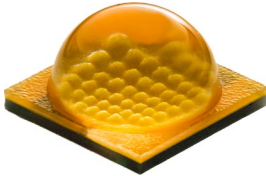


Cree® XLamp® MK-R2 LEDs



PRODUCT DESCRIPTION

The XLamp® MK-R2 EasyWhite® LED builds on the breakthrough performance of the original MK-R by enabling high-voltage driver solutions while providing a small, uniform, single point source for precise optical control. The MK-R2 shares the same mechanical footprint as the original MK-R, providing customers with a seamless upgrade path and shortening the LED luminaire and retrofit lamp design cycle.

MK-R2 LEDs are designed for high-output, directional lighting applications and are the ideal replacement for lighting applications that currently use inefficient halogen lamps. MK-R2 LEDs are optimized for use in track, accent, lamp retrofit, downlighting and other applications where color quality, consistency and optical control are required.

FEATURES

- Available in 4-step and 2-step EasyWhite bins at 2700 K & 3000 K, 80-CRI minimum
- Maximum drive current: 420 mA
- Low thermal resistance: 1.7 °C/W
- Maximum junction temperature: 150 °C
- Binned at 85 °C
- Viewing angle: 120°
- Unlimited floor life at ≤ 30 °C/85% RH
- Reflow solderable - JEDEC J-STD-020C
- Electrically neutral thermal path
- 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 | | 1.7 | |
| Viewing angle - full width half maximum (FWHM) | degrees | | 120 | |
| Temperature coefficient of voltage | mV/°C | | -28 | |
| ESD withstand voltage (HBM per Mil-Std-883D) | V | | | 8000 |
| DC forward current | mA | | | 420 |
| Reverse current | mA | | | 100 |
| Forward voltage (@ 233 mA, 85 °C) | V | | 36 | |
| Forward voltage (@ 233 mA, 25 °C) | V | | | 42 |
| LED junction temperature | °C | | | 150 |

FLUX CHARACTERISTICS, STANDARD ORDER CODES AND BINS ($I_f = 233 \text{ mA}$, $T_j = 85 \text{ °C}$)

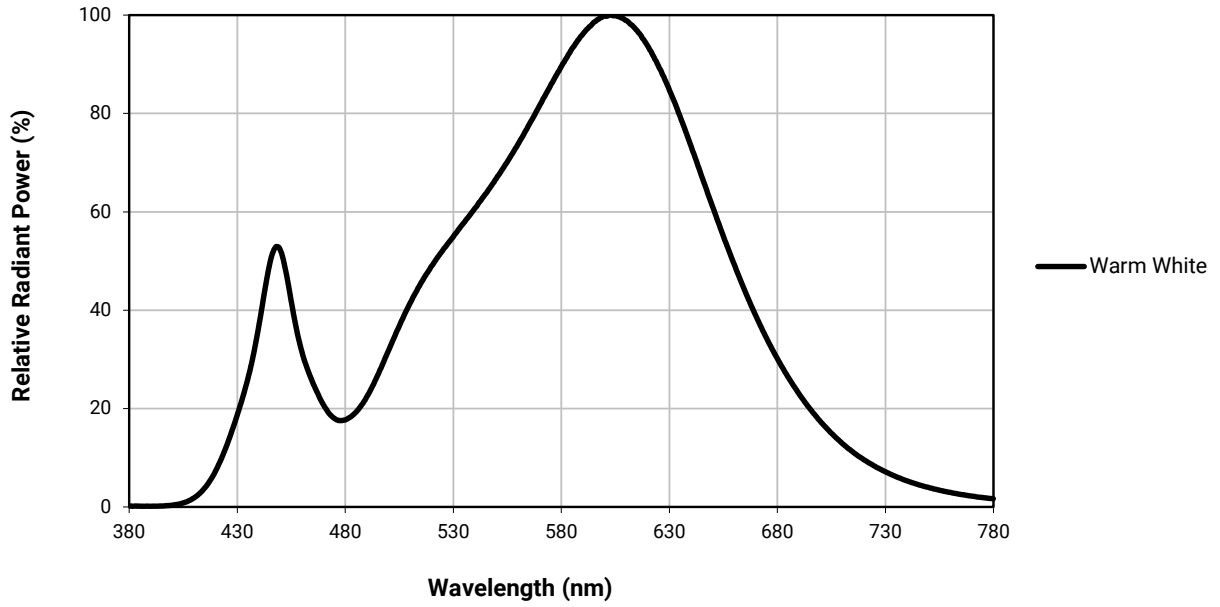
The following tables provide order codes for XLamp MK-R2 EasyWhite LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 8).

| Color | CCT Range | Minimum Luminous Flux | | | 2-Step | | 4-Step | |
|------------------|-----------|-----------------------|-------------------|--------------------|---------------------|--------------------------|---------------------|--------------------------|
| | | Group | Flux (lm) @ 85 °C | Flux (lm) @ 25 °C* | Chromaticity Region | Order Code | Chromaticity Region | Order Code |
| 80-CRI EasyWhite | 3000 K | G4 | 840 | 961 | 30H | MKRBWT-00-0000-0N0HG430H | 30F | MKRBWT-00-0000-0N0HG430F |
| | | G2 | 780 | 893 | | MKRBWT-00-0000-0N0HG230H | | MKRBWT-00-0000-0N0HG230F |
| | 2700 K | G2 | 780 | 893 | 27H | MKRBWT-00-0000-0N0HG227H | 27F | MKRBWT-00-0000-0N0HG227F |
| | | F4 | 730 | 847 | | MKRBWT-00-0000-0N0HF427H | | MKRBWT-00-0000-0N0HF427F |

