

Cree® XLamp® XQ-D LED



PRODUCT DESCRIPTION

Cree XLamp XQ-D LEDs revolutionize low-cost, high-power LEDs by delivering lighting-class reliability and a wider spread of light than typical plastic packages. The XQ-D's innovative wide light emission can improve the omnidirectionality of replacement lamps, while also reducing system cost by using fewer LEDs.

Using Cree's newest generation of silicon carbide-based LED chips, XQ-D is optimized to dramatically lower system cost in replacement lamp, non-directional and outdoor area lighting applications.

FEATURES

- Cree's smallest lighting class LED: 1.6 X 1.6 X 1.6 mm
- Available in white, 80-minimum CRI white, and 70-minimum CRI cool white
- Binned at 25 °C
- 700 mA maximum drive current
- Low thermal resistance: 7.5 °C/W
- Wide viewing angle: 145°
- Reflow solderable - JEDEC J-STD-020C compatible
- Unlimited floor life at ≤ 30 °C/85% RH
- UL-recognized component (E349212)



TABLE OF CONTENTS

Characteristics	2
Flux Characteristics.....	3
Relative Spectral Power Distribution.....	4
Relative Flux vs. Junction Temperature	4
Electrical Characteristics	5
Thermal Design	5
Relative Flux vs. Current	6
Typical Spatial Distribution.....	6
Reflow Soldering Characteristics .	7
Notes.....	8
Mechanical Dimensions.....	9
Tape and Reel	10
Packaging.....	11

CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		7.5	
Viewing angle (FWHM)	degrees		145	
Temperature coefficient of voltage	mV/°C		-3	
ESD classification (HBM per Mil-Std-883D)			Class 1	
DC forward current	mA		350	700
Reverse voltage	V			-5
Forward voltage (@ 350 mA, 25 °C)	V		3.1	3.5
LED junction temperature	°C			150

FLUX CHARACTERISTICS (T_j = 25 °C)

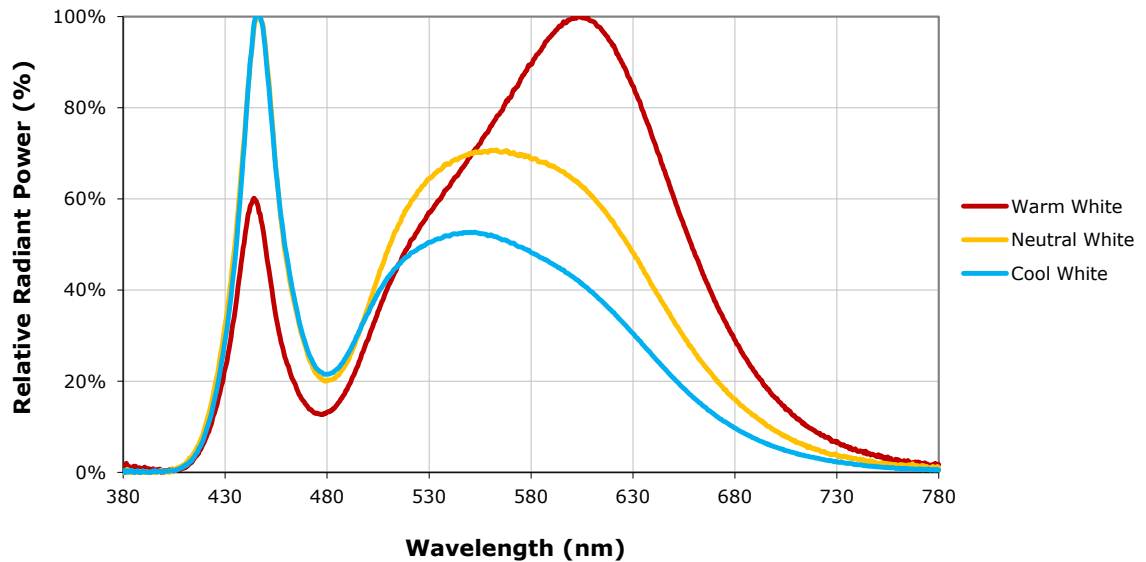
The following table provides several base order codes for XLamp XQ-D LEDs. It is important to note that the base order codes listed here are a subset of the total available order codes for the product family. For more order codes, as well as a complete description of the order-code nomenclature, please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

