# XLamp® MX-3 LEDs

## PRODUCT DESCRIPTION

The XLamp® MX-3 LED provides the proven lighting-class performance and reliability of XLamp LEDs in a flat-top PLCC package. The XLamp MX-3 LED continues Cree LED's history of innovation in LEDs for lighting applications with a wide viewing angle, unlimited floor life, uniform light output without secondary optics and electrically neutral thermal path.

The XLamp MX-3 LED brings high performance and quality of light to a wide range of lighting applications, including linear lighting, LED light bulbs, fluorescent retrofits and retail-display lighting.

## FEATURES

- Available in white (2600 K to 8300 K CCT)
- Maximum drive current: 500 mA
- Wide viewing angle: 120°
- Electrically neutral thermal path
- Qualification at maximum drive current
- RoHS and REACh compliant
- UL® recognized component (E349212)

## TABLE OF CONTENTS



Cree LED / 4400 Silicon Drive / Durham, NC 27703 USA / +1.919.313.5330 / www.cree-led.com

## CHARACTERISTICS

| Characteristics | Unit | Minimum | Typical | Maximum |
|---|---|---|---|---|
| Thermal resistance, junction to solder point | °C/W | | 11 | |
| Viewing angle (FWHM) | degrees | | 120 | |
| Temperature coefficient of voltage | mV/ °C | | -2.7 | |
| ESD classification (HBM per Mil-Std-883D) | | | Class 2 | |
| DC forward current | mA | | | 500 |
| Reverse voltage | V | | | 1 |
| Reverse current | mA | | | -0.1 |
| Forward voltage (@ 350 mA) | V | | 3.7 | 4.0 |
| LED junction temperature | °C | | | 150 |

## FLUX CHARACTERISTICS - COOL WHITE ($T_J$ = 25 °C)

The following tables provide order codes for XLamp MX-3 LEDs. For a complete description of the order-code nomenclature, please consult the Bin and Order Code Formats section (page 14).