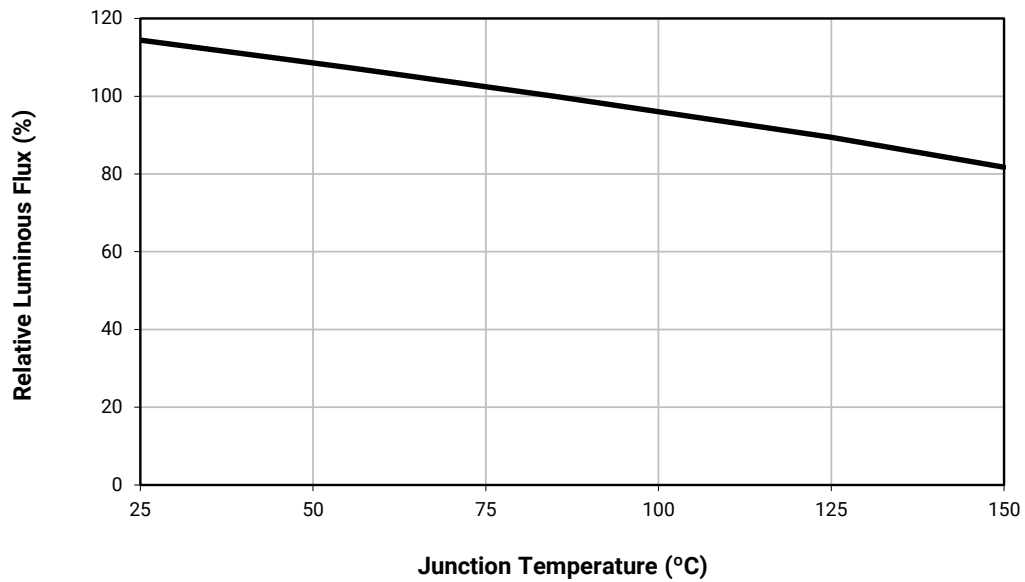
Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and ± 2 on CRI measurements. See the Measurements section (page 10).
- Minimum CRI for 80-CRI White is 80.
- * Flux values @ 25 °C are calculated and for reference only.

