

# Cree® XLamp® MP-L EasyWhite® LEDs



## PRODUCT DESCRIPTION

The XLamp MP-L EasyWhite LED eliminates traditional chromaticity binning and maximizes lumen density, enabling luminaire and bulb retrofit manufacturers to deliver consistent color and required light output to the target end user. XLamp MP-L EasyWhite LEDs can reduce LED-to-LED color variation to within a 2-step MacAdams ellipse around the desired color temperature, which is 94% smaller than the total area of the corresponding ANSI C78.377 color region.

The XLamp MP-L EasyWhite LED is the perfect choice for lighting applications where high luminous flux output is required from a single, small point source. Examples of specific applications include: commercial/retail display spotlights, LED retrofit bulbs, and other indoor general illumination applications.

## FEATURES

- Cree EasyWhite color temperatures
- High lumen density
- Wide viewing angle: 125°
- Minimum 80 CRI at 2700 K and 3000 K CCT
- Electrically neutral thermal path
- RoHS- and REACh-compliant
- UL-recognized component (E349212)

## APPLICATIONS

- Commercial/residential directional lighting
- LED retrofit bulbs
- General indoor/outdoor illumination

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## CHARACTERISTICS

| Characteristics                                     | Unit    | Minimum | Typical | Maximum |
|---|---------|---------|---------|---------|
| Solder Point Temperature                            | °C      |         |         | 110     |
| Viewing Angle (FWHM) - white                        | degrees |         | 125     |         |
| Temperature Coefficient of Voltage (per LED string) | mV/°C   |         | -30     |         |
| ESD Classification (HBM per Mil-Std-883D)           |         |         | Class 2 |         |
| Total Power, all strings @ 150 mA                   | W       |         | 11.3    |         |
| Total Power, all strings @ 250 mA                   | W       |         | 19.9    |         |
| DC Forward Current, per LED string                  | mA      |         |         | 250     |
| Reverse Current, per LED string                     | mA      |         |         | 0.1     |
| Forward Voltage @ 150 mA, per LED string            | V       |         | 25.0    | 26.0    |
| Forward Voltage @ 250 mA, per LED string            | V       |         | 26.5    | 27.5    |

## FLUX CHARACTERISTICS @ 150 mA (T<sub>j</sub> = 25 °C)

The following table provides several base order codes for XLamp MP-L EasyWhite LEDs. For additional order codes, as well as a complete description of the order-code nomenclature, please reference pages 6 through 9 of this document.

| Color               | CCT Range | Base Order Codes<br>Min. Luminous Flux (lm) |           | Order Code               |
|---------------------|-----------|---|-----------|--------------------------|
|                     |           | Group                                       | Flux (lm) |                          |
| EasyWhite<br>4-Step | 4000 K    | D0  | 900       | MPLEZW-A1-0000-0000D040F |
|                     |           | E0  | 1000      | MPLEZW-A1-0000-0000E040F |
|                     | 3500 K    | B0  | 700       | MPLEZW-A1-0000-0000B035F |
|                     |           | C0  | 800       | MPLEZW-A1-0000-0000C035F |
|                     | 3000 K    | B0  | 700       | MPLEZW-A1-0000-0000B030F |
|                     |           | C0  | 800       | MPLEZW-A1-0000-0000C030F |
|                     | 2700 K    | B0  | 700       | MPLEZW-A1-0000-0000B027F |
|                     |           | C0  | 800       | MPLEZW-A1-0000-0000C027F |

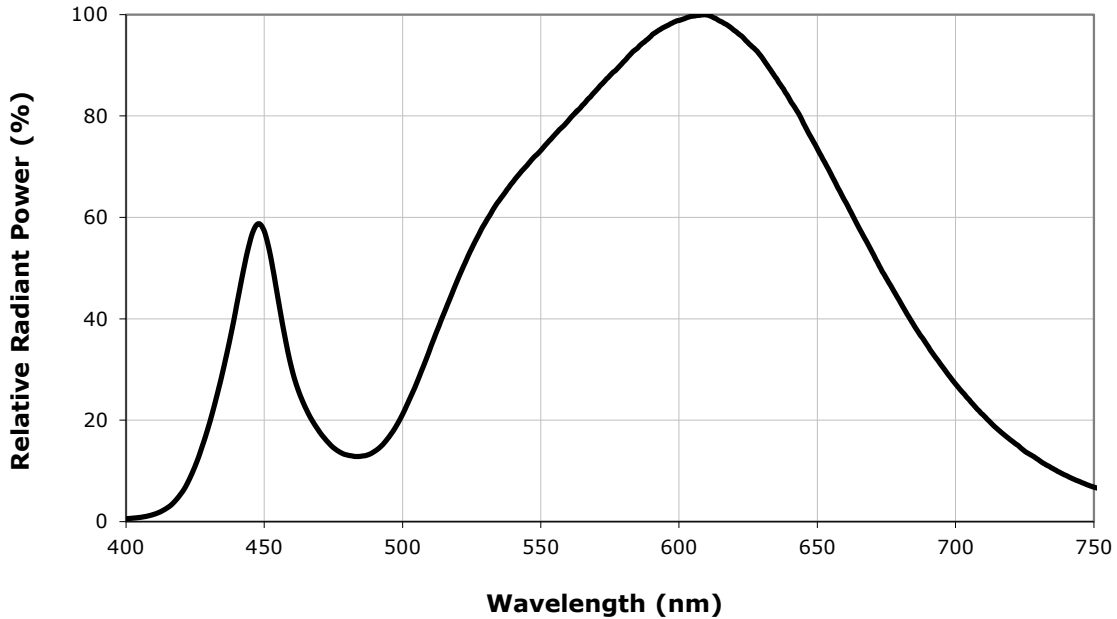
| Color               | CCT Range | Base Order Codes<br>Min. Luminous Flux (lm) |           | Order Code               |
|---------------------|-----------|---|-----------|--------------------------|
|                     |           | Group                                       | Flux (lm) |                          |
| EasyWhite<br>2-Step | 4000 K    | D0  | 900       | MPLEZW-A1-0000-0000D040H |
|                     |           | E0  | 1000      | MPLEZW-A1-0000-0000E040H |
|                     | 3500 K    | B0  | 700       | MPLEZW-A1-0000-0000B035H |
|                     |           | C0  | 800       | MPLEZW-A1-0000-0000C035H |
|                     | 3000 K    | B0  | 700       | MPLEZW-A1-0000-0000B030H |
|                     |           | C0  | 800       | MPLEZW-A1-0000-0000C030H |
|                     | 2700 K    | B0  | 700       | MPLEZW-A1-0000-0000B027H |
|                     |           | C0  | 800       | MPLEZW-A1-0000-0000C027H |

### Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CC<sub>x</sub>, CC<sub>y</sub>) measurements and ±2 on CRI measurements.
- Minimum CRI for EasyWhite color temperatures 27F, 27H, 30F, 30H is 80.
- Minimum CRI for EasyWhite color temperatures 35F, 35H, 40F, 40H is 77.
- Typical CRI for EasyWhite color temperatures 35F, 35H, 40F, 40H is 80.

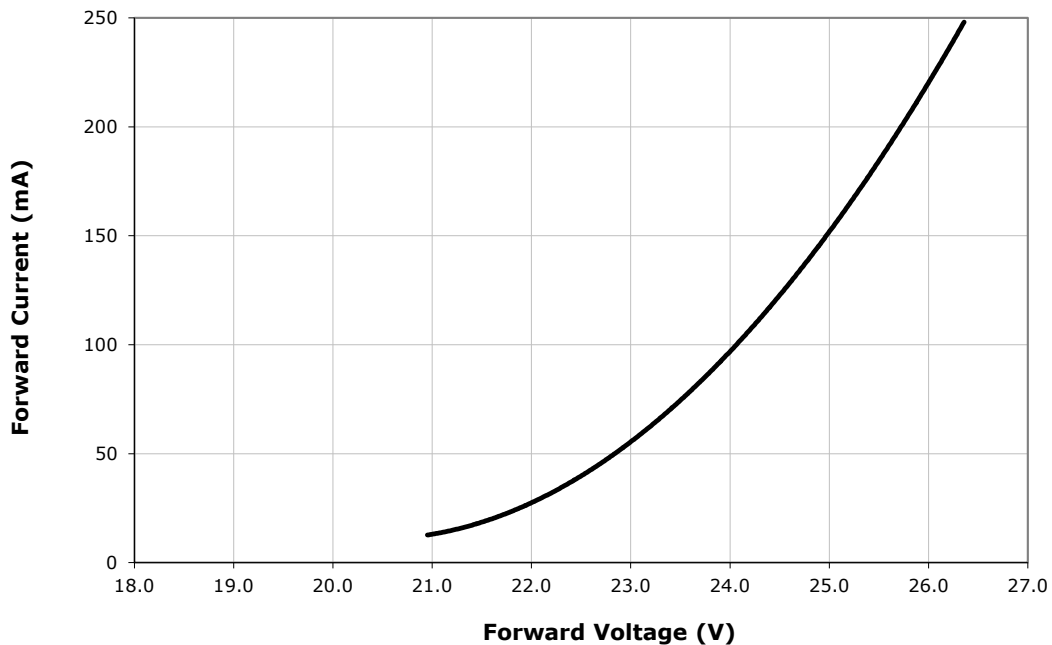
**RELATIVE SPECTRAL POWER DISTRIBUTION ( $I_f = 150 \text{ mA PER LED}$ )**

The following graph represents typical spectral output of the XLamp MP-L EasyWhite LED with all LEDs on simultaneously.



