

Cree® XLamp® XT-E LEDs



PRODUCT DESCRIPTION

XLamp XT-E is Cree's highest performing silicon carbide-based LED technology, delivered in Cree's industry-standard XP/XT packaging. XT-E White sets the new standard for high performance and dramatically lowers system cost. XT-E Royal Blue is Cree's highest performing source of royal blue light for remote-phosphor applications.

Cree XLamp LEDs bring high performance and quality of light to a wide range of lighting applications, including remote-phosphor, color-changing, portable and personal, outdoor, indoor-directional, transportation, stage and studio, commercial and emergency-vehicle lighting.

FEATURES

- Available in white, 80-CRI min white, 70-min CRI white and royal blue
- Binned at 85 °C
- Cool white efficacy of up to 148 lm/W (@ 85 °C, 350 mA)
- Royal Blue wall plug efficiency of up to 53% (@ 85 °C, 350 mA)
- Wide viewing angle: 115-140°
- Thermal resistance: 5 °C/W
- Maximum drive current: 1.5 A
- Electrically neutral thermal path
- Vf binning supported for XT-E White and Royal Blue
- XT-E Royal Blue sorted into 2.5-nm wavelength bins
- Unlimited floor life at ≤ 30 °C/85% RH
- Reflow solderable - JEDEC J-STD-020C Compatible
- RoHS- and REACH-compliant

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PRODUCT CHARACTERISTICS

| Characteristics | Unit | Minimum | Typical | Maximum |
|--|---------|---------|---------|---------|
| Thermal resistance, junction to solder point | °C/W | | 5 | |
| Viewing angle (FWHM) - white | degrees | | 115 | |
| Viewing angle (FWHM) - royal blue | degrees | | 140 | |
| Temperature coefficient of voltage | mV/°C | | -2.5 | |
| ESD classification (HBM per Mil-Std-883D) | | | Class 2 | |
| DC forward current | mA | | | 1500 |
| Reverse voltage | V | | | 5 |
| Forward voltage (@ 350 mA, 85 °C) | V | | 2.85 | 3.4 |
| LED junction temperature | °C | | | 150 |

FLUX CHARACTERISTICS - WHITE (T_j = 85 °C)

The following table provides several base order codes for XLamp XT-E White 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 XT-E Binning and Labeling document.

| Color | CCT Range | | Base Order Codes | | Calculated Minimum Luminous Flux (lm)* | | Order Code |
|------------------------------|-----------|---------|------------------|------|--|-----------|---------------------------|
| | | | Min. | Max. | Group | Flux (lm) | |
| Cool White | 5,000 K | 8,300 K | R3 | 122 | 217 | 369 | XTEAWT-00-0000-000000F51 |
| | | | R4 | 130 | 231 | 393 | XTEAWT-00-0000-000000G51 |
| | | | R5 | 139 | 247 | 420 | XTEAWT-00-0000-000000H51 |
| Outdoor White | 4,000 K | 6,200 K | R3 | 122 | 217 | 369 | XTEAWT-00-0000-000000FE3 |
| | | | R4 | 130 | 231 | 393 | XTEAWT-00-0000-000000GE3 |
| | | | R5 | 139 | 247 | 420 | XTEAWT-00-0000-000000HE3 |
| Neutral White | 3,700 K | 5,000 K | Q5 | 107 | 190 | 324 | XTEAWT-00-0000-000000LFE4 |
| | | | R2 | 114 | 203 | 354 | XTEAWT-00-0000-000000LEE4 |
| | | | R3 | 122 | 217 | 369 | XTEAWT-00-0000-000000LDE3 |
| 70 CRI Minimum Neutral White | 3,700 K | 5,000 K | Q5 | 107 | 190 | 324 | XTEAWT-00-0000-000000BDF5 |
| | | | R2 | 114 | 203 | 354 | XTEAWT-00-0000-000000BEF5 |
| | | | R3 | 122 | 217 | 369 | XTEAWT-00-0000-000000BFF5 |

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.
- Calculated flux values are for reference only

FLUX CHARACTERISTICS - WHITE (T_j = 85 °C)

| Color | CCT Range | | Base Order Codes Minimum Luminous Flux @ 350 mA (lm) | | Calculated Minimum Luminous Flux (lm)* | | Order Code |
|---------------------------|-----------|---------|---|-----------|--|---------|--------------------------|
| | Min. | Max. | Group | Flux (lm) | 700 mA | 1500 mA | |
| 80 CRI Minimum White | 2,600 K | 4,300 K | Q3 | 93.9 | 167 | 284 | XTEAWT-00-0000-00000HBE7 |
| | | | Q4 | 100 | 178 | 302 | XTEAWT-00-0000-00000HCE7 |
| | | | Q5 | 107 | 190 | 324 | XTEAWT-00-0000-00000HDE7 |
| Warm White | 2,600 K | 3,700 K | Q3 | 93.9 | 167 | 284 | XTEAWT-00-0000-00000LBE7 |
| | | | Q4 | 100 | 178 | 302 | XTEAWT-00-0000-00000LCE7 |
| | | | Q5 | 107 | 190 | 324 | XTEAWT-00-0000-00000LDE7 |
| 70 CRI Minimum Warm White | 2,600 K | 3,700 K | Q4 | 100 | 167 | 284 | XTEAWT-00-0000-00000BCE7 |
| | | | Q5 | 107 | 178 | 302 | XTEAWT-00-0000-00000BDE7 |
| | | | R2 | 114 | 190 | 324 | XTEAWT-00-0000-00000BEE7 |

Notes:

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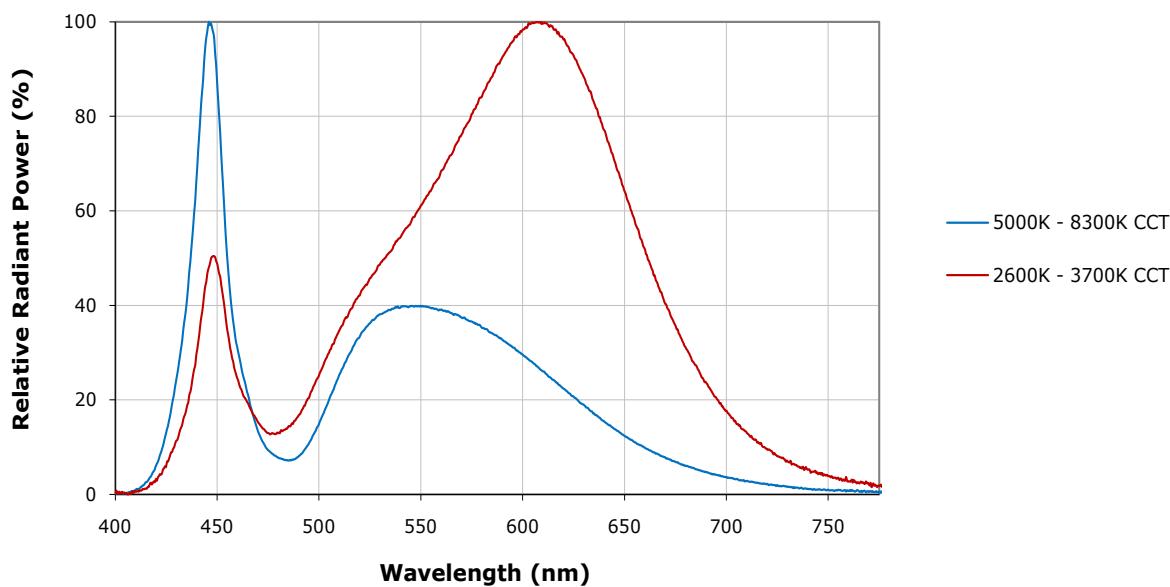
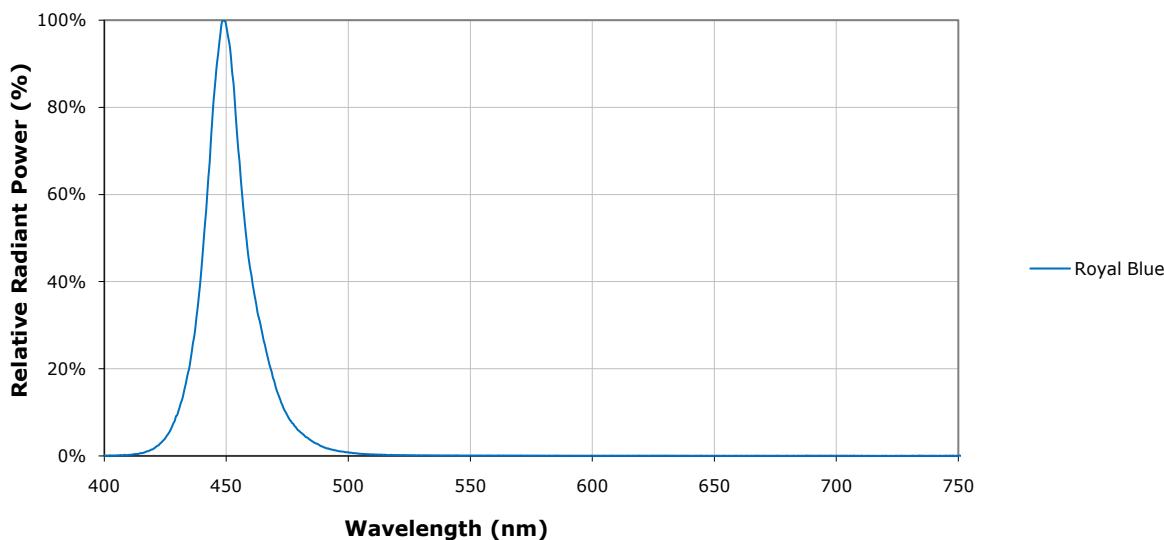
FLUX CHARACTERISTICS - ROYAL BLUE (T_j = 85 °C)

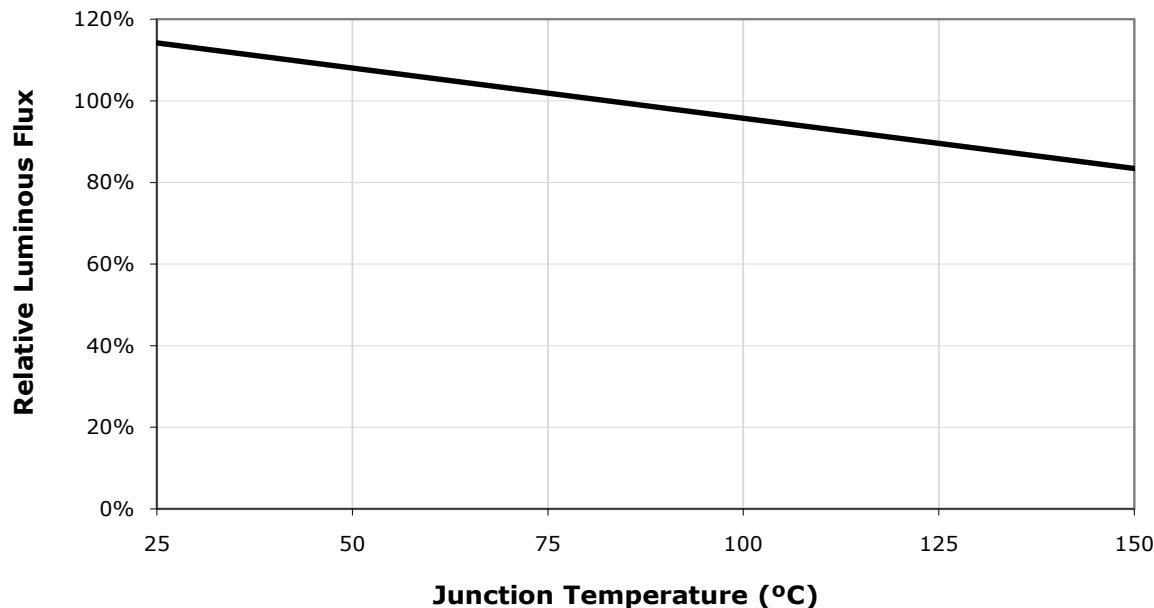
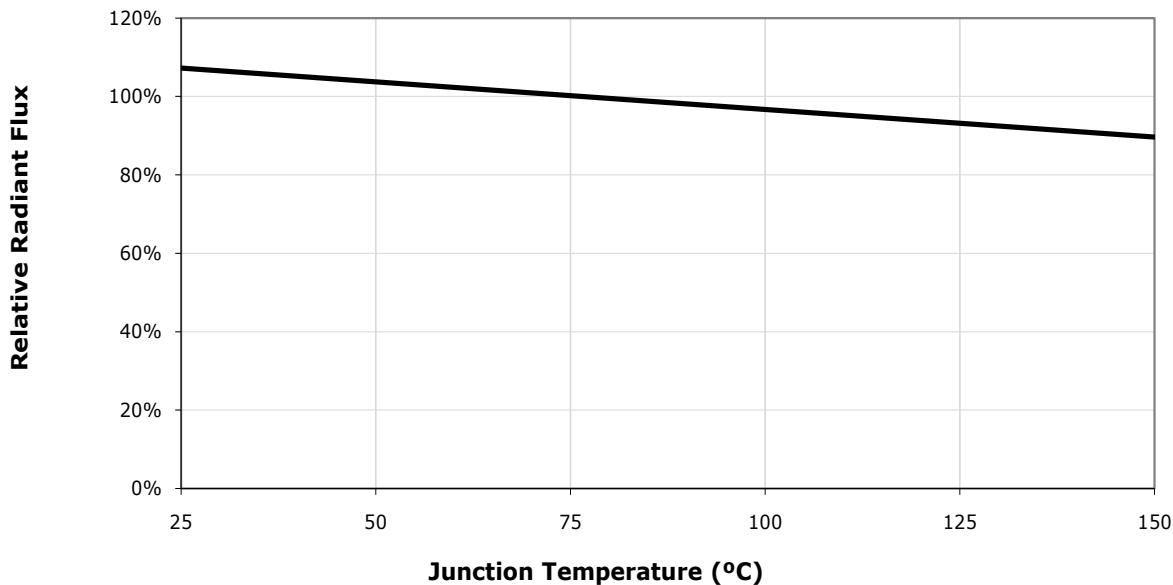
The following table provides order codes for XLamp XT-E Royal Blue LEDs. Additional information on the performance grouping and codes for XT-E Royal Blue LEDs can be found in the XT-E Binning and Labeling document.