Color	CCT Range		Base Order Codes Minimum Luminous Flux @ 350 mA		Calculated Minimum Luminous Flux (lm)*	Order Code
	Min.	Max.	Group	Flux (lm)	700 mA	
Cool White	5000 K	8300 K	R4	130	227	XQDAWT-00-0000-00000LG51
			R3	122	213	XQDAWT-00-0000-00000LF51
			R2	114	199	XQDAWT-00-0000-00000LE51
70 CRI Minimum Cool White	5000 K	8300 K	R4	130	227	XQDAWT-00-0000-00000BG51
			R3	122	213	XQDAWT-00-0000-00000BF51
			R2	114	199	XQDAWT-00-0000-00000BE51
Neutral White	3700 K	5000 K	R3	122	213	XQDAWT-00-0000-00000BFE5
			R2	114	199	XQDAWT-00-0000-00000BEE5
			Q5	107	187	XQDAWT-00-0000-00000LDE5
80 CRI Minimum White	2600 K	4300 K	Q4	100	172	XQDAWT-00-0000-00000HCE7
			Q3	93.9	164	XQDAWT-00-0000-00000HBE7
			Q2	87.4	153	XQDAWT-00-0000-00000HAE7
Warm White	2600 K	3700 K	Q4	100	172	XQDAWT-00-0000-00000LCE7
			Q3	93.9	164	XQDAWT-00-0000-00000LBE7
			Q2	87.4	153	XQDAWT-00-0000-00000LAE7

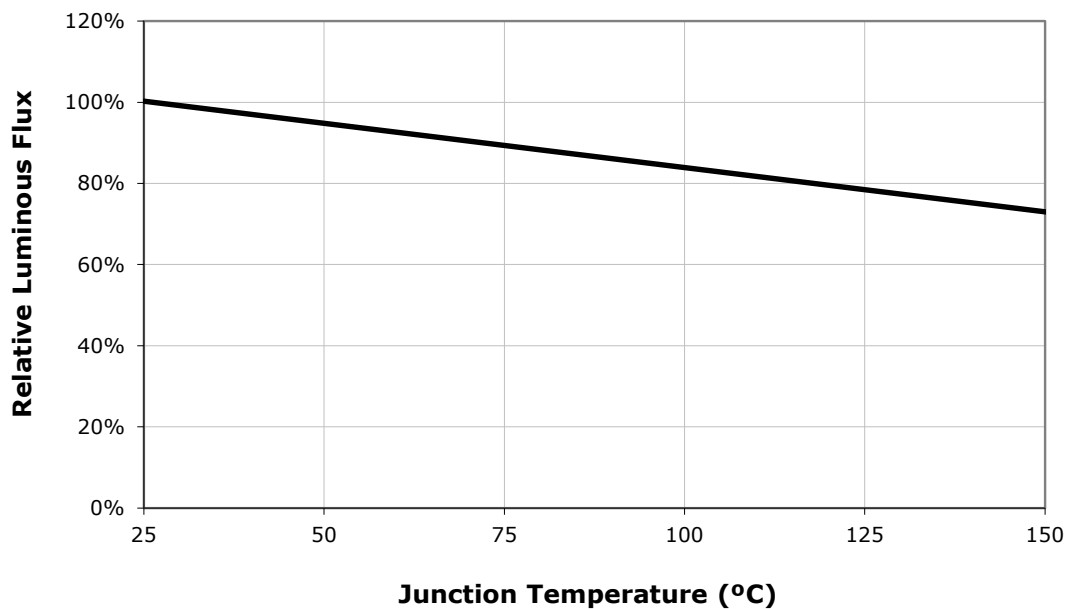
Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and ± 2 on CRI measurements.
- Typical CRI for Neutral White, 3700 K - 5000K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.
- * Calculated flux values at 700 mA are for reference only.