| Minimum Luminous Flux @ 350 mA | | Calculated Minimum Luminous Flux @ 300 mA* | Chromaticity Regions | Order Code | CCT |
|---|---|---|---|---|---|
| Group | Flux (lm) | Flux (lm) | | | |
| Q2 | 87.4 | 77 | 2C,2D,2U,2T,3A,3B,3C,3D,3R,3S,3T,3U,4A,4B,4R,4S | MX3AWT-A1-0000-000ADZ | 5000 K |
| | | | 3A,3B,3C,3D,4A,4B,4C,4D | MX3AWT-A1-0000-000AB1 | 4750 K |
| | | | 3A,3B,3C,3D | MX3AWT-A1-0000-000AE3 | 5000 K |
| | | | 3C,3D,4A,4B | MX3AWT-A1-0000-000AF4 | 4750 K |
| | | | 4A,4B,4C,4D | MX3AWT-A1-0000-000AE4 | 4500 K |
| | | | 4C,4D,5A1,5A2,5A3,5A4,5B1,5B2,5B3,5B4 | MX3AWT-A1-0000-000AF5 | 4300 K |
| Q3 | 93.9 | 82 | 0A,0B,0C,0D,0R,0S,0T,0U,1A,1B,1C,1D,1R,1S,1T,1U,2A,2B,2C,2D,2R,2S,2T,2U,3A,3B,3R,3S | MX3AWT-A1-0000-000B51 | 6500 K |
| | | | 1A,1B,1C,1D,1R,1S,1T,1U,2A,2B,2C,2D,2R,2S,2T,3A,3B,3S | MX3AWT-A1-0000-000B53 | 6000 K |
| | | | 1A,1B,1C,1D,2A,2B,2C,2D | MX3AWT-A1-0000-000B50 | 6000 K |
| | | | 2C,2D,2U,2T,3A,3B,3C,3D,3R,3S,3T,3U,4A,4B,4R,4S | MX3AWT-A1-0000-000BDZ | 5000 K |
| | | | 3A,3B,3C,3D,4A,4B,4C,4D | MX3AWT-A1-0000-000BB1 | 4750 K |
| | | | 3A,3B,3C,3D | MX3AWT-A1-0000-000BE3 | 5000 K |
| | | | 3C,3D,4A,4B | MX3AWT-A1-0000-000BF4 | 4750 K |
| | | | 4A,4B,4C,4D | MX3AWT-A1-0000-000BE4 | 4500 K |
| | | | 4C,4D,5A1,5A2,5A3,5A4,5B1,5B2,5B3,5B4 | MX3AWT-A1-0000-000BF5 | 4300 K |
| Q4 | 100 | 87 | 0A,0B,0C,0D,0R,0S,0T,0U,1A,1B,1C,1D,1R,1S,1T,1U,2A,2B,2C,2D,2R,2S,2T,2U,3A,3B,3R,3S | MX3AWT-A1-0000-000C51 | 6500 K |
| | | | 1A,1B,1C,1D,1R,1S,1T,1U,2A,2B,2C,2D,2R,2S,2T,3A,3B,3S | MX3AWT-A1-0000-000C53 | 6000 K |
| | | | 1A,1B,1C,1D,2A,2B,2C,2D | MX3AWT-A1-0000-000C50 | 6000 K |
| | | | 2C,2D,2U,2T,3A,3B,3C,3D,3R,3S,3T,3U,4A,4B,4R,4S | MX3AWT-A1-0000-000CDZ | 5000 K |
| | | | 3A,3B,3C,3D | MX3AWT-A1-0000-000CE3 | 5000 K |
| | | | 3C,3D,4A,4B | MX3AWT-A1-0000-000CF4 | 4750 K |
| | | | 4A,4B,4C,4D | MX3AWT-A1-0000-000CE4 | 4500 K |
| | | | 4C,4D,5A1,5A2,5A3,5A4,5B1,5B2,5B3,5B4 | MX3AWT-A1-0000-000CF5 | 4300 K |
| Q5 | 107 | 93.9 | 0A,0B,0C,0D,0R,0S,0T,0U,1A,1B,1C,1D,1R,1S,1T,1U,2A,2B,2C,2D,2R,2S,2T,2U,3A,3B,3R,3S | MX3AWT-A1-0000-000D51 | 6500 K |
| | | | 1A,1B,1C,1D,1R,1S,1T,1U,2A,2B,2C,2D,2R,2S,2T,3A,3B,3S | MX3AWT-A1-0000-000D53 | 6000 K |
| | | | 1A,1B,1C,1D,2A,2B,2C,2D | MX3AWT-A1-0000-000D50 | 6000 K |
| | | | 2C,2D,2U,2T,3A,3B,3C,3D,3R,3S,3T,3U,4A,4B,4R,4S | MX3AWT-A1-0000-000DDZ | 5000 K |
| | | | 3A,3B,3C,3D | MX3AWT-A1-0000-000DE3 | 5000 K |
| | | | 3C,3D,4A,4B | MX3AWT-A1-0000-000DF4 | 4750 K |
| | | | 4A,4B,4C,4D | MX3AWT-A1-0000-000DE4 | 4500 K |

Notes:

- Cree LED maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 16).
- XLamp MX-3 LED order codes specify only a minimum flux bin and not a maximum. LED 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.
- Typical CRI for Cool White (4300 K – 8300 K CCT) is 75.
- Typical CRI for Warm White (2600 K – 4300 K CCT) is 80.

* Calculated values for reference purposes only.

## FLUX CHARACTERISTICS - COOL WHITE ($T_J$ = 25 °C) - CONTINUED

| Minimum Luminous Flux @ 350 mA | | Calculated Minimum Luminous Flux @ 300 mA* | Chromaticity Regions | Order Code | CCT |
|---|---|---|---|---|---|
| Group | Flux (lm) | Flux (lm) | | | |
| R2 | 114 | 100 | 0A,0B,0C,0D,0R,0S,0T,0U,1A,1B,1C,1D,1R,1S,1T,1U,2A,2B,2C,2D,2R,2S,2T,2U,3A,3B,3R,3S | MX3AWT-A1-0000-000E51 | 6500 K |
| | | | 1A,1B,1C,1D,1R,1S,1T,1U,2A,2B,2C,2D,2R,2S,2T,3A,3B,3S | MX3AWT-A1-0000-000E53 | 6000 K |
| | | | 1A,1B,1C,1D,2A,2B,2C,2D | MX3AWT-A1-0000-000E50 | 6000 K |