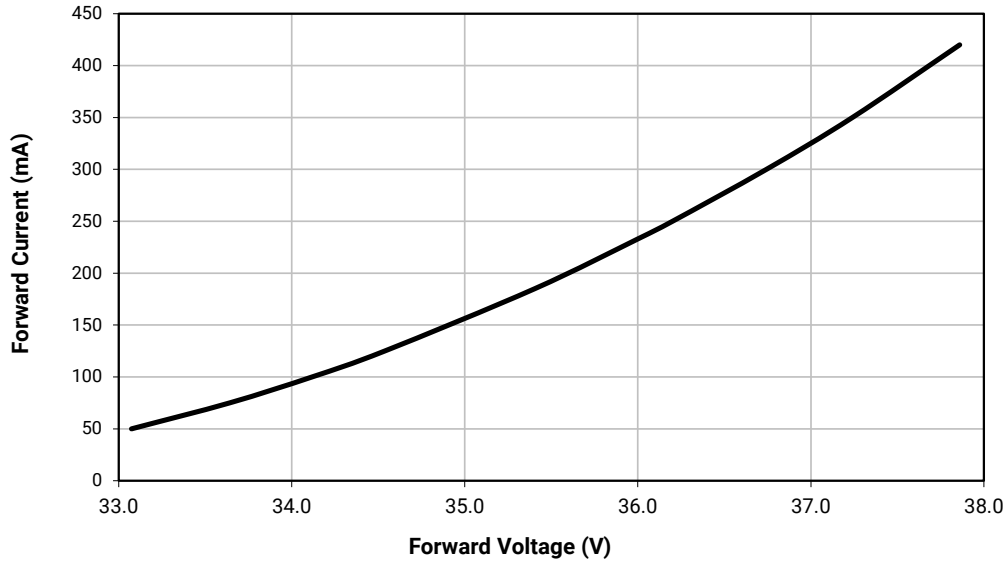
RELATIVE SPECTRAL POWER DISTRIBUTION



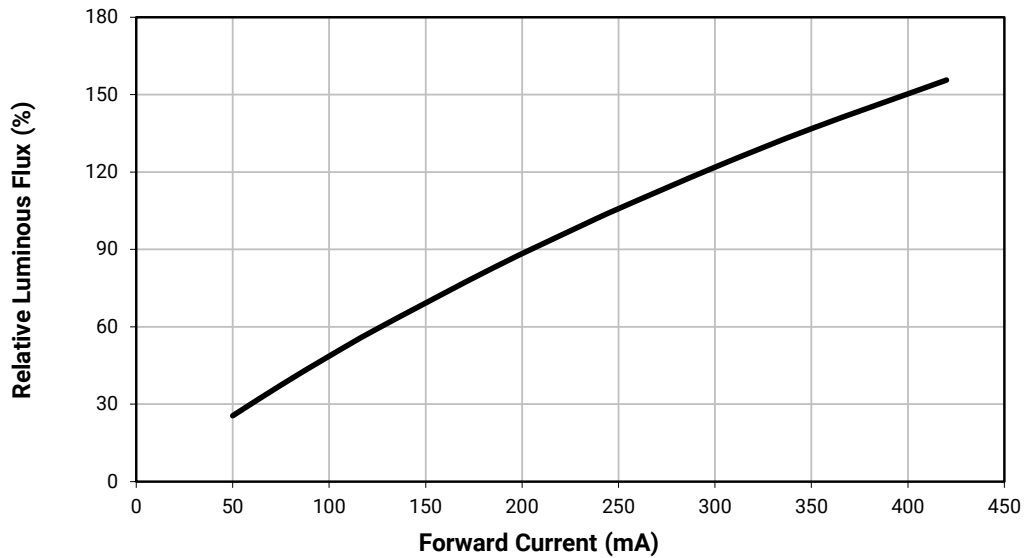
RELATIVE FLUX VS. JUNCTION TEMPERATURE ($I_F = 233 \text{ mA}$)



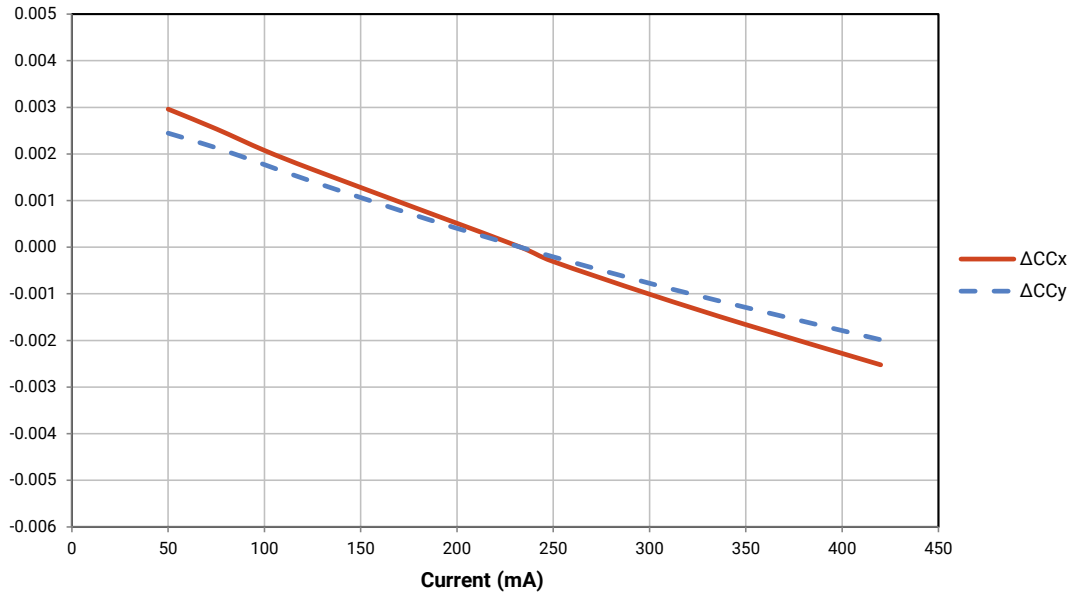
ELECTRICAL CHARACTERISTICS ($T_j = 85\text{ }^\circ\text{C}$)



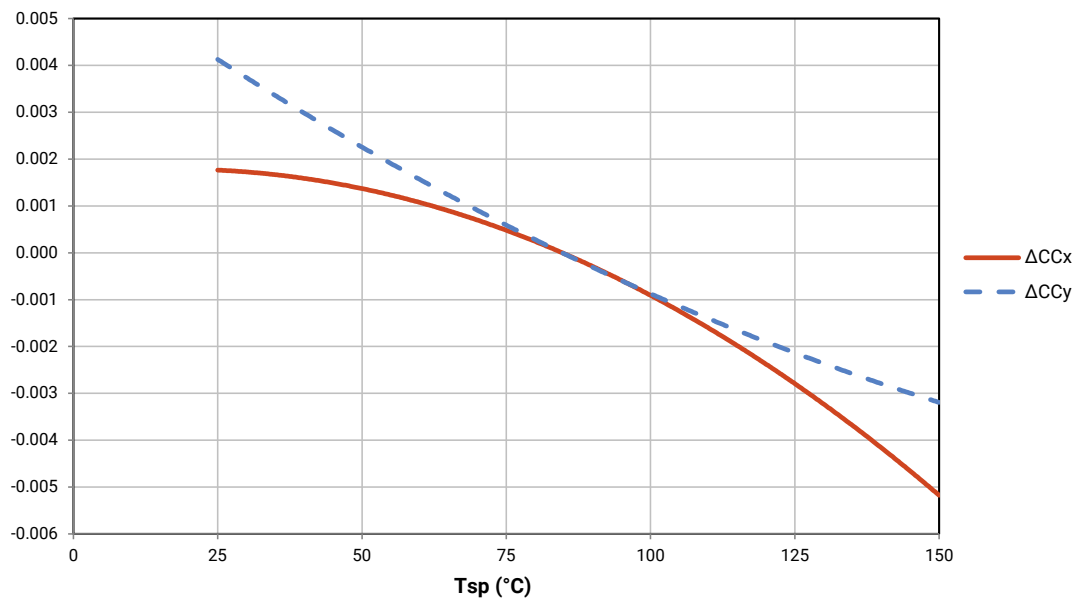
RELATIVE FLUX VS. CURRENT ($T_j = 85\text{ }^\circ\text{C}$)