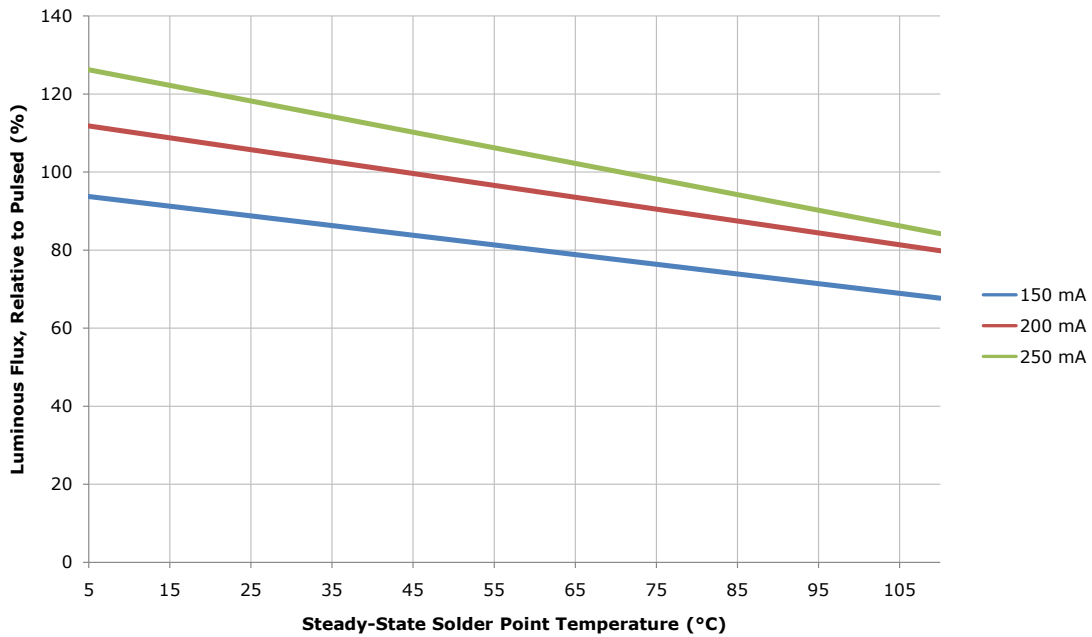
**ELECTRICAL CHARACTERISTICS ( $T_j = 25 \text{ }^\circ\text{C}$ )**

The following graph represents typical electrical characteristics of an individual string of XLamp MP-L EasyWhite LEDs.

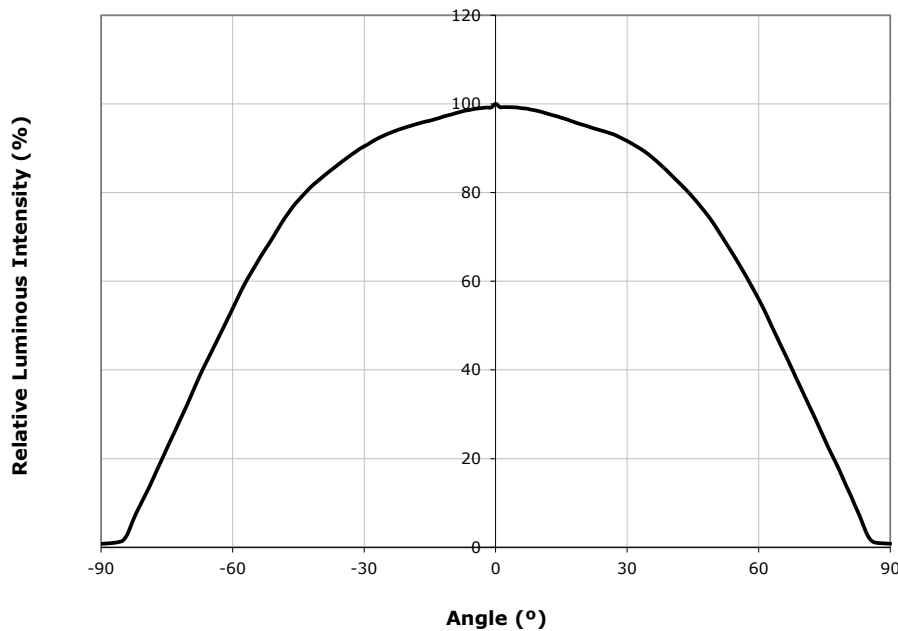


### RELATIVE LUMINOUS FLUX VS CURRENT AND SOLDER POINT TEMPERATURE (STEADY-STATE CONDITIONS)

The data below is representative of the XLamp MP-L EasyWhite in steady-state operation with all strings driven equally at the current shown. The relative luminous flux is shown as a percentage of the light output under pulsed test conditions ( $t=20\text{ ms}$ ,  $I_f=150\text{ mA}$ ,  $T_{sp}=T_j=25\text{ }^\circ\text{C}$ ). The XLamp MP-L EasyWhite LED is binned under these pulsed test conditions.



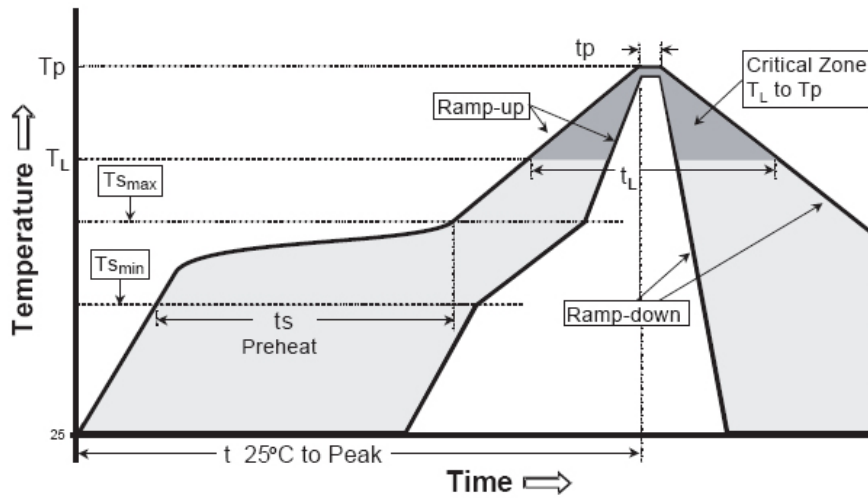
### TYPICAL SPATIAL DISTRIBUTION



## REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp MP-L EasyWhite 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.



