

# 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
- RoHS- and REACH-compliant
- UL-recognized component (E349212)

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## 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<sub>j</sub> = 25 °C)

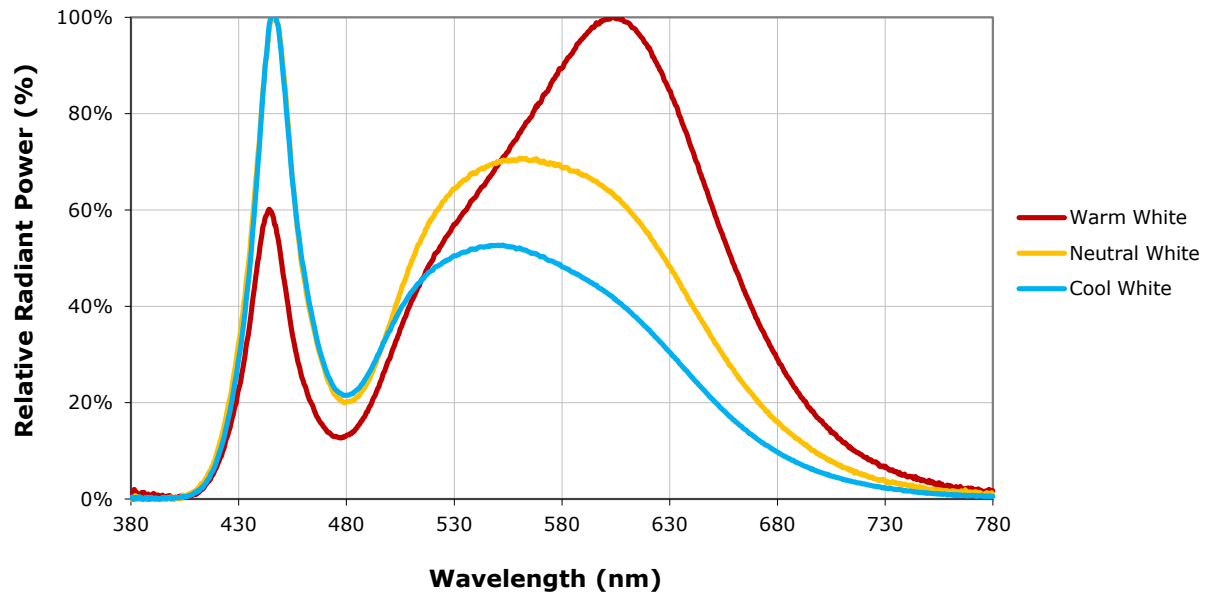
The following table provides several base order codes for XLamp XQ-D LEDs. It is important to note that the base order codes listed here are a subset of the total available order codes for the product family. For more order codes, as well as a complete description of the order-code nomenclature, please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

| Color                        | CCT Range |        | Base Order Codes<br>Minimum Luminous<br>Flux @ 350 mA |           | Calculated<br>Minimum<br>Luminous<br>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<br>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<br>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 |

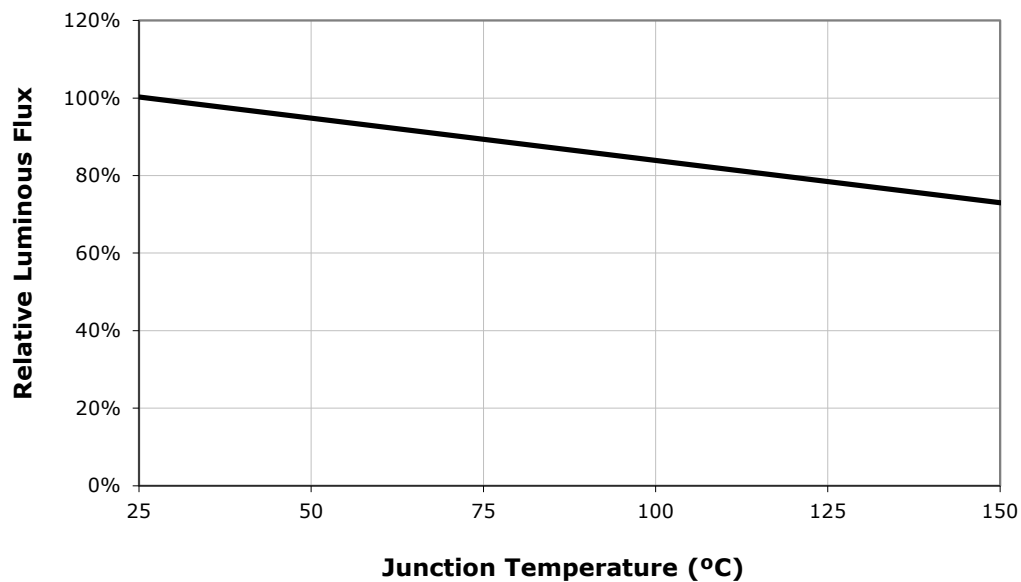
### Notes:

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CC<sub>x</sub>, CC<sub>y</sub>) measurements and  $\pm 2$  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.

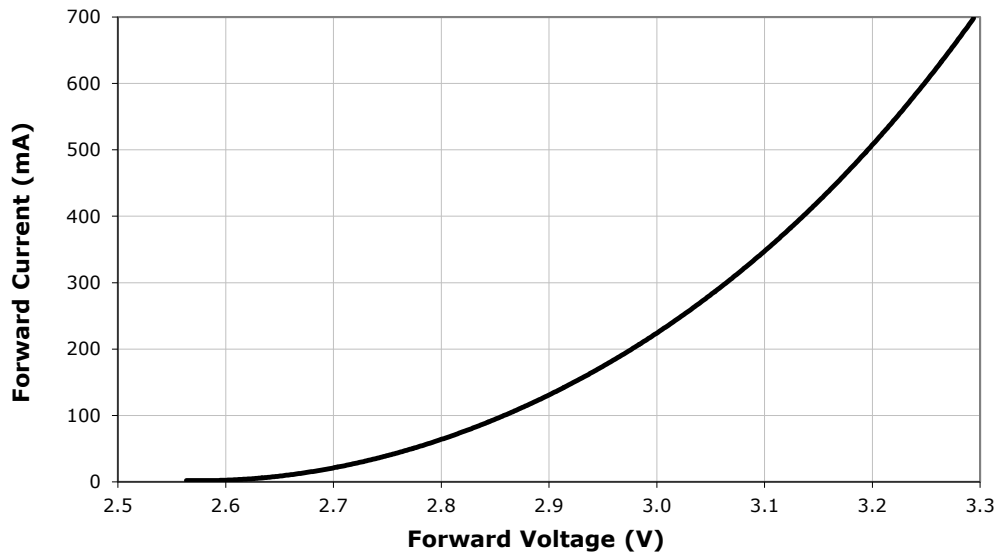
## RELATIVE SPECTRAL POWER DISTRIBUTION



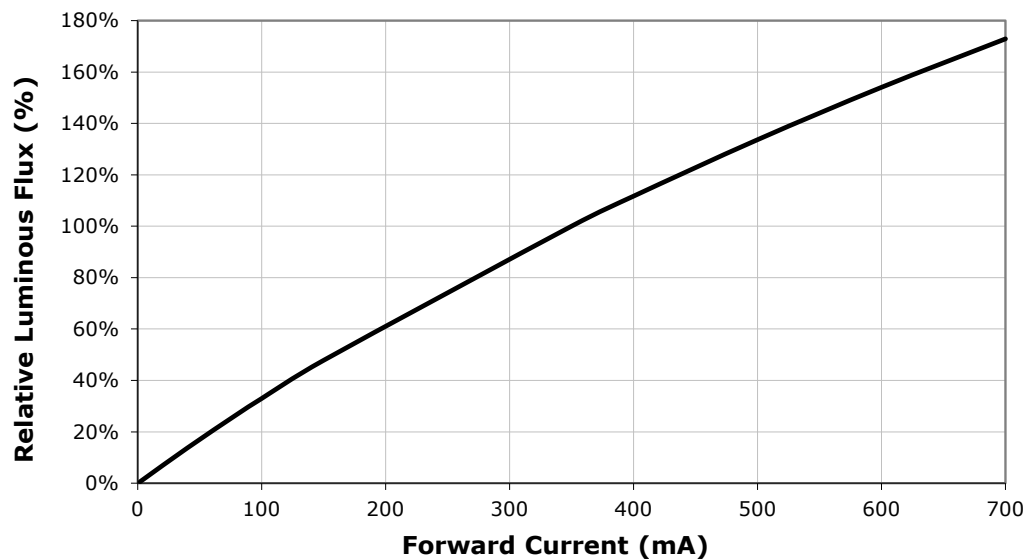
## RELATIVE FLUX VS. JUNCTION TEMPERATURE ( $I_F = 350$ mA)