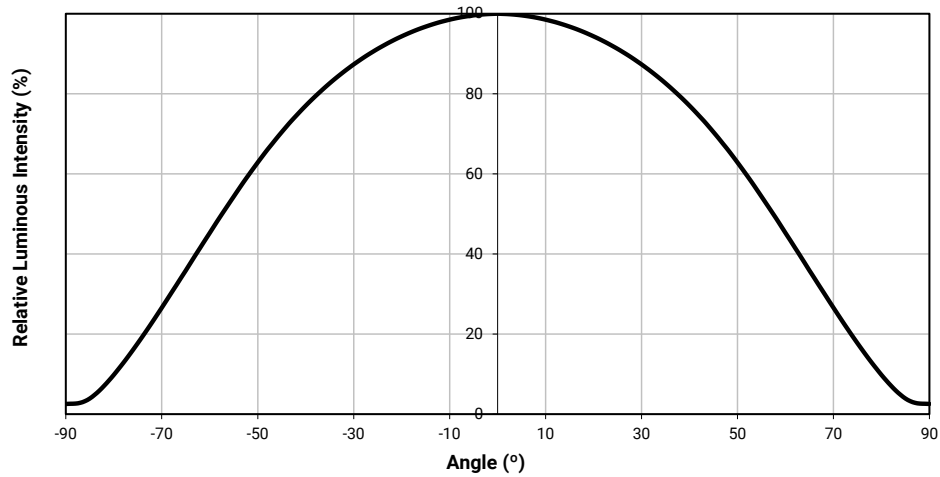
RELATIVE CHROMATICITY VS. CURRENT - WARM WHITE ($T_j = 85\text{ }^\circ\text{C}$)



RELATIVE CHROMATICITY VS. TEMPERATURE - WARM WHITE ($I_F = 233\text{ mA}$)

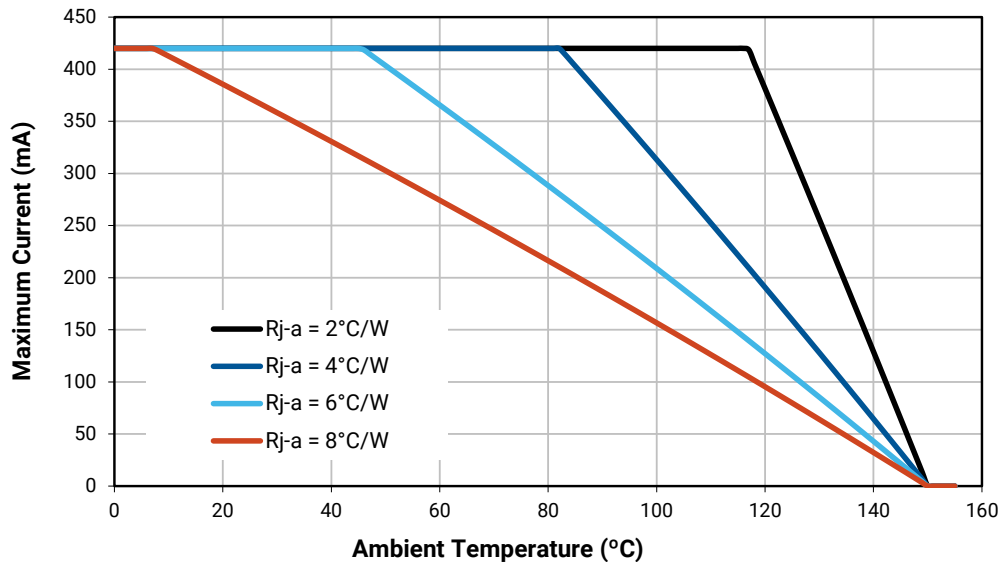


TYPICAL SPATIAL DISTRIBUTION



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.



PERFORMANCE GROUPS - BRIGHTNESS ($I_F = 233 \text{ mA}$, $T_J = 85 \text{ }^\circ\text{C}$)

XLamp MK-R2 LEDs are tested for luminous flux and placed into one of the following bins.

| Group Code | Minimum Luminous Flux | Maximum Luminous Flux |
|------------|-----------------------|-----------------------|
| D2 | 510 | 550 |
| D4 | 550 | 590 |
| E2 | 590 | 635 |
| E4 | 635 | 680 |
| F2 | 680 | 730 |
| F4 | 730 | 780 |
| G2 | 780 | 840 |
| G4 | 840 | 900 |
| H2 | 900 | 970 |
| H4 | 970 | 1040 |
| J2 | 1040 | 1120 |
| J4 | 1120 | 1200 |
| K2 | 1200 | 1290 |