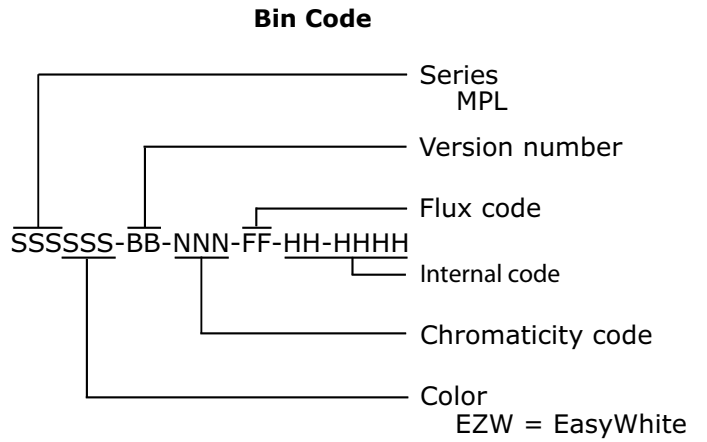
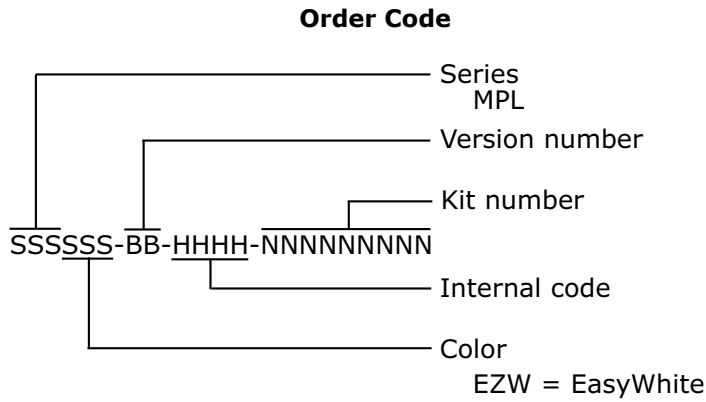
IPC/JEDEC J-STD-020C

| Profile Feature                                       | Lead-Based Solder | Lead-Free Solder |
|---|-------------------|------------------|
| Average Ramp-Up Rate ( $T_{smax}$ to $T_p$ )          | 3 °C/second max.  | 3 °C/second max. |
| Preheat: Temperature Min ( $T_{smin}$ )               | 100 °C            | 150 °C           |
| Preheat: Temperature Max ( $T_{smax}$ )               | 150 °C            | 200 °C           |
| Preheat: Time ( $t_{smin}$ to $t_{smax}$ )            | 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.

**BIN AND ORDER-CODE FORMAT**

Bin codes and order codes are configured in the following manner:



## PERFORMANCE GROUPS – BRIGHTNESS

XLamp MP-L EasyWhite LEDs are tested for luminous flux and placed into one of the following luminous-flux groups:

| Group Code | Min. Luminous Flux @ 150 mA per string (lm) | Max. Luminous Flux @ 150 mA per string (lm) |
|------------|---|---|
| A0         | 600   | 700   |
| B0         | 700   | 800   |
| C0         | 800   | 900   |
| D0         | 900   | 1000  |
| E0         | 1000  | 1100  |
| F0         | 1100  | 1200  |