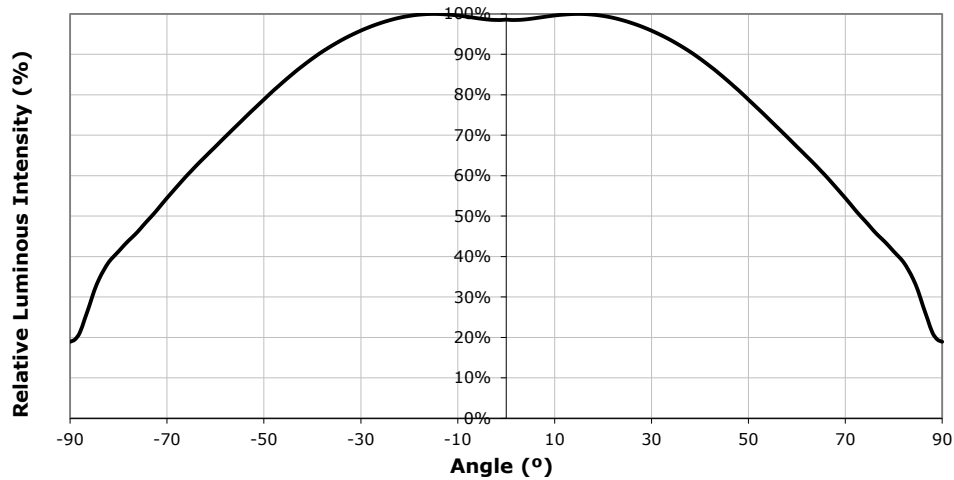
## ELECTRICAL CHARACTERISTICS ( $T_j = 25\text{ }^{\circ}\text{C}$ )