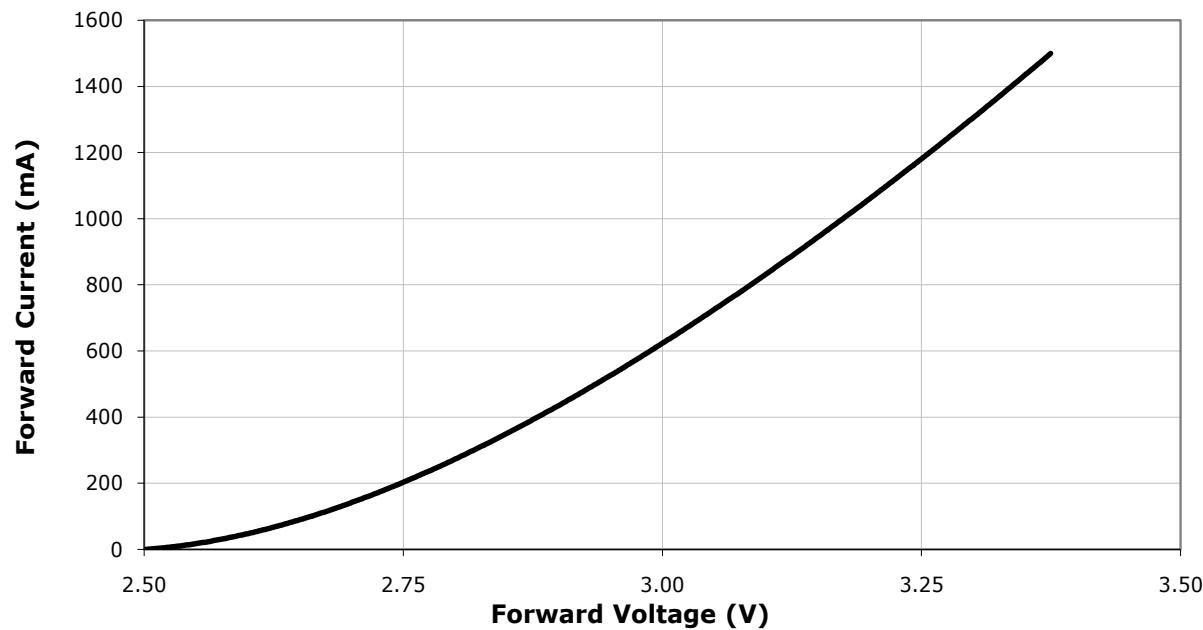
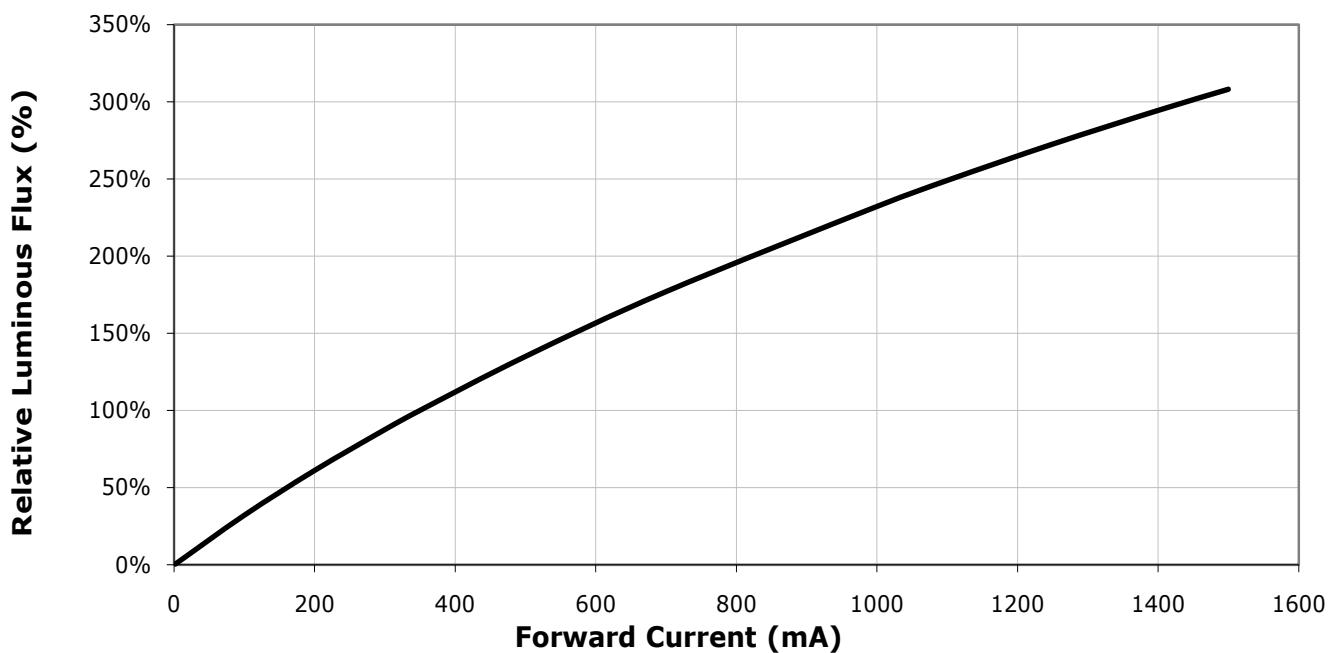
| DWL Kit Codes | Dominant Wavelength Range | | | | Order Codes, Minimum Radiant Flux @ 350 mA, T _j =85 °C | | | |
|---------------|---------------------------|----------|-------|----------|---|-------------------------|-------------------------|-------------------------|
| | Min. | | Max. | | Order Codes, Minimum Radiant Flux @ 350 mA, T _j =85 °C | | | |
| | Group | DWL (nm) | Group | DWL (nm) | 475 mW | 500 mW | 525 mW | 550 mW |
| 01 | D36 | 450 | D57 | 465 | XTEARY-00-0000-00000K01 | XTEARY-00-0000-00000L01 | XTEARY-00-0000-00000M01 | XTEARY-00-0000-00000N01 |
| 02 | D36 | 450 | D47 | 460 | XTEARY-00-0000-00000K02 | XTEARY-00-0000-00000L02 | XTEARY-00-0000-00000M02 | XTEARY-00-0000-00000N02 |
| 03 | D46 | 455 | D57 | 465 | XTEARY-00-0000-00000K03 | XTEARY-00-0000-00000L03 | XTEARY-00-0000-00000M03 | XTEARY-00-0000-00000N03 |
| 04 | D36 | 450 | D37 | 455 | XTEARY-00-0000-00000K04 | XTEARY-00-0000-00000L04 | XTEARY-00-0000-00000M04 | XTEARY-00-0000-00000N04 |
| 05 | D46 | 455 | D47 | 460 | XTEARY-00-0000-00000K05 | XTEARY-00-0000-00000L05 | XTEARY-00-0000-00000M05 | XTEARY-00-0000-00000N05 |
| 06 | D56 | 460 | D57 | 465 | XTEARY-00-0000-00000K06 | XTEARY-00-0000-00000L06 | XTEARY-00-0000-00000M06 | XTEARY-00-0000-00000N06 |
| 07 | D37 | 452.5 | D46 | 457.5 | XTEARY-00-0000-00000K07 | XTEARY-00-0000-00000L07 | XTEARY-00-0000-00000M07 | XTEARY-00-0000-00000N07 |
| 08 | D47 | 457.5 | D56 | 462.5 | XTEARY-00-0000-00000K08 | XTEARY-00-0000-00000L08 | XTEARY-00-0000-00000M08 | XTEARY-00-0000-00000N08 |
| 09 | D37 | 452.5 | D56 | 462.5 | XTEARY-00-0000-00000K09 | XTEARY-00-0000-00000L09 | XTEARY-00-0000-00000M09 | XTEARY-00-0000-00000N09 |