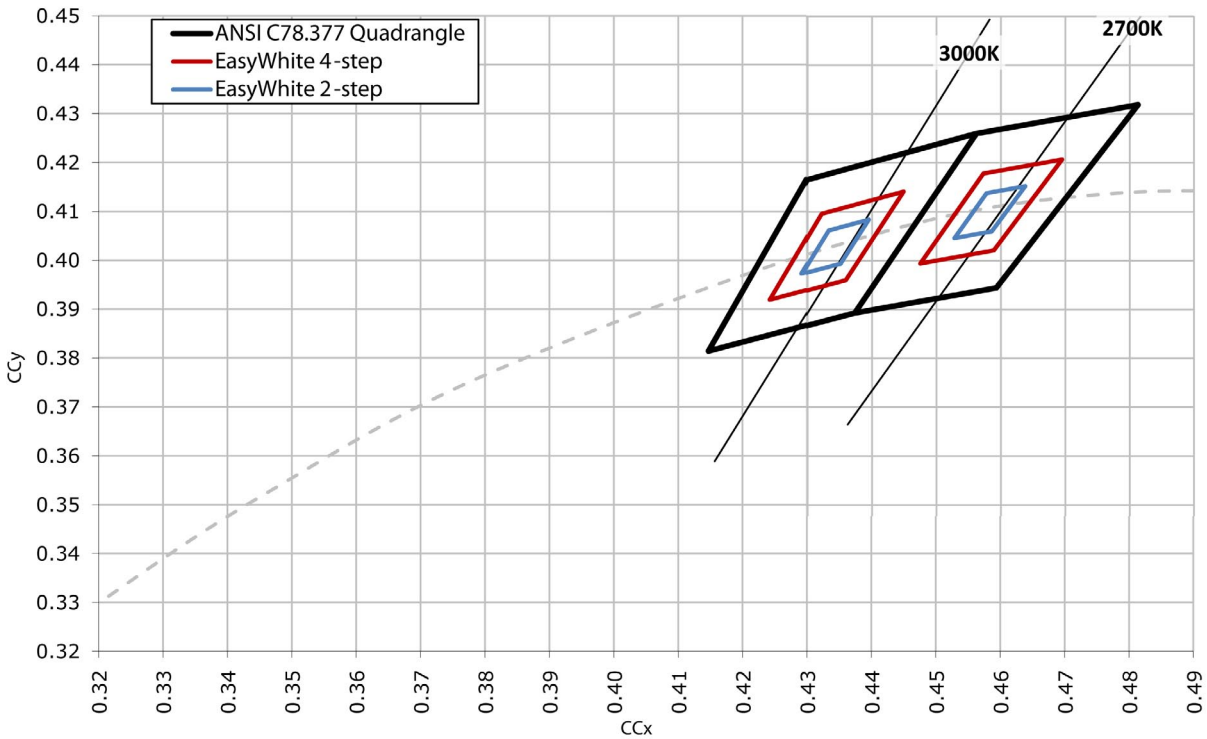
PERFORMANCE GROUPS - CHROMATICITY ($T_J = 85 \text{ }^\circ\text{C}$)

XLamp MK-R2 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

| EasyWhite Color Temperatures – 4-Step | | | |
|---------------------------------------|--------|--------|--------|
| Code | CCT | x | y |
| 30F | 3000 K | 0.4242 | 0.3919 |
| | | 0.4322 | 0.4096 |
| | | 0.4449 | 0.4141 |
| | | 0.4359 | 0.3960 |
| 27F | 2700 K | 0.4475 | 0.3994 |
| | | 0.4573 | 0.4178 |
| | | 0.4695 | 0.4207 |
| | | 0.4589 | 0.4021 |

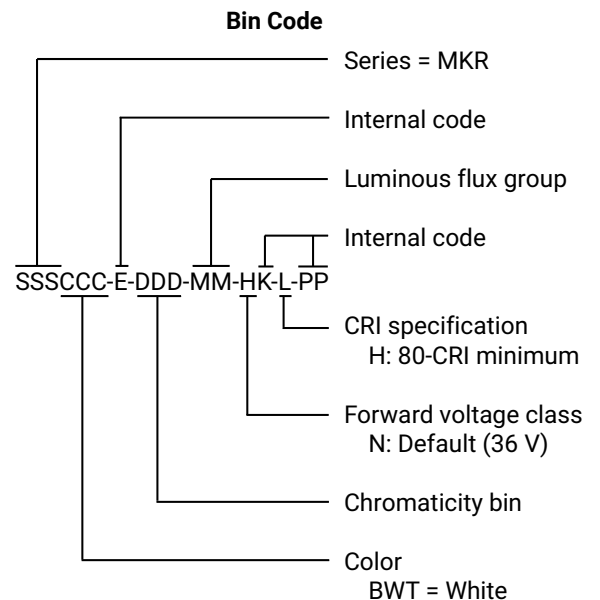
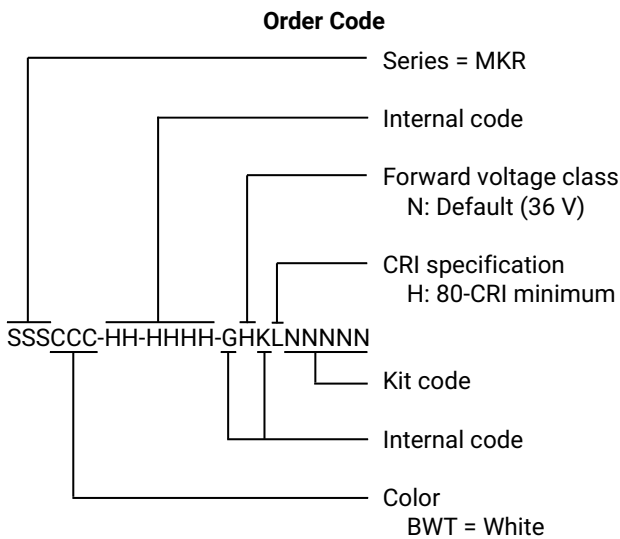
| EasyWhite Color Temperatures – 2-Step | | | |
|---------------------------------------|--------|--------|--------|
| Code | CCT | x | y |
| 30H | 3000 K | 0.4291 | 0.3973 |
| | | 0.4333 | 0.4062 |
| | | 0.4395 | 0.4084 |
| | | 0.4351 | 0.3994 |
| 27H | 2700 K | 0.4528 | 0.4046 |
| | | 0.4578 | 0.4138 |
| | | 0.4638 | 0.4152 |
| | | 0.4586 | 0.4060 |