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

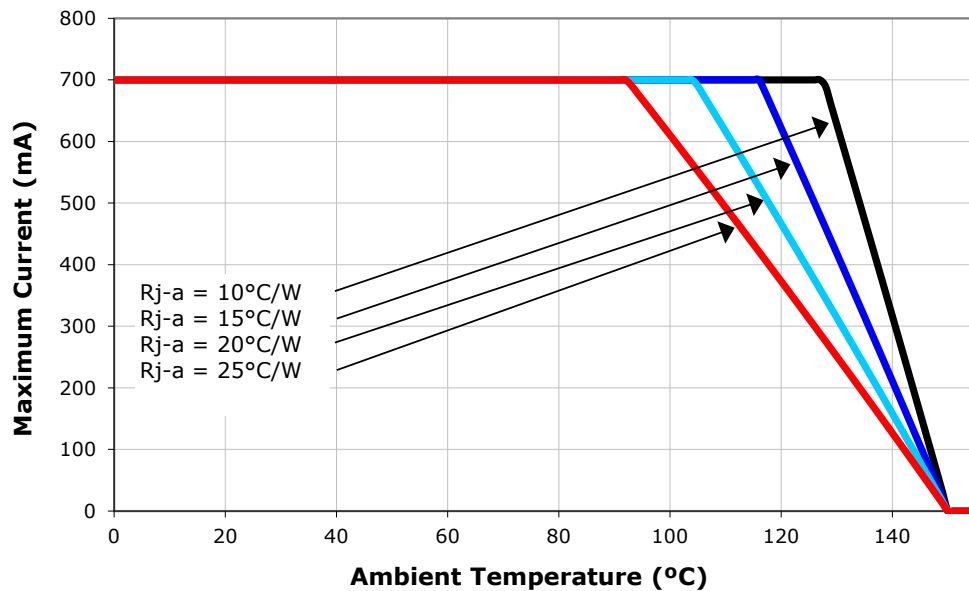


## TYPICAL SPATIAL DISTRIBUTION



## THERMAL DESIGN

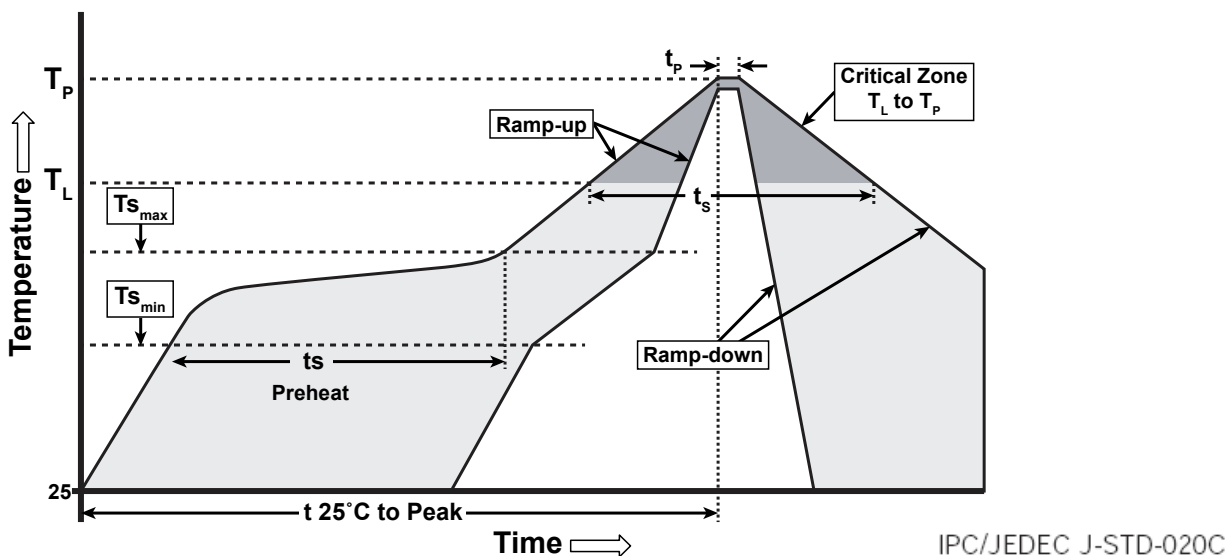
The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.



## REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp 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

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### 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](http://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](http://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](http://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.

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

### REACH Compliance

REACH substances of 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 representative to insure you get the most up-to-date REACH SVHC Declaration. REACH banned substance information (REACH Article 67) is also available upon request.