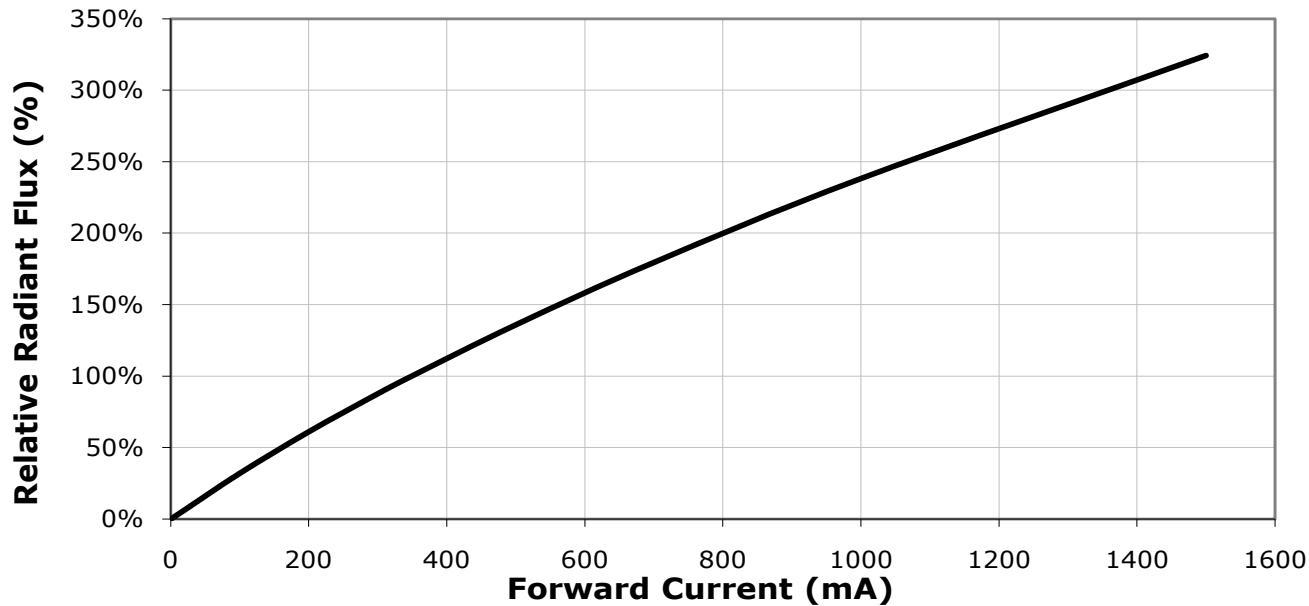
Note:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and ± 2 on CRI measurements.

