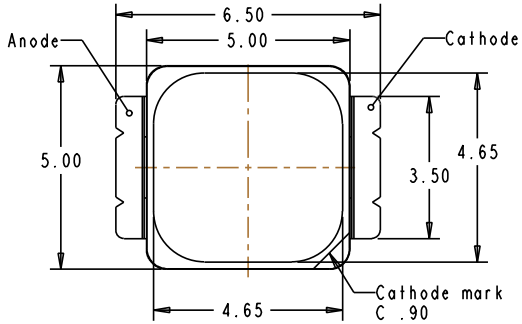
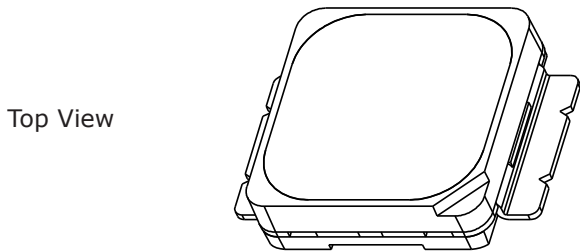
The levels of environmentally sensitive, persistent biologically toxic (PBT), persistent organic pollutants (POP), or otherwise restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended through April 21, 2006.

### Vision Advisory Claim

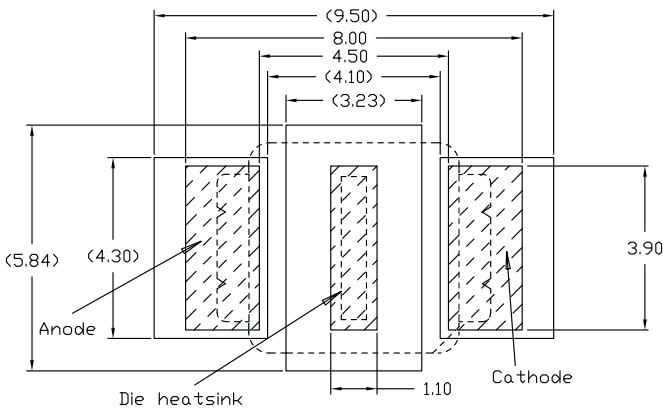
Users should be cautioned not to stare at the light of this LED product. The bright light can damage the eye.

**MECHANICAL DIMENSIONS**

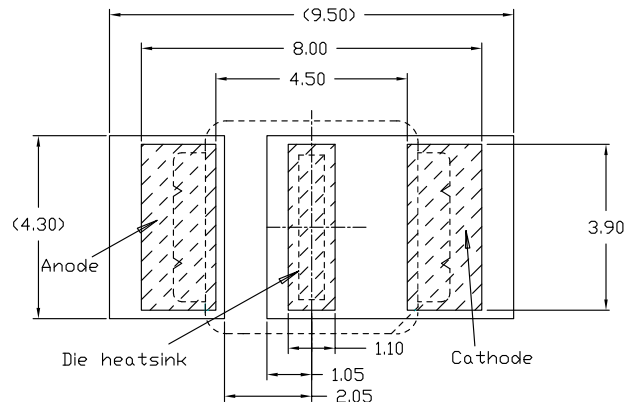
All measurements are  $\pm .13$  mm unless otherwise indicated.