CREE EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE ($T_j = 85^\circ\text{C}$)



BIN AND ORDER CODE FORMATS

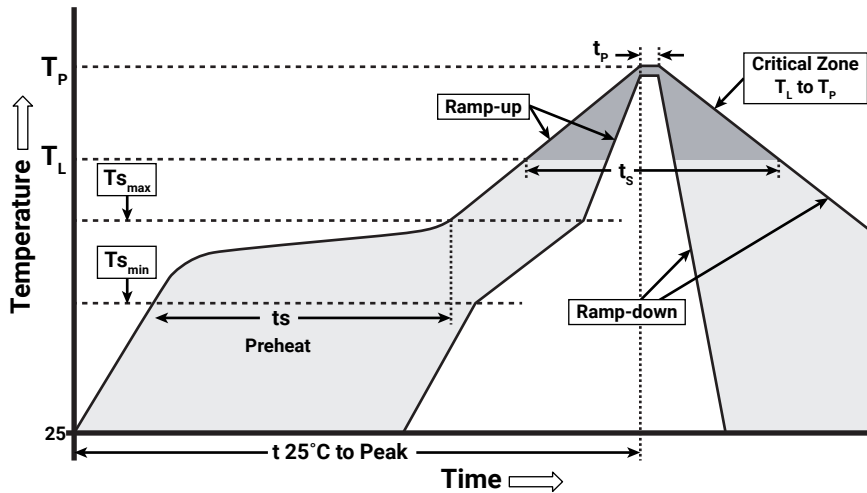
Bin codes and order codes are configured as follows.



REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp MK-R2 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 the 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-Free Solder |
|---|------------------|
| Average Ramp-Up Rate ($T_{s_{max}}$ to T_p) | 1.2 °C/second |
| Preheat: Temperature Min ($T_{s_{min}}$) | 120 °C |
| Preheat: Temperature Max ($T_{s_{max}}$) | 170 °C |
| Preheat: Time ($t_{s_{min}}$ to $t_{s_{max}}$) | 65-150 seconds |
| Time Maintained Above: Temperature (T_L) | 217 °C |
| Time Maintained Above: Time (t_L) | 45-90 seconds |
| Peak/Classification Temperature (T_p) | 235 - 245 °C |
| Time Within 5 °C of Actual Peak Temperature (t_p) | 20-40 seconds |
| Ramp-Down Rate | 1 - 6 °C/second |
| Time 25 °C to Peak Temperature | 4 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, forward voltage 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.

Pre-Release Qualification Testing

Please read the [LED Reliability Overview](#) for details of the qualification process Cree applies to ensure long-term reliability for XLamp LEDs and details of Cree's pre-release qualification testing for XLamp LEDs.

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 MK-R2 LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of ≤ 30 °C/85% relative humidity (RH). Regardless of 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 Ecology](#) section of the Cree website.

REACH Compliance

REACH substances of very 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.

NOTES - CONTINUED

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.