### 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.

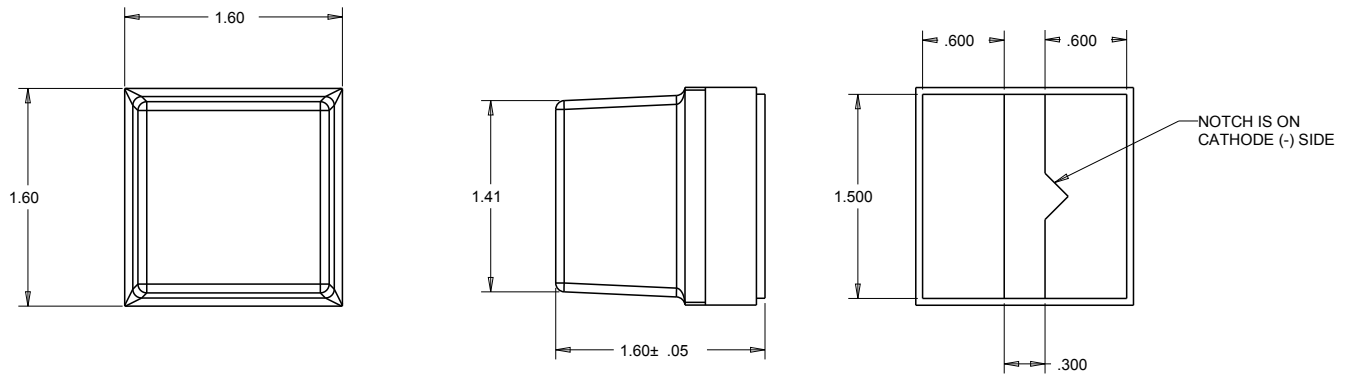
### Vision Advisory Claim

**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](http://www.cree.com/xlamp_app_notes/led_eye_safety).

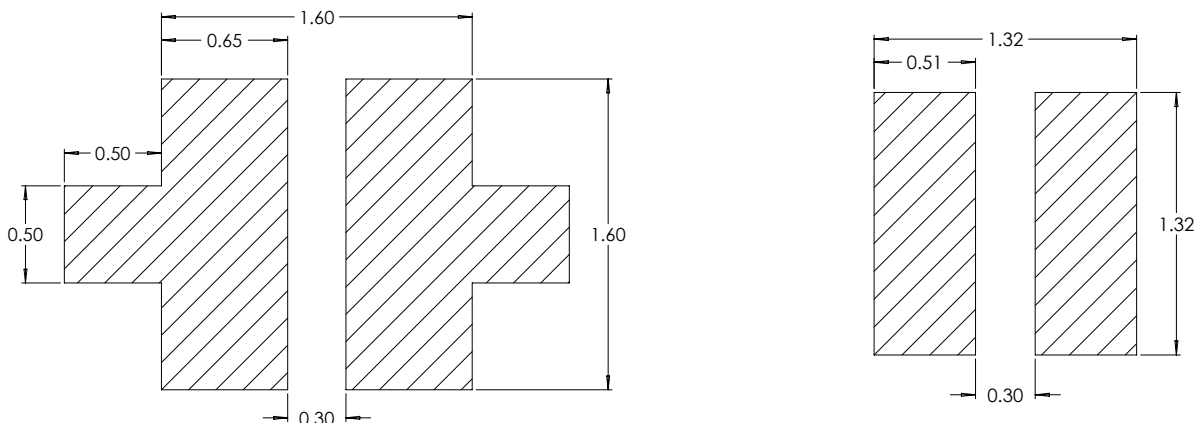
## MECHANICAL DIMENSIONS

All dimensions in mm.

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

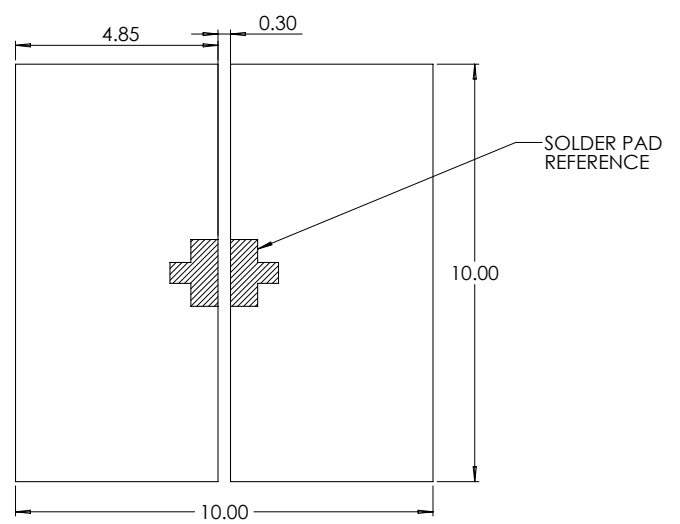
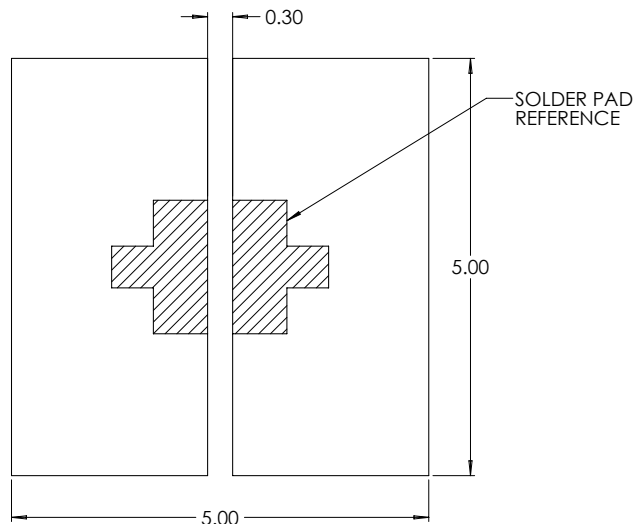