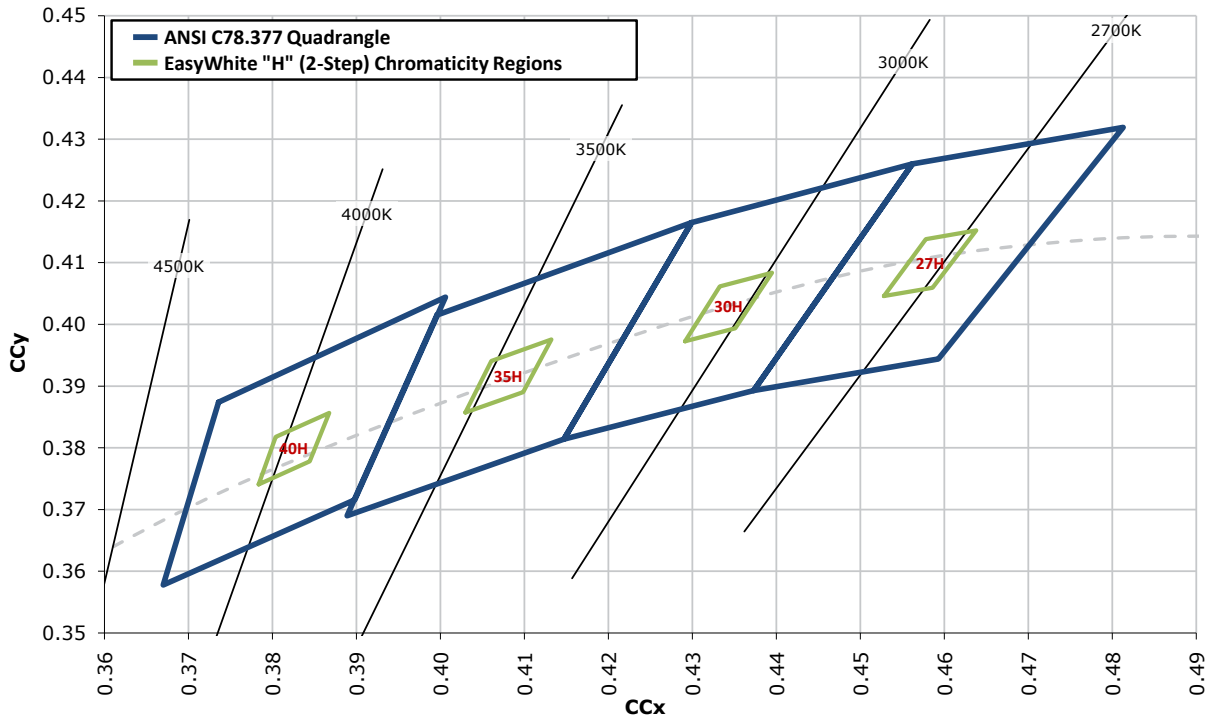
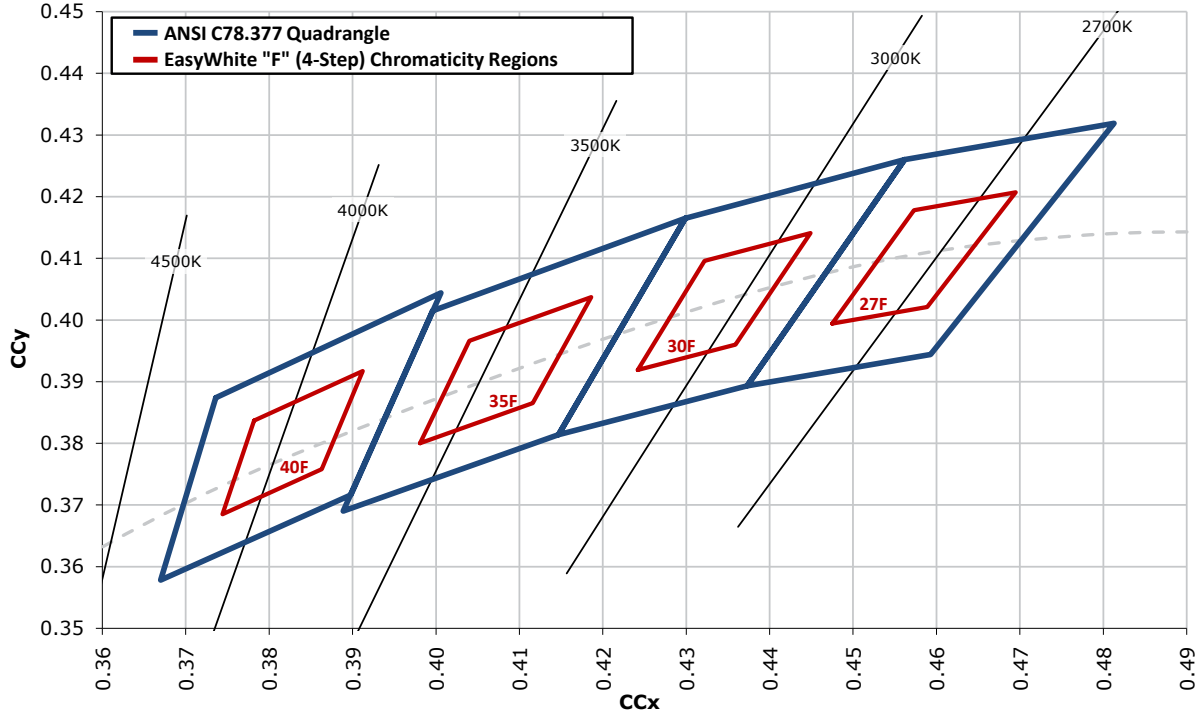
## PERFORMANCE GROUPS – CHROMATICITY

XLamp MP-L EasyWhite 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      |
| 40F                                   | 4000 K | 0.3744 | 0.3685 |
|                                       |        | 0.3782 | 0.3837 |
|                                       |        | 0.3912 | 0.3917 |
|                                       |        | 0.3863 | 0.3758 |
| 35F                                   | 3500 K | 0.3981 | 0.3800 |
|                                       |        | 0.4040 | 0.3966 |
|                                       |        | 0.4186 | 0.4037 |
|                                       |        | 0.4116 | 0.3865 |
| 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      |
| 40H                                   | 4000 K | 0.3784 | 0.3741 |
|                                       |        | 0.3804 | 0.3818 |
|                                       |        | 0.3867 | 0.3857 |
|                                       |        | 0.3844 | 0.3778 |
| 35H                                   | 3500 K | 0.4030 | 0.3857 |
|                                       |        | 0.4061 | 0.3941 |
|                                       |        | 0.4132 | 0.3976 |
|                                       |        | 0.4099 | 0.3890 |
| 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 COLOR TEMPERATURES PLOTTED ON THE 1931 CIE CURVE