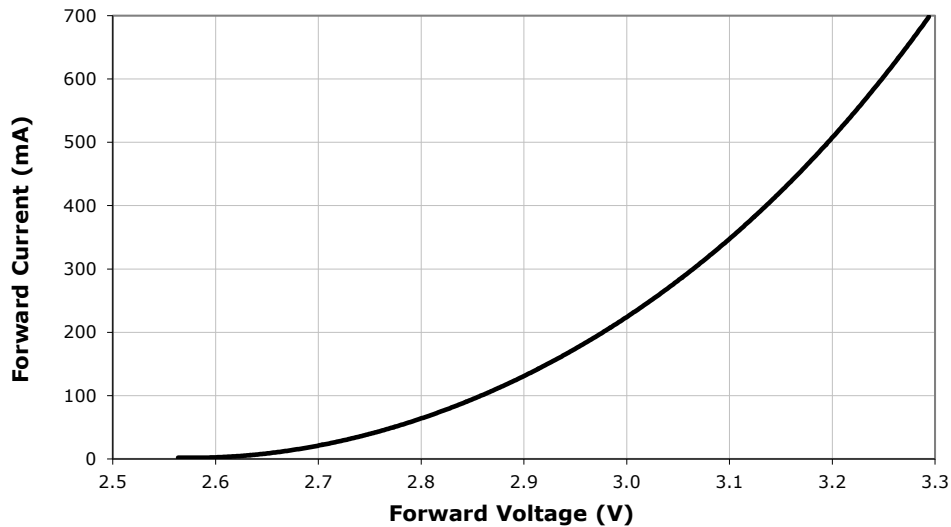
RELATIVE SPECTRAL POWER DISTRIBUTION



RELATIVE FLUX VS. JUNCTION TEMPERATURE ($I_F = 350$ mA)

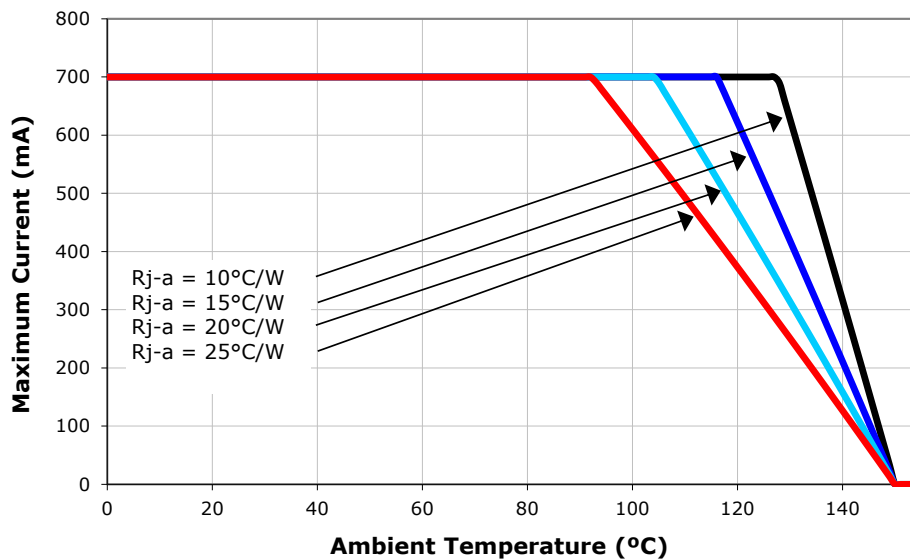


ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$)