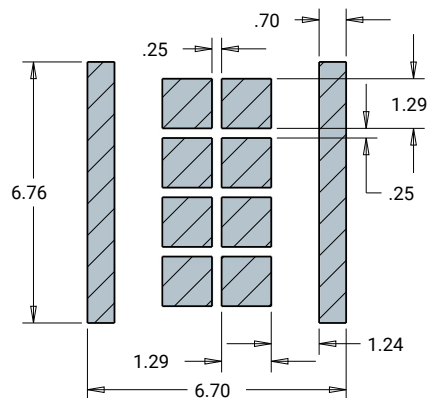
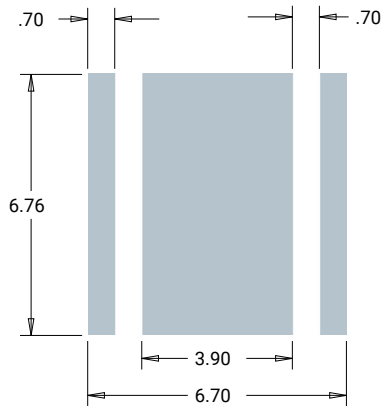
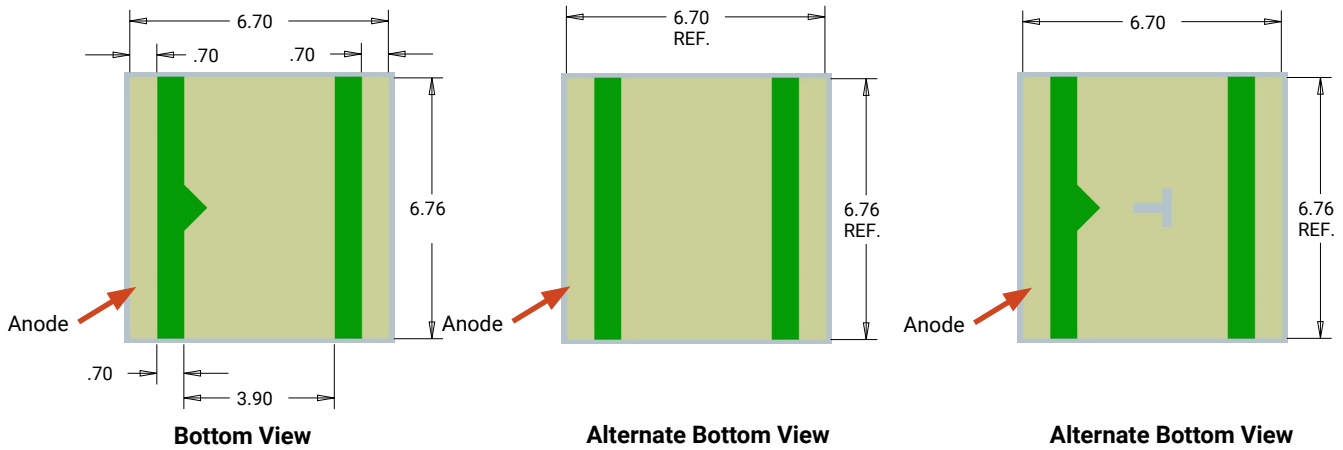
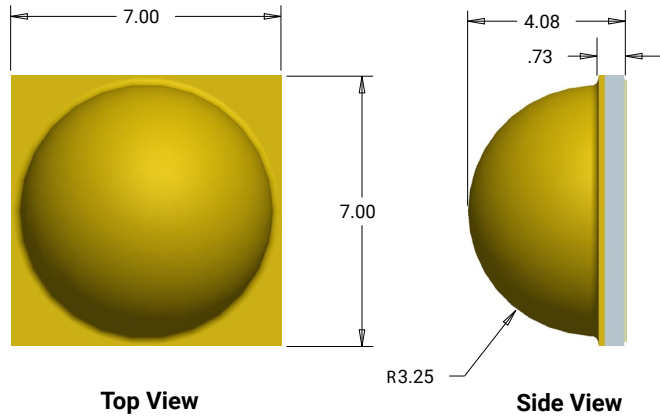
Vision Advisory

WARNING: Do not look at an 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

Thermal vias, if present, are not shown on these drawings.

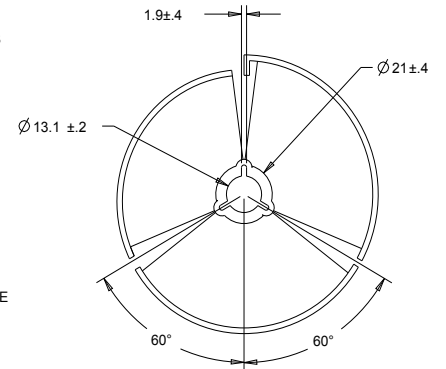
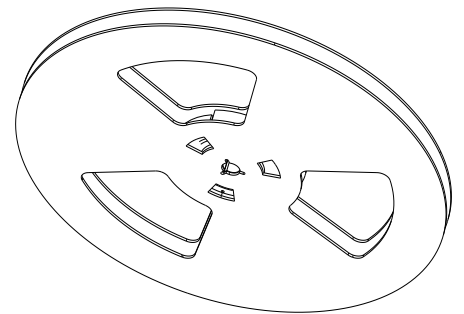
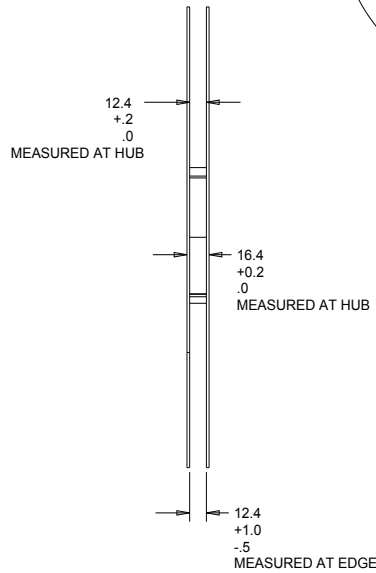
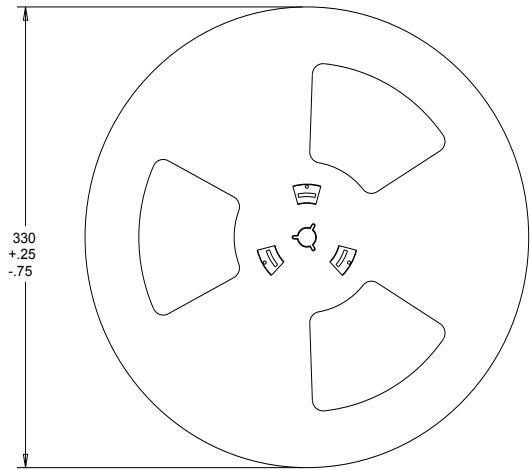
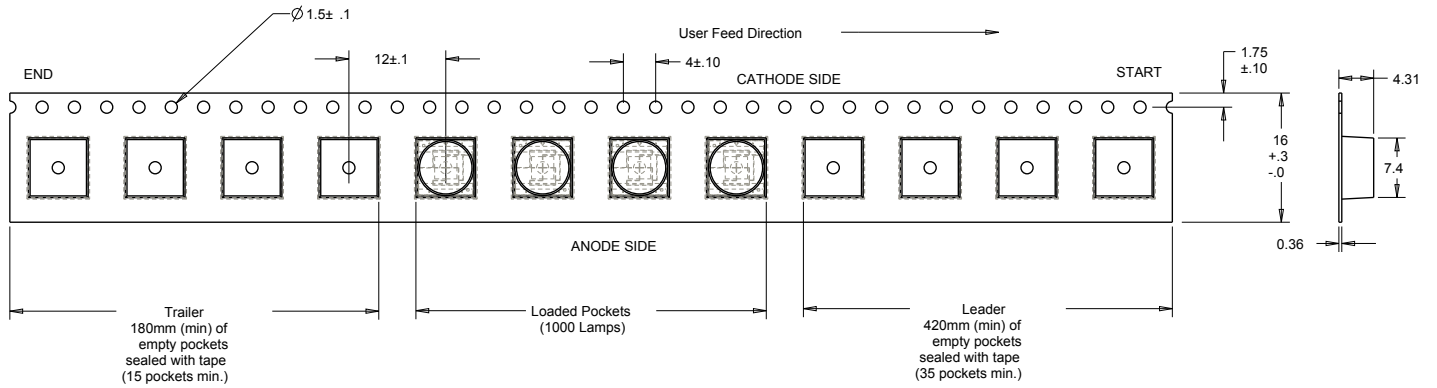
All measurements are ± 0.13 mm unless otherwise indicated.