**STANDARD ORDER CODES AND BINS (MP-L EASYWHITE)**

The following tables list standard kit numbers and performance bins. Kit numbers completely describe an order code's chromaticity regions and luminous flux range.

| XLamp MP-L EasyWhite LED Standard Order Codes |           |                         |            |
|---|-----------|-------------------------|------------|
| Min. Luminous Flux (lm)<br>@ 150 mA*          |           | Chromaticity<br>Regions | Kit Number |
| Group   | Flux (lm) |                         |            |
| EasyWhite                                     |           |                         |            |
| B0  | 700       | 27F                     | 0000B027F  |
|   |           | 27H                     | 0000B027H  |
|   |           | 30F                     | 0000B030F  |
|   |           | 30H                     | 0000B030H  |
|   |           | 35F                     | 0000B035F  |
|   |           | 35H                     | 0000B035H  |
| C0  | 800       | 27F                     | 0000C027F  |
|   |           | 27H                     | 0000C027H  |
|   |           | 30F                     | 0000C030F  |
|   |           | 30H                     | 0000C030H  |
|   |           | 35F                     | 0000C035F  |
|   |           | 35H                     | 0000C035H  |
| D0  | 900       | 40F                     | 0000D040F  |
|   |           | 40H                     | 0000D040H  |
| E0  | 1000      | 40F                     | 0000E040F  |
|   |           | 40H                     | 0000E040H  |

For other flux and chromaticity combinations, contact Cree or an authorized distributor.

\* Cree XLamp MP-L EasyWhite order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.

**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](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/lumen\\_maintenance](http://www.cree.com/xlamp_app_notes/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**

XLamp MP-L EasyWhite LEDs are shipped in sealed, moisture-barrier bags (MBB) designed for long shelf life. If XLamp MP-L EasyWhite LEDs are exposed to moist environments after opening the MBB packaging but before soldering, damage to the LED may occur during the soldering operation. The derating table at right defines the maximum exposure time (in days) for an XLamp MP-L EasyWhite LED in the listed humidity and temperature conditions. LEDs with exposure time longer than the time specified below must be baked according to the baking conditions listed below.

| Temp. | Maximum Percent Relative Humidity |     |     |     |     |     |     |
|-------|-----------------------------------|-----|-----|-----|-----|-----|-----|
|       | 30%                               | 40% | 50% | 60% | 70% | 80% | 90% |
| 35 °C | -                                 | -   | -   | 17  | 1   | .5  | .5  |
| 30 °C | -                                 | -   | -   | 28  | 1   | 1   | 1   |
| 25 °C | -                                 | -   | -   | -   | 2   | 1   | 1   |
| 20 °C | -                                 | -   | -   | -   | 2   | 1   | 1   |

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.

**Baking Conditions**

It is not necessary to bake all XLamp MP-L EasyWhite LEDs. Only the LEDs that meet all of the following criteria must be baked:

1. LEDs that have been removed from the original MBB packaging.
2. LEDs that have been exposed to a humid environment longer than listed in the Moisture Sensitivity section above.
3. LEDs that have not been soldered.

LEDs should be baked at 80 °C for 24 hours. LEDs may be baked on the original reels. Remove LEDs from MBB packaging before baking. Do not bake parts at temperatures higher than 80 °C. This baking operation resets the exposure time as defined in the Moisture Sensitivity section above.

## NOTES - CONTINUED

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### Storage Conditions

XLamp MP-L EasyWhite LEDs that have been removed from the original MBB packaging but not soldered should be stored in one of the following ways:

- Store the parts in a rigid metal container with a tight-fitting lid. Verify that the storage temperature is  $<30^{\circ}\text{C}$ , and place fresh desiccant and an RH indicator in the container to verify that the RH is no greater than 60%.
- Store the parts in a dry, nitrogen-purged cabinet or container that actively maintains the temperature at  $<30^{\circ}$  and the RH at no greater than 60%.
- For short-term store only: LEDs can be resealed in the original MBB bag soon after opening. Fresh desiccant may be needed. Use the included humidity indicator card to verify  $<60\%$  RH.

If an environment of  $<60\%$  RH is not available for storage, XLamp MP-L EasyWhite LEDs should be baked (described above) before reflow soldering.

### 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 [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 notices 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 Declaration. Historical REACH banned substance information (substances restricted or banned in the EU prior to 2010) is also available upon request.

### UL Recognized Component

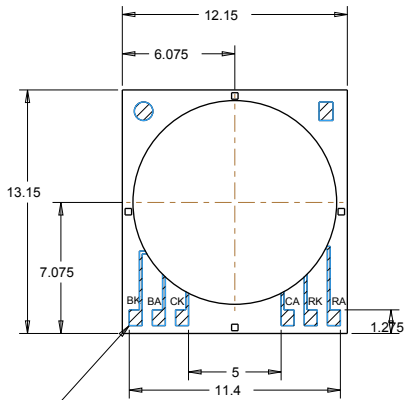
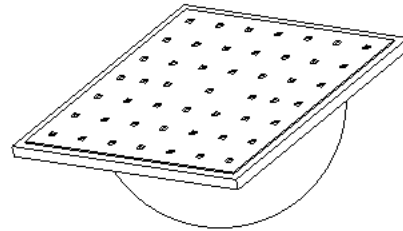
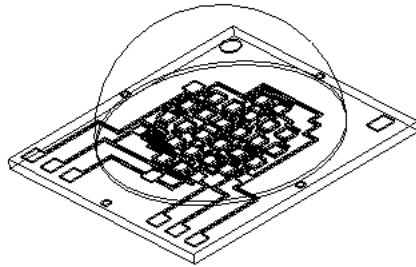
Level 4 enclosure consideration. The LED package or a portion thereof has been investigated as a fire and electrical enclosure per ANSI/UL 8750.