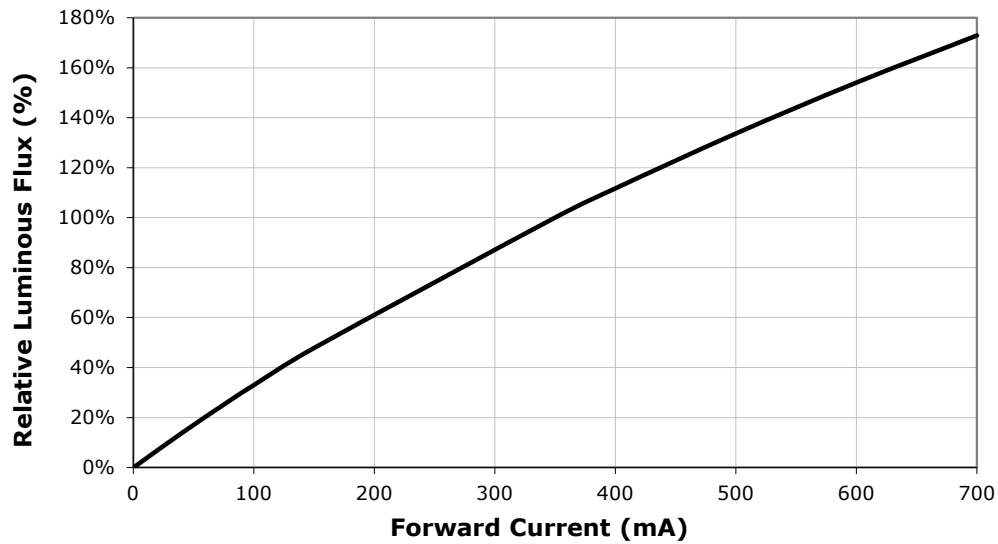


THERMAL DESIGN

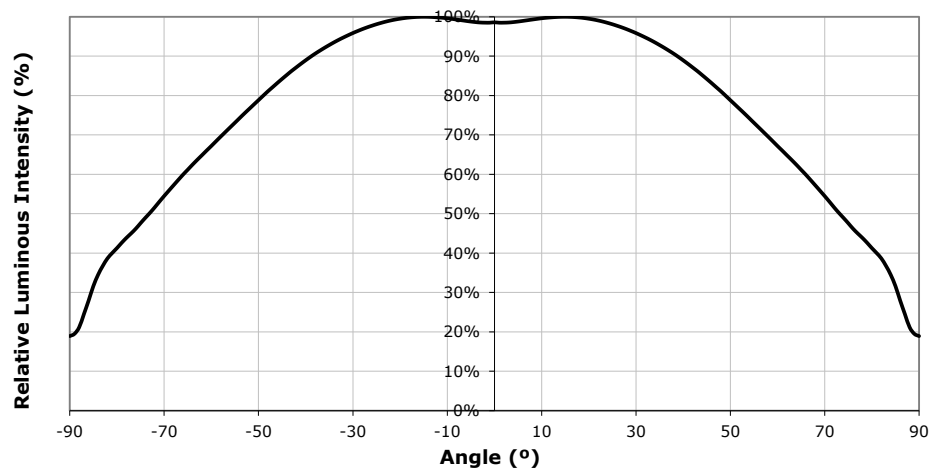
The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.