Recommended FR4 Solder Pad



Recommended MCPCB Solder Pad

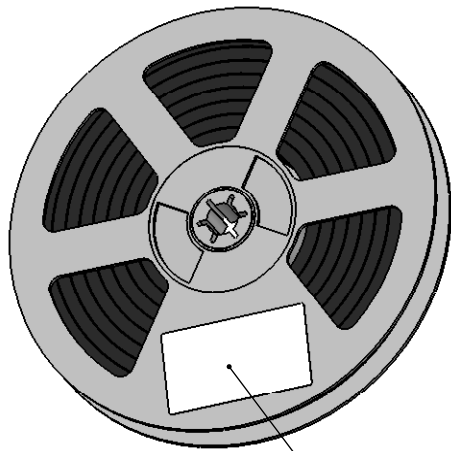


Alternative Solder Pad

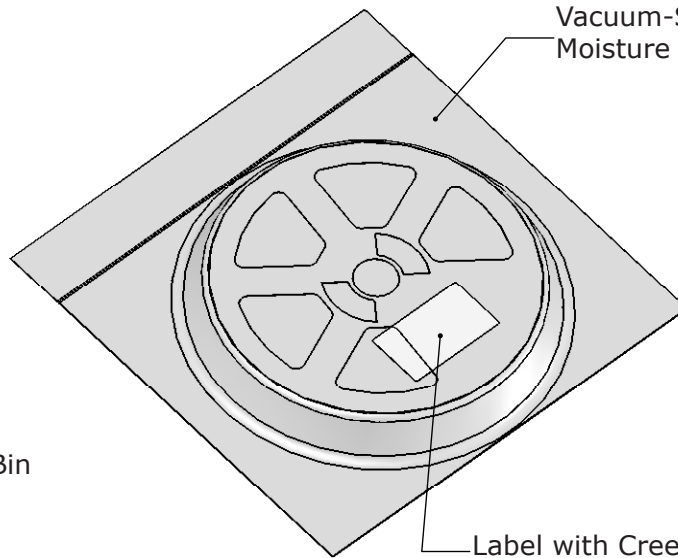




### PACKAGING

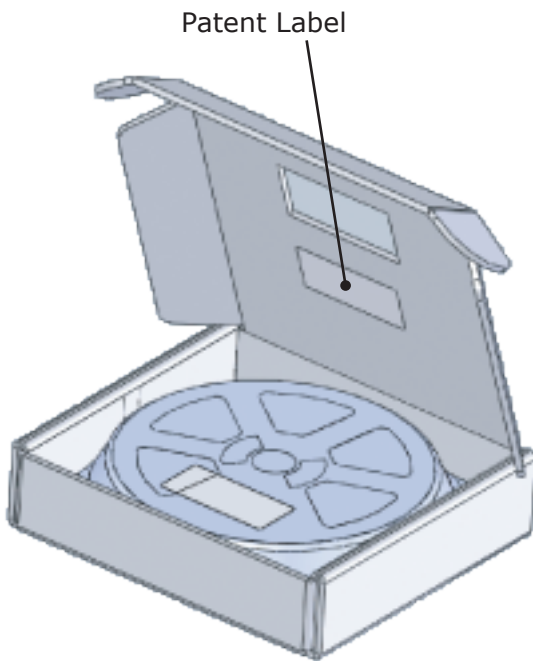


Label with Cree Bin Code, Qty, Lot #

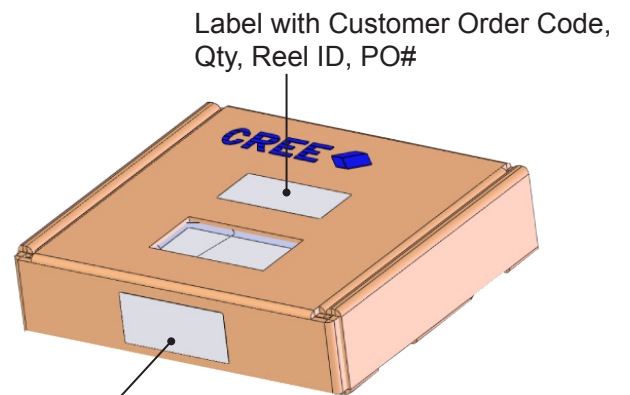


Vacuum-Sealed Moisture Barrier Bag

Label with Cree Bin Code, Qty, Lot #



Patent Label



Label with Customer Order Code, Qty, Reel ID, PO#

Label with Cree Bin Code, Qty, Lot #