Measurement tolerance: .xx = .13 mm



**Recommended PCB solder pad**

**Recommended stencil opening**



**Recommended trace layout: MCPCB**

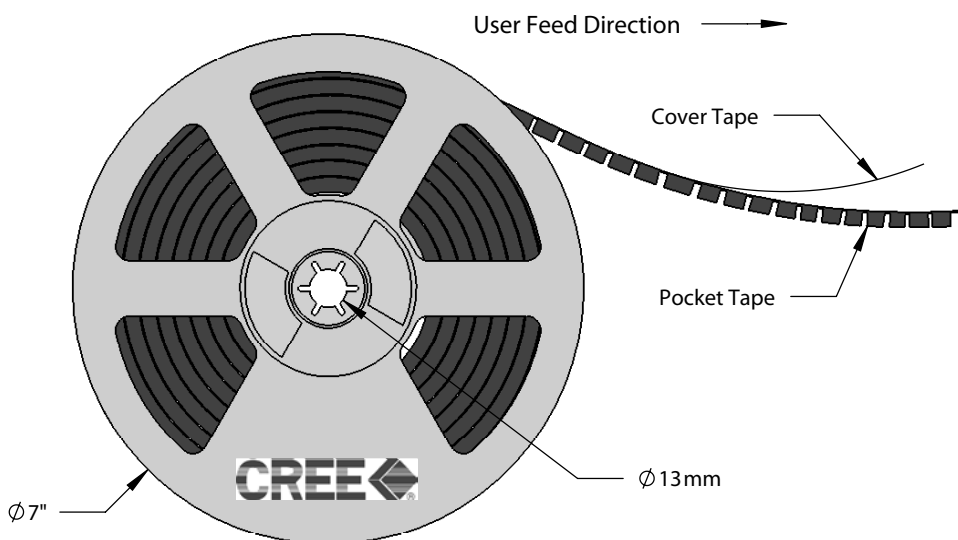
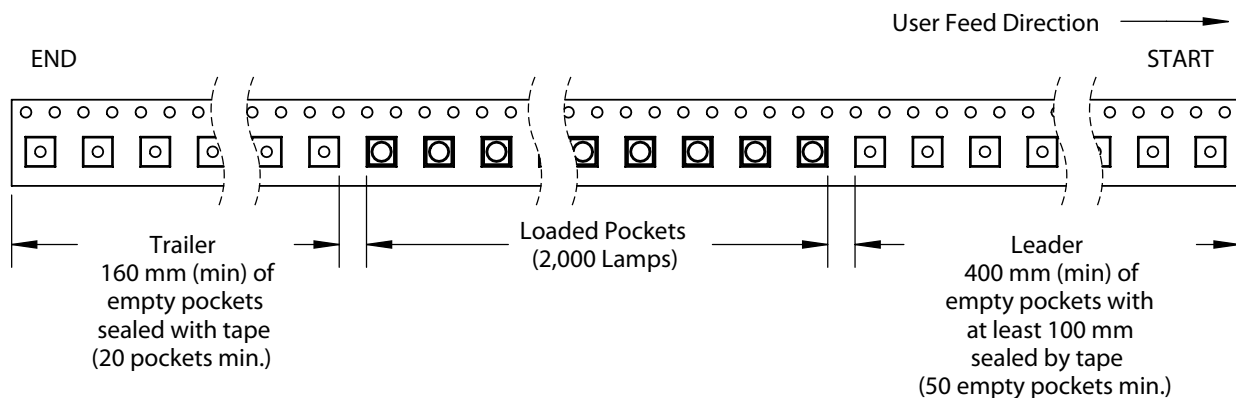
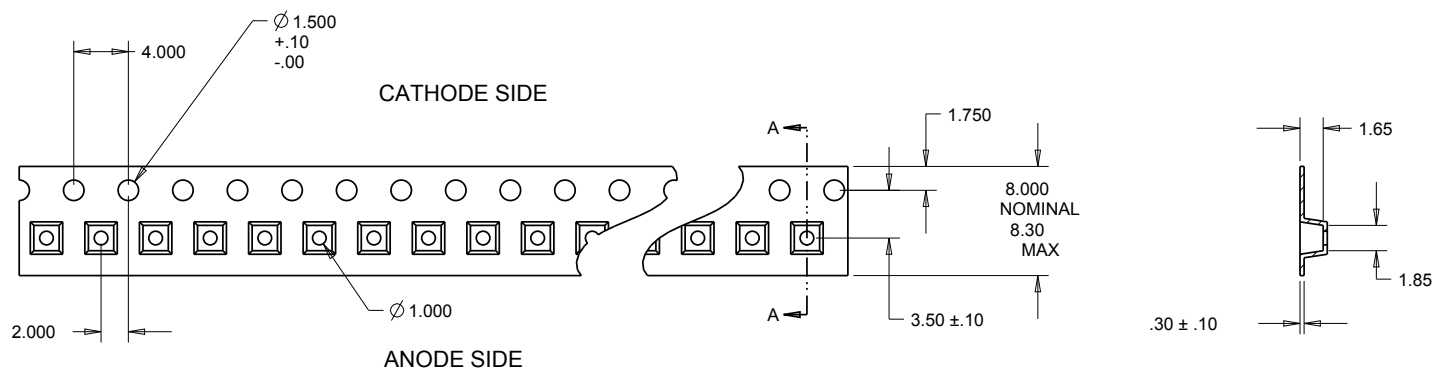
**Recommended trace layout: FR4**