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



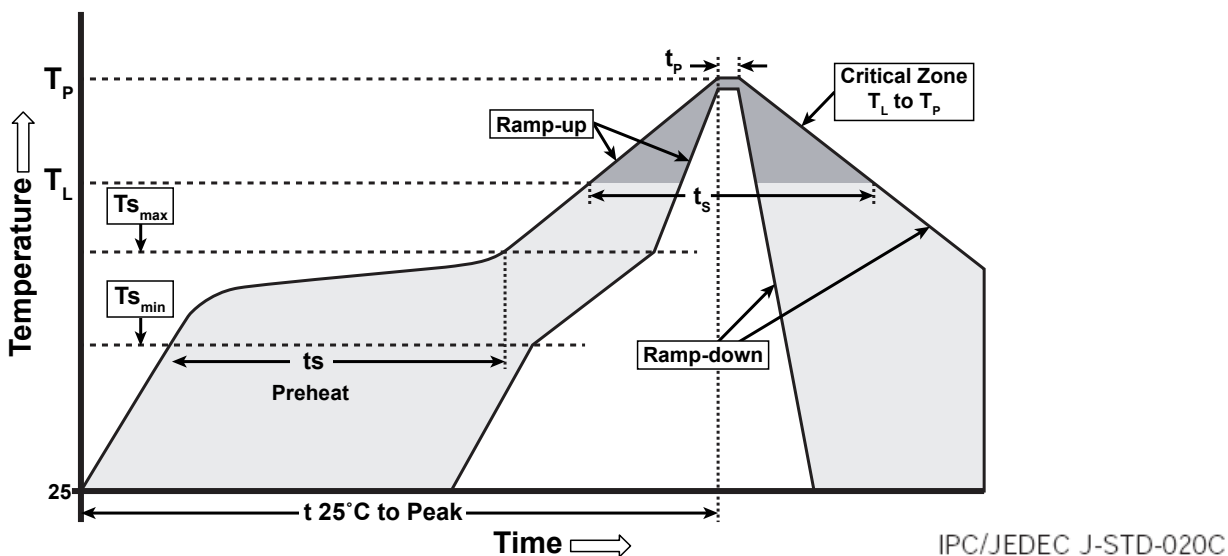
TYPICAL SPATIAL DISTRIBUTION



REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XQ-D 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.



Profile Feature	Lead-Based Solder	Lead-Free Solder
Average Ramp-Up Rate ($T_{s_{max}}$ to T_P)	3 °C/second max.	3 °C/second max.
Preheat: Temperature Min ($T_{s_{min}}$)	100 °C	150 °C
Preheat: Temperature Max ($T_{s_{max}}$)	150 °C	200 °C
Preheat: Time ($t_{s_{min}}$ to $t_{s_{max}}$)	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 (T_P)	215 °C	260 °C
Time Within 5 °C of Actual Peak Temperature (t_p)	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 topside of the package, measured on the package body surface.

NOTES

Lumen Maintenance Projections

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 at www.cree.com/xlamp_app_notes/LM80_results.

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

Moisture Sensitivity

In testing, Cree has found XLamp XQ-D 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 $85^{\circ}\text{C}/85\%$ RH followed by 3 reflow cycles, with visual and electrical inspections at each stage.

Cree recommends keeping XLamp LEDs in their sealed moisture-barrier packaging until immediately prior to use. Cree also recommends returning any unused LEDs to the resealable moisture-barrier bag and closing the bag immediately after use.

UL Recognized Component

Level 1 enclosure consideration. The LED package or a portion thereof has not been investigated as a fire enclosure or a fire and electrical enclosure per ANSI/UL 8750.

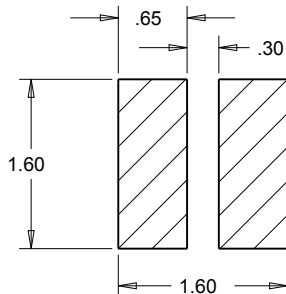
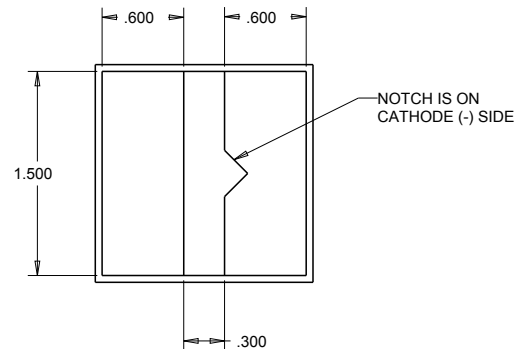
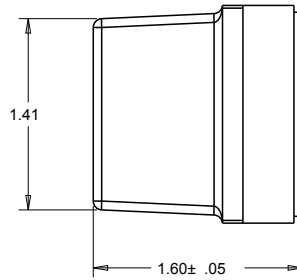
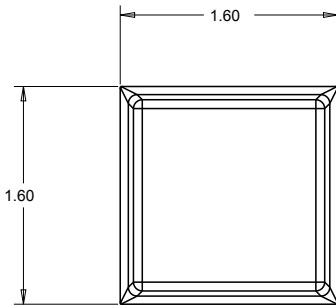
Vision Advisory Claim