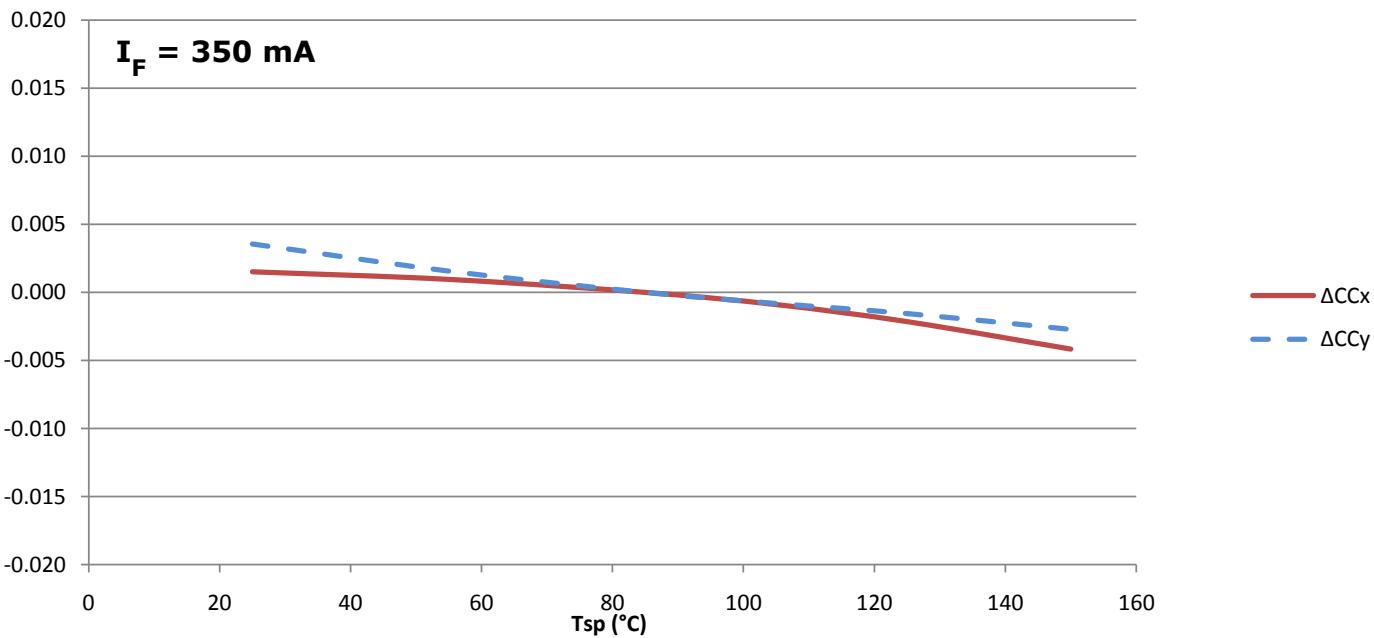
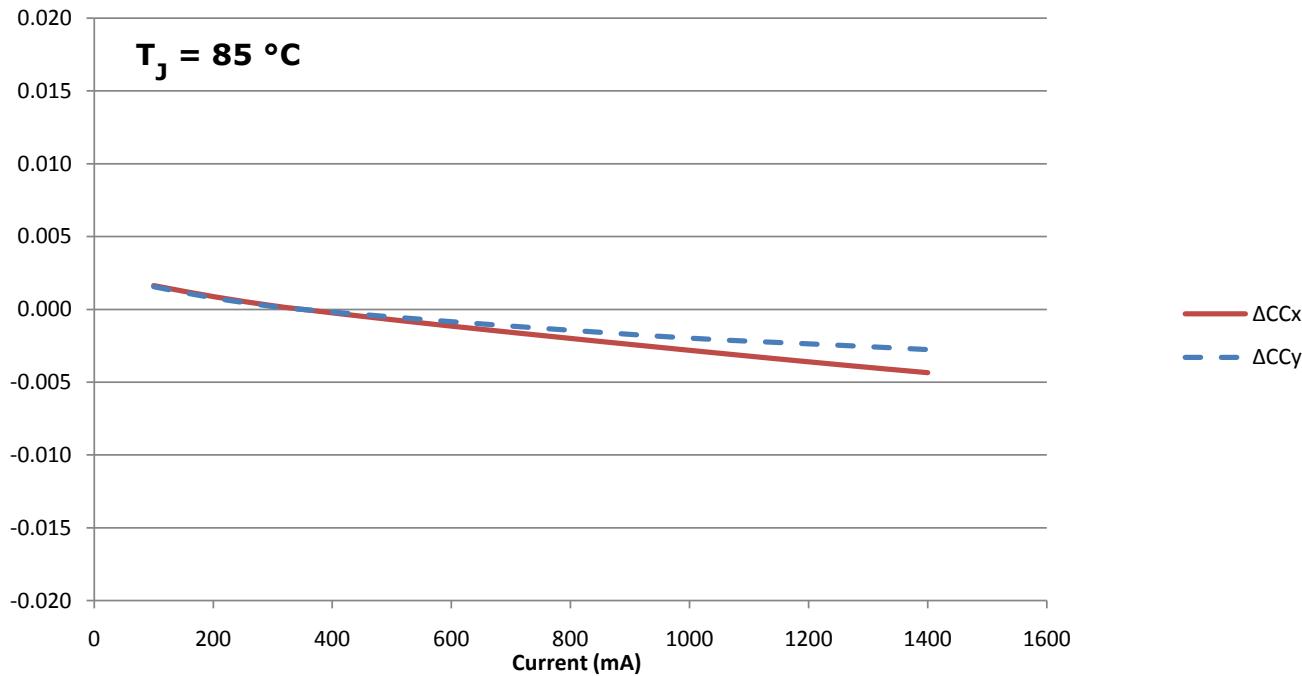
RELATIVE SPECTRAL POWER DISTRIBUTION - WHITE**RELATIVE SPECTRAL POWER DISTRIBUTION - ROYAL BLUE**

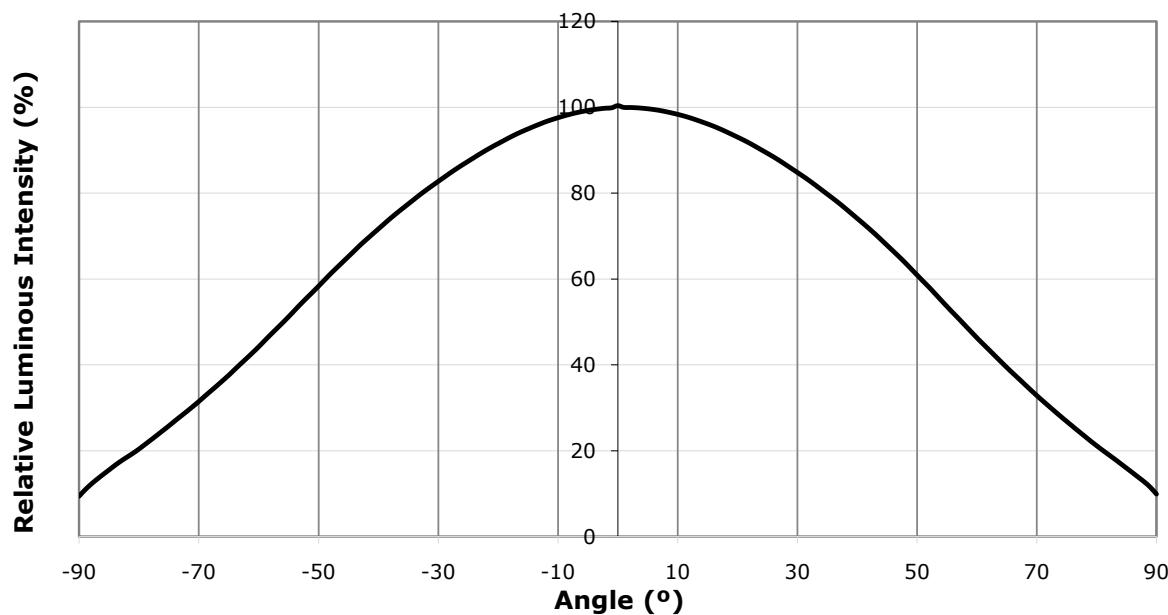
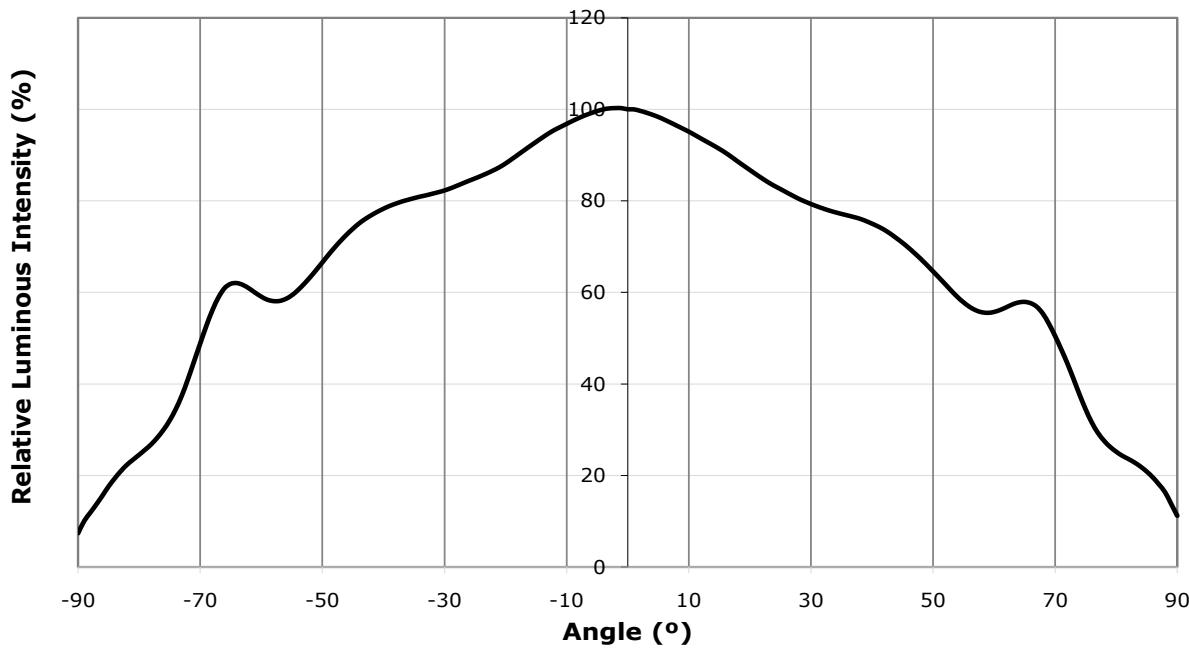
RELATIVE LUMINOUS FLUX VS. JUNCTION TEMPERATURE ($I_F = 350$ mA) - WHITE**RELATIVE RADIANT FLUX VS. JUNCTION TEMPERATURE ($I_F = 350$ mA) - ROYAL BLUE**