### Vision Advisory Claim

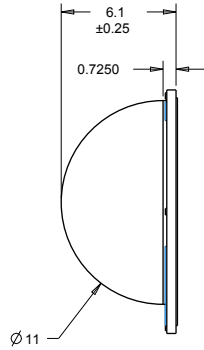
WARNING. Do not look at exposed lamp in operation. Eye injury can result. For more information about LEDs and eye safety, please refer to the Cree LED Eye Safety application note at [www.cree.com/xlamp\\_app\\_notes/led\\_eye\\_safety](http://www.cree.com/xlamp_app_notes/led_eye_safety).

**MECHANICAL DIMENSIONS**

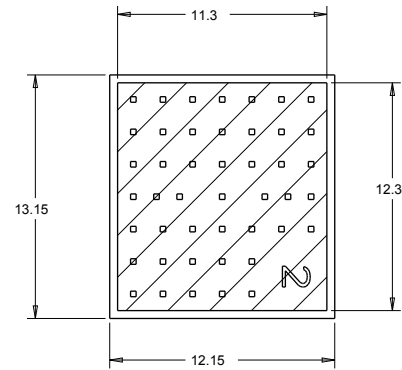
All measurements are  $\pm 0.13$  mm unless otherwise indicated.



TOP VIEW



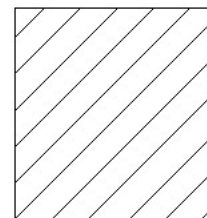
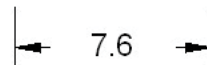
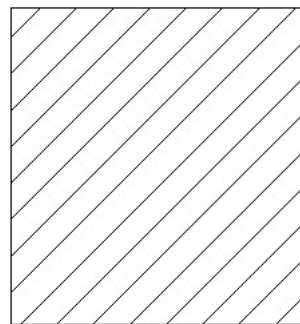
SIDE VIEW



BOTTOM VIEW

CONTACT PADS  
SIZE: 0.70 X 0.85  
PITCH: 1.25

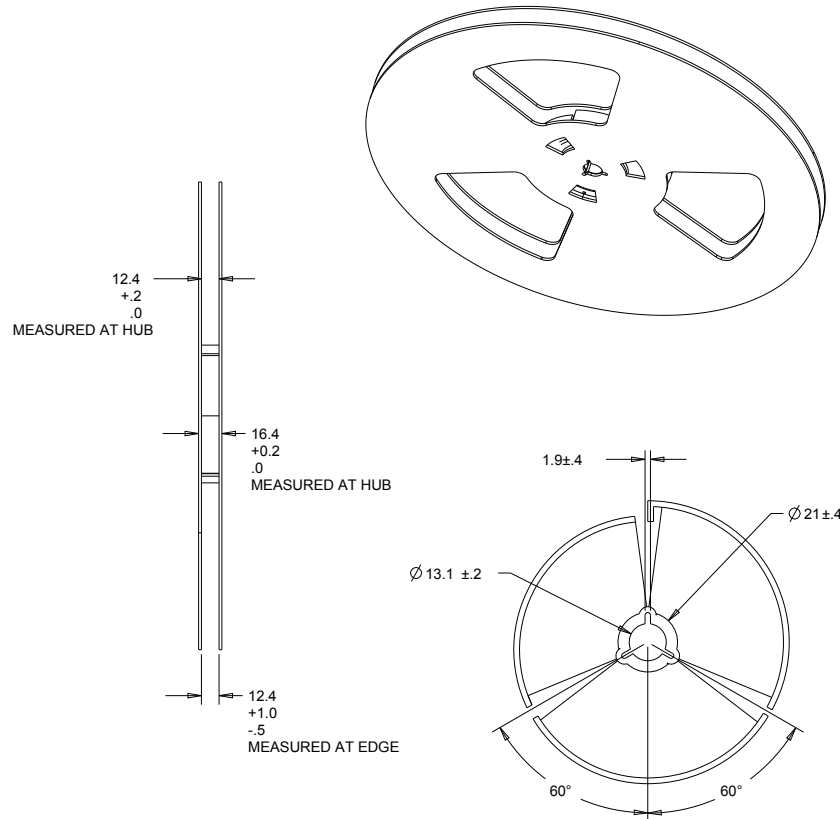
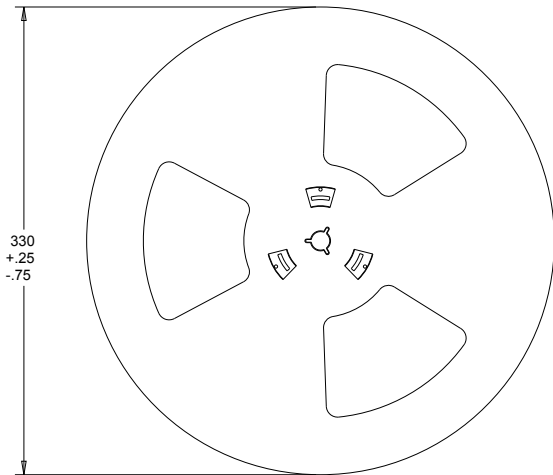
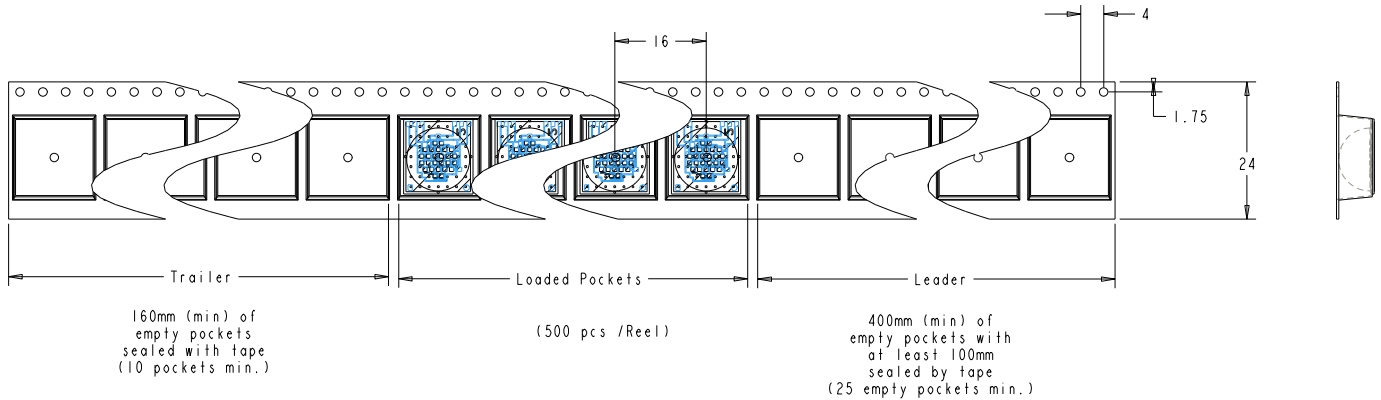
CATHODE(-): BK, CK, RK  
ANODE(+): BA, CA, RA