WARNING: Do not look at exposed lamp in operation. Eye injury can result. See the LED Eye Safety application note at www.cree.com/xlamp_app_notes/led_eye_safety.

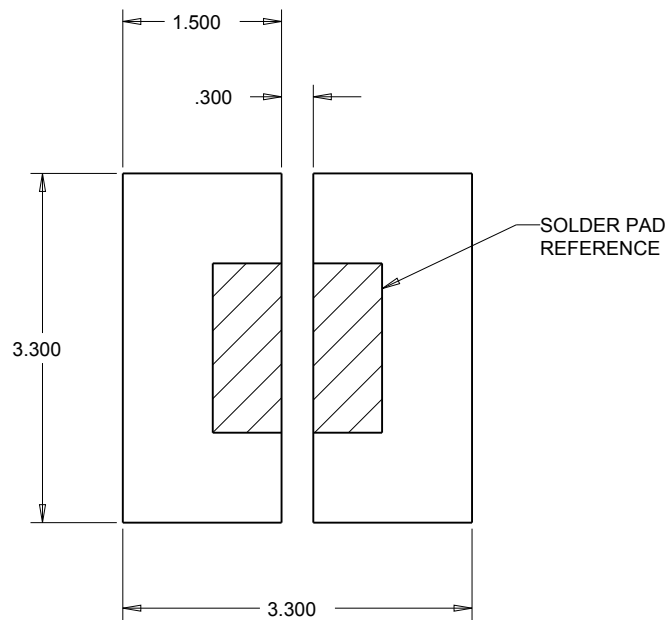
MECHANICAL DIMENSIONS

All dimensions in mm.

Measurement tolerances unless indicated otherwise: .xx = .25 mm, .xxx = .125 mm



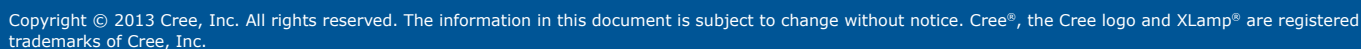
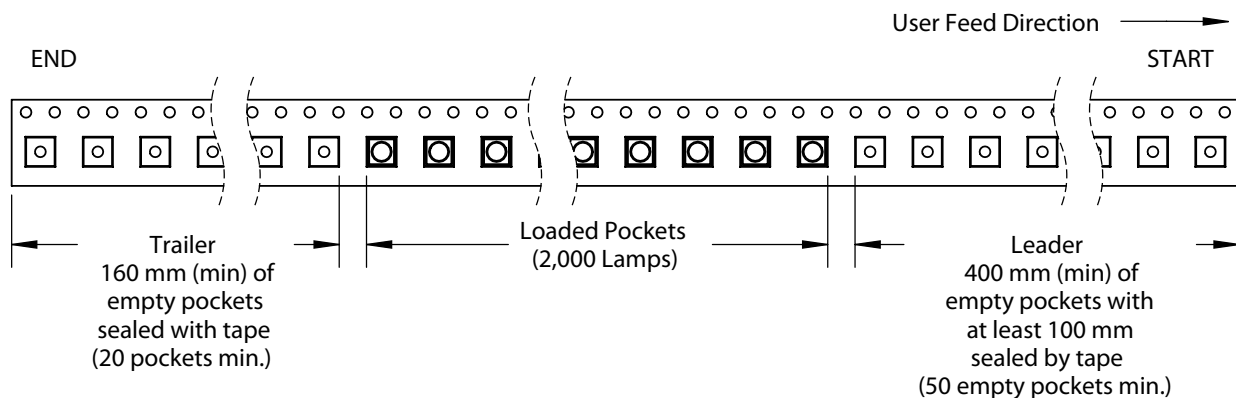
RECOMMENDED PC BOARD SOLDER PAD