ELECTRICAL CHARACTERISTICS (T_j = 85 °C)**RELATIVE LUMINOUS FLUX VS. CURRENT (T_j = 85 °C) - WHITE**

RELATIVE RADIANT FLUX VS. CURRENT ($T_j = 85^\circ\text{C}$) - ROYAL BLUE

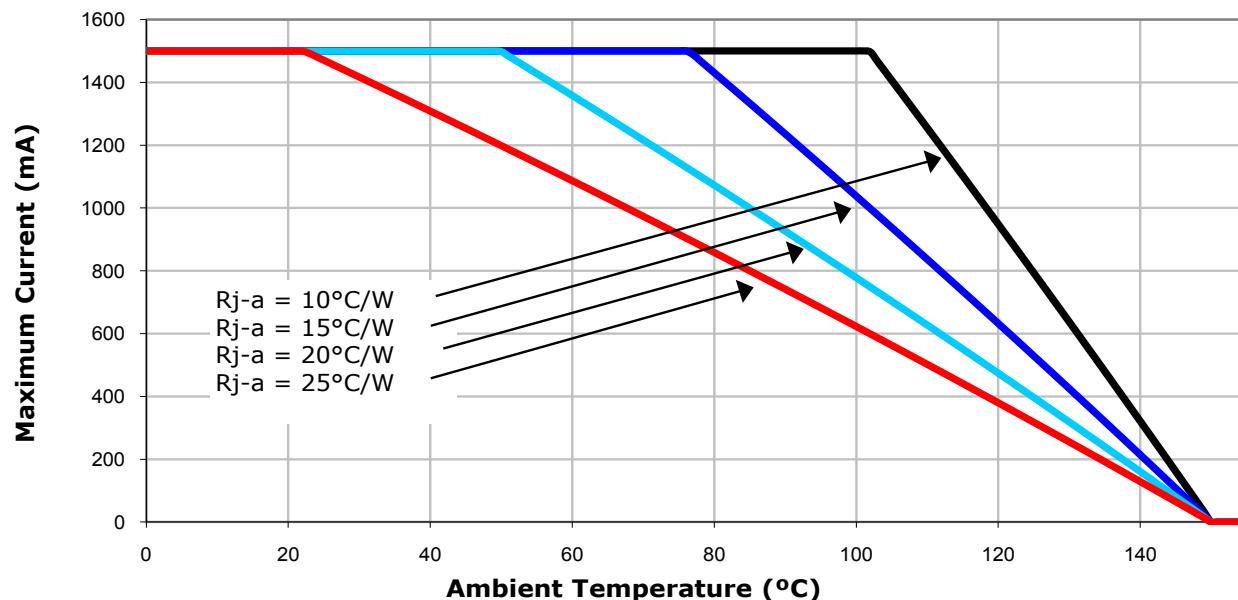
RELATIVE CHROMATICITY VS. CURRENT AND TEMPERATURE (WARM WHITE)



TYPICAL SPATIAL DISTRIBUTION - WHITE

TYPICAL SPATIAL DISTRIBUTION - ROYAL BLUE


Thermal Design

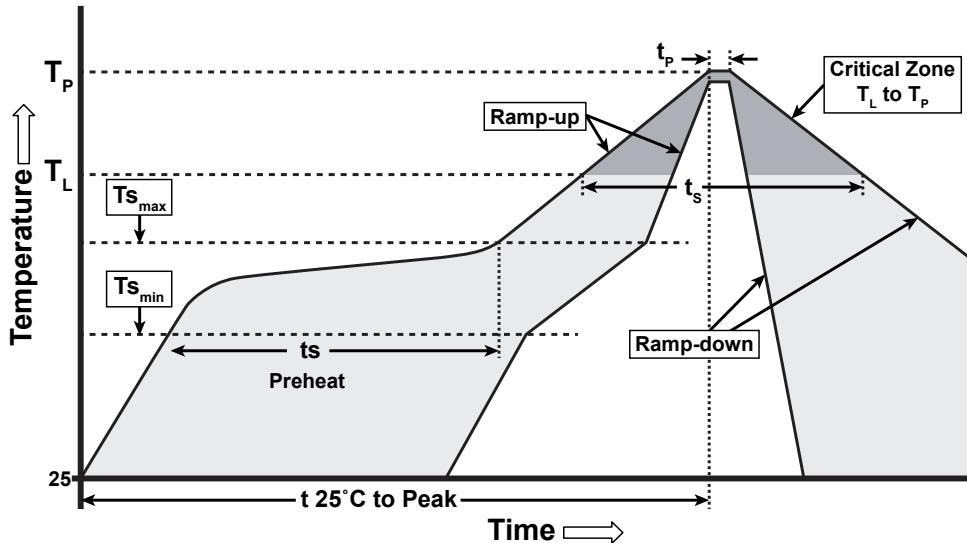
The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.



REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XT-E 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 ($T_{s_{\max}}$ 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 the 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/products/pdf/LM-80_Results.pdf.

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 XT-E 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

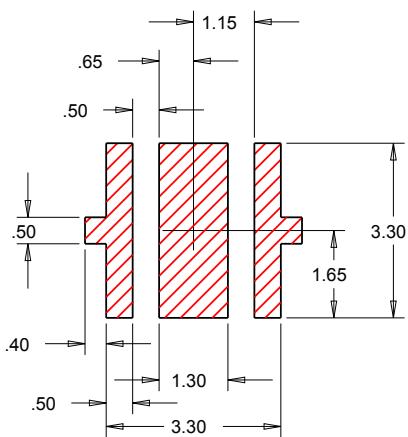
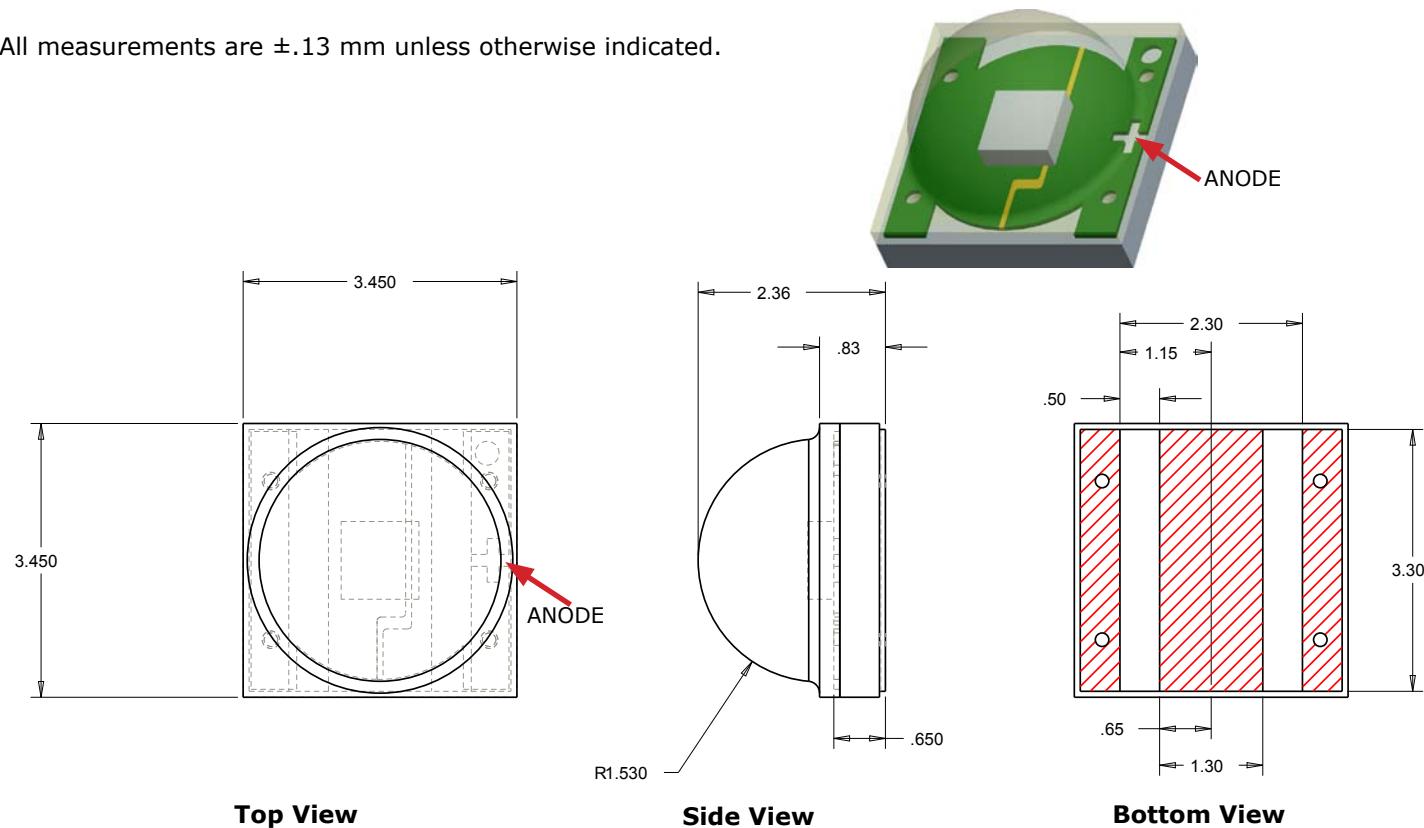
The levels of environmentally sensitive, persistent biologically toxic (PBT), persistent organic pollutants (POP), or otherwise restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted 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

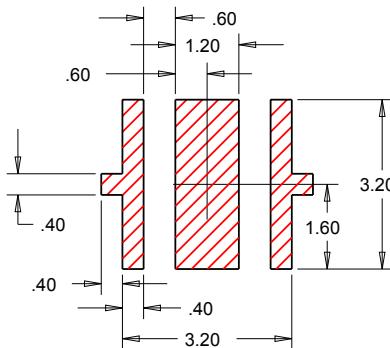
WARNING: Do not look at exposed lamp in operation. Eye injury can result. See LED Eye Safety at www.cree.com/products/pdf/XLamp_EyeSafety.pdf.