## TAPE AND REEL

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

All dimensions in mm.

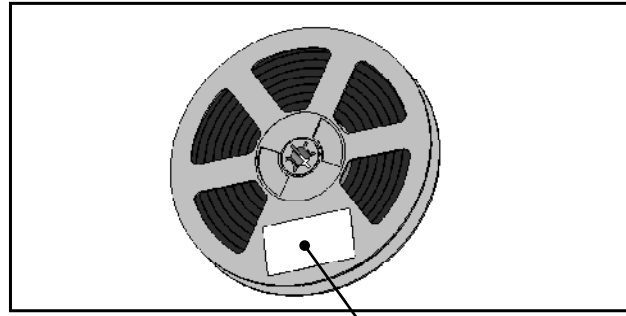
Measurement tolerances unless indicated otherwise: .xx = .25 mm, .xxx = .125 mm



## PACKAGING

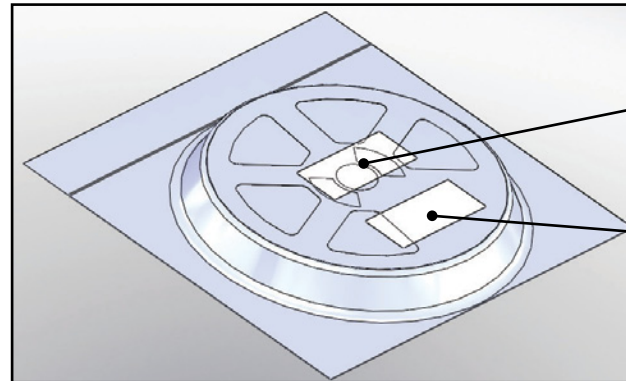
The diagrams below show the packaging and labels Cree uses to ship XLamp XQ-D LEDs. XLamp XQ-D LEDs are shipped in tape loaded on a reel. Each box contains only one reel in a moisture barrier bag.

**Unpackaged Reel**



Label with Cree Bin Code, Qty, Reel ID

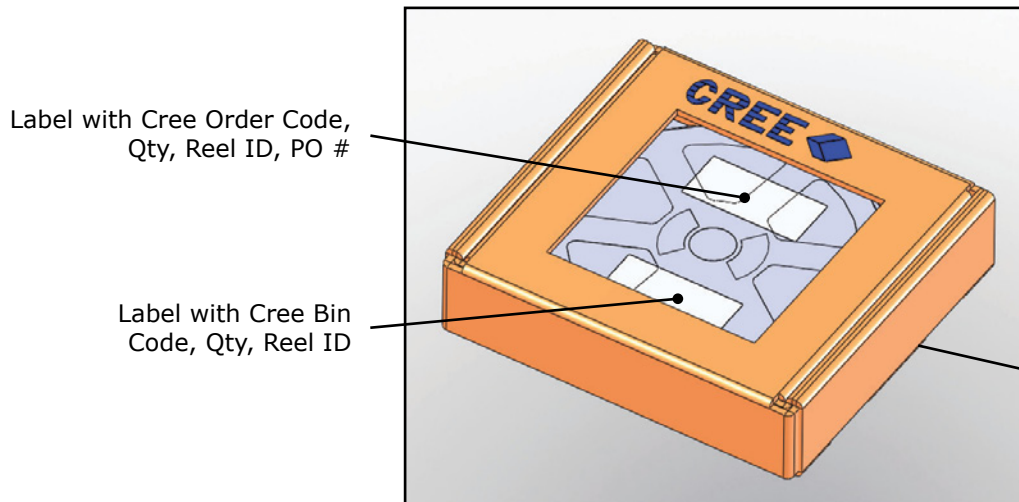
**Packaged Reel**



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)