TAPE AND REEL

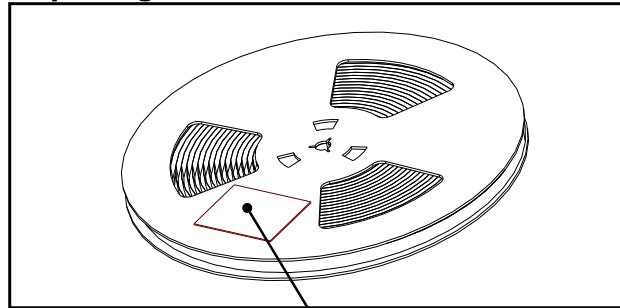
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

All dimensions in mm.



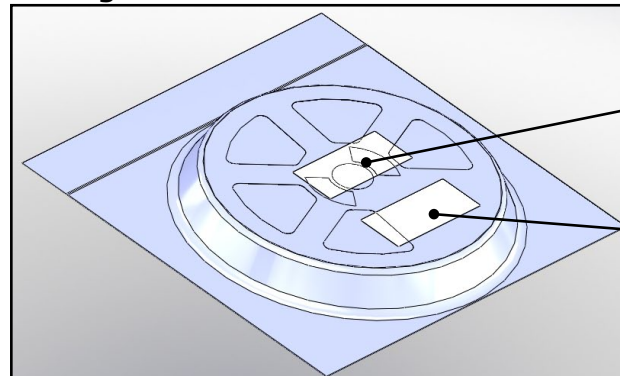
PACKAGING

Unpackaged Reel



Label with Cree Bin Code,
Quantity, Reel ID

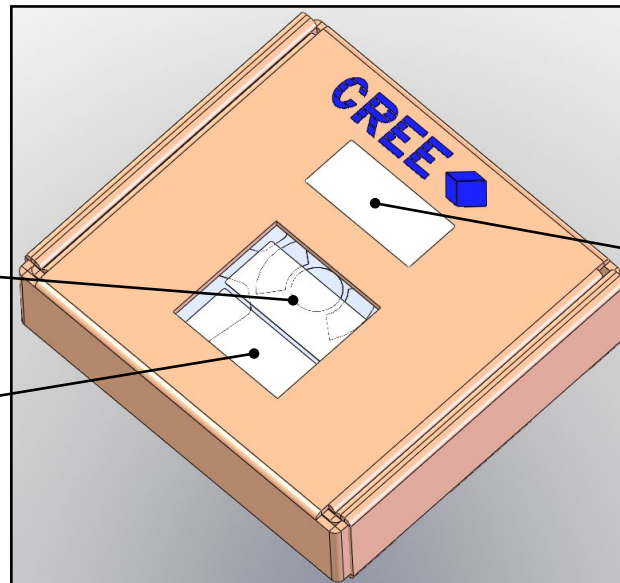
Packaged Reel



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

Label with Cree Bin Code,
Quantity, Reel ID

Boxed Reel



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

Patent Label

Label with Cree Bin Code,
Quantity, Reel ID