MECHANICAL DIMENSIONS

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



Recommended PCB Solder Pad

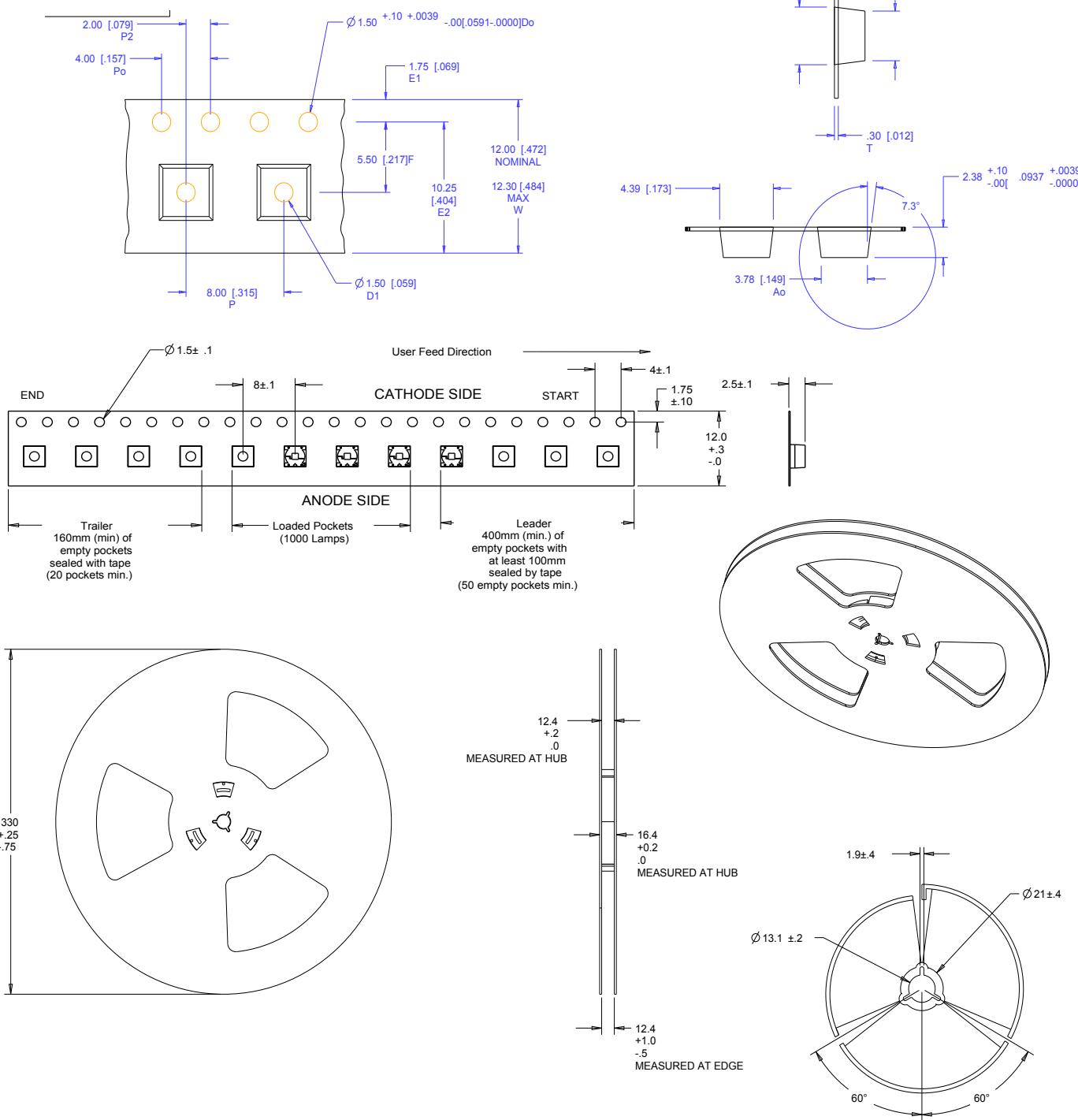


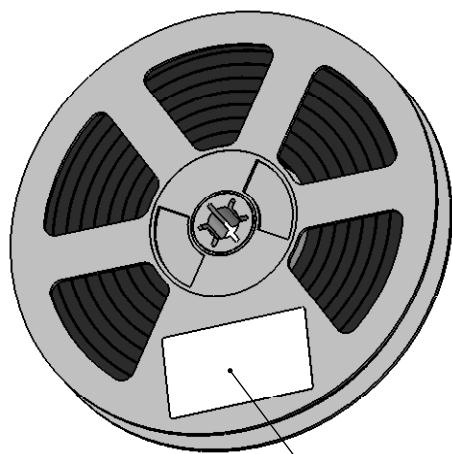
Recommended Stencil Pattern
(Shaded Area Is Open)

TAPE AND REEL

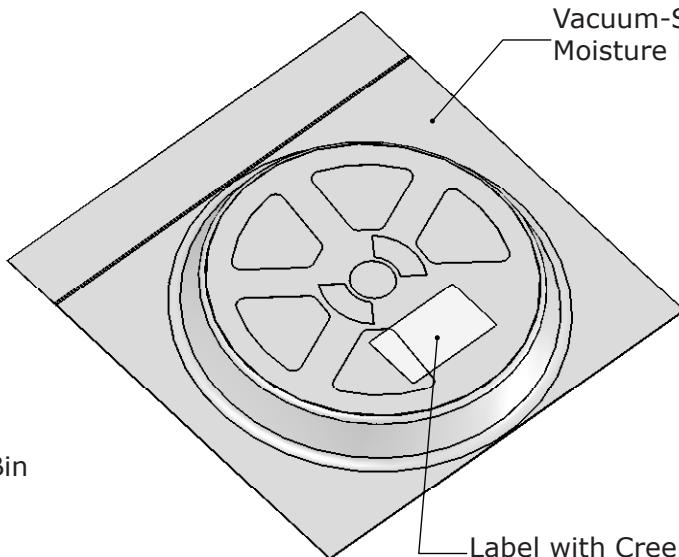
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

All dimensions in mm.



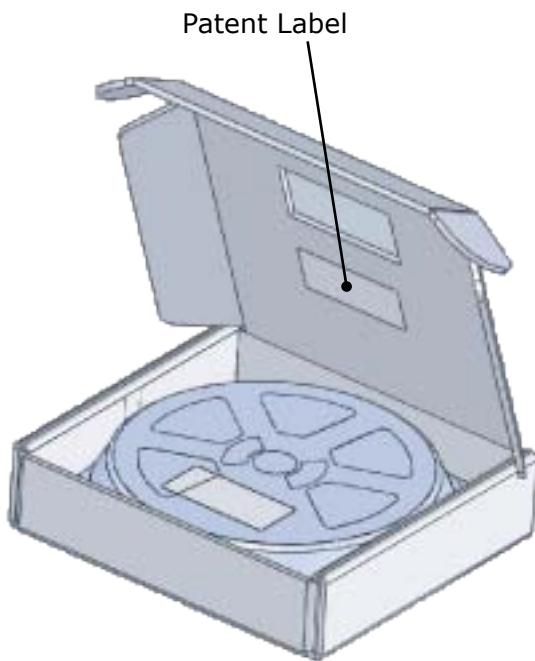
PACKAGING

Label with Cree Bin
Code, Qty, Lot #

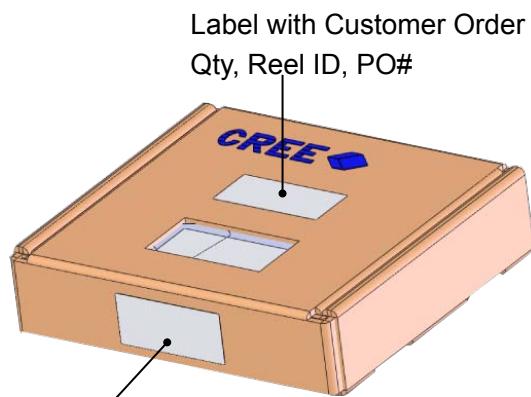


Vacuum-Sealed
Moisture Barrier Bag

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 #