RECOMMENDED TRACE LAYOUT

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

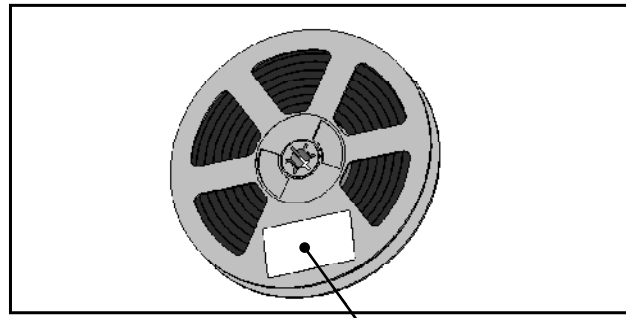
Measurement tolerances unless indicated otherwise: .xx = .25 mm, .xxx = .125 mm



PACKAGING

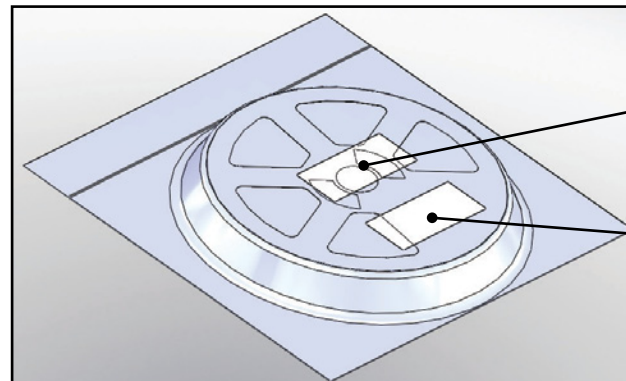
The diagrams below show the packaging and labels Cree uses to ship XLamp XQ-D LEDs. XLamp XQ-D LEDs are shipped in tape loaded on a reel. Each box contains only one reel in a moisture barrier bag.

Unpackaged Reel



Label with Cree Bin Code, Qty, Reel ID

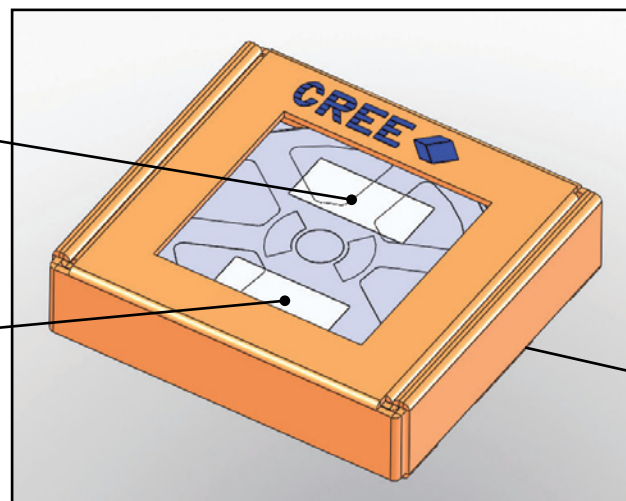
Packaged Reel



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

Label with Cree Bin Code, Qty, Reel ID

Boxed Reel



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

Label with Cree Bin Code, Qty, Reel ID

Patent Label (on bottom of box)