**TAPE AND REEL**

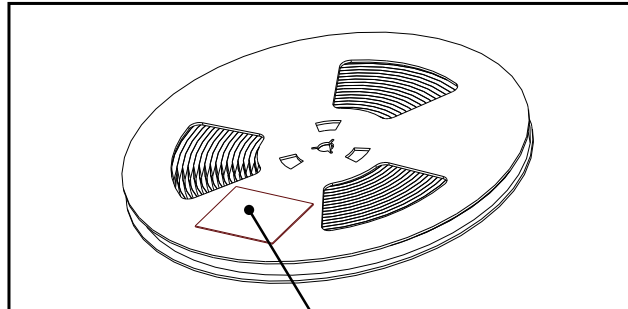
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

All dimensions in mm.



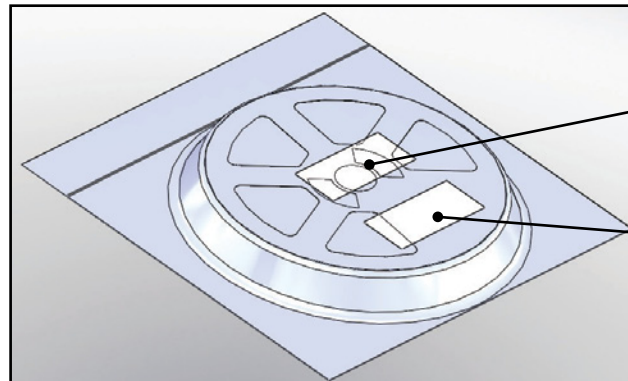
### PACKAGING

#### Unpackaged Reel



Label with Cree Bin Code, Qty, Reel ID

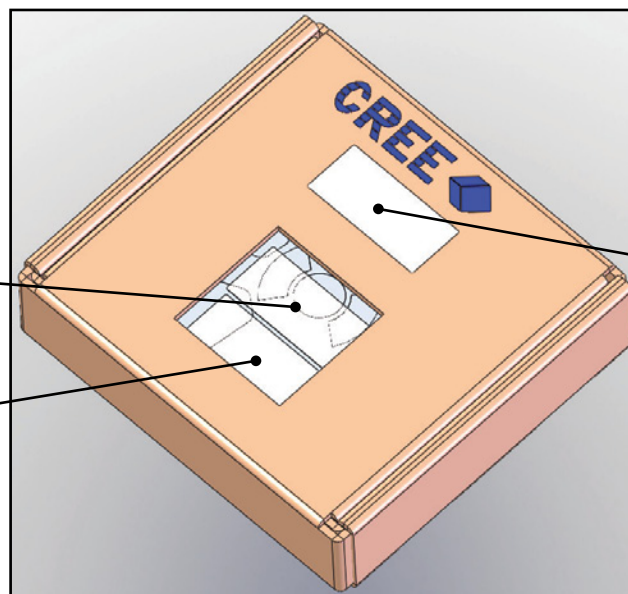
#### Packaged Reel



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