## FLUX CHARACTERISTICS - WARM WHITE ($T_J$ = 25 °C)

| Minimum Luminous Flux @ 350 mA | | Calculated Minimum Luminous Flux @ 300 mA* | Chromaticity Regions | Order Code | CCT |
|---|---|---|---|---|---|
| Group | Flux (lm) | Flux (lm) | | | |
| P2 | 67.2 | 59 | 7C1,7C2,7C3,7C4,7D1,7D2,7D3,7D4,8A1,8A2,8A3,8A4,8B1,8B2,8B3,8B4 | MX6AWT-A1-0000-0007F8 | 2900 K |
| | | | 8A1,8A2,8A3,8A4,8B1,8B2,8B3,8B4,8C1,8C2,8C3,8C4,8D1,8D2,8D3,8D4 | MX6AWT-A1-0000-0007E8 | 2700 K |
| P3 | 73.9 | 65 | 5C1,5C2,5C3,5C4,5D1,5D2,5D3,5D4,6A1,6A2,6A3,6A4,6B1,6B2,6B3,6B4 | MX3AWT-A1-0000-0008F6 | 3700 K |
| | | | 6A1,6A2,6A3,6A4,6B1,6B2,6B3,6B4,6C1,6C2,6C3,6C4,6D1,6D2,6D3,6D4 | MX3AWT-A1-0000-0008E6 | 3500 K |
| | | | 6C1,6C2,6C3,6C4,6D1,6D2,6D3,6D4,7A1,7A2,7A3,7A4,7B1,7B2,7B3,7B4 | MX3AWT-A1-0000-0008F7 | 3200 K |
| | | | 7A1,7A2,7A3,7A4,7B1,7B2,7B3,7B4,7C(1,7C2,7C3,7C4,7D1,7D2,7D3,7D4 | MX3AWT-A1-0000-0008E7 | 3000 K |
| | | | 7C1,7C2,7C3,7C4,7D1,7D2,7D3,7D4,8A1,8A2,8A3,8A4,8B1,8B2,8B3,8B4 | MX3AWT-A1-0000-0008F8 | 2900 K |
| | | | 8A1,8A2,8A3,8A4,8B1,8B2,8B3,8B4,8C1,8C2,8C3,8C4,8D1,8D2,8D3,8D4 | MX3AWT-A1-0000-0008E8 | 2700 K |
| P4 | 80.6 | 70 | 5C1,5C2,5C3,5C4,5D1,5D2,5D3,5D4,6A1,6A2,6A3,6A4,6B1,6B2,6B3,6B4 | MX3AWT-A1-0000-0009F6 | 3700 K |
| | | | 6A1,6A2,6A3,6A4,6B1,6B2,6B3,6B4,6C1,6C2,6C3,6C4,6D1,6D2,6D3,6D4 | MX3AWT-A1-0000-0009E6 | 3500 K |
| | | | 6C1,6C2,6C3,6C4,6D1,6D2,6D3,6D4,7A1,7A2,7A3,7A4,7B1,7B2,7B3,7B4 | MX3AWT-A1-0000-0009F7 | 3200 K |
| | | | 7A1,7A2,7A3,7A4,7B1,7B2,7B3,7B4,7C1,7C2,7C3,7C4,7D1,7D2,7D3,7D4 | MX3AWT-A1-0000-0009E7 | 3000 K |
| | | | 7C1,7C2,7C3,7C4,7D1,7D2,7D3,7D4,8A1,8A2,8A3,8A4,8B1,8B2,8B3,8B4 | MX3AWT-A1-0000-0009F8 | 2900 K |
| | | | 8A1,8A2,8A3,8A4,8B1,8B2,8B3,8B4,8C1,8C2,8C3,8C4,8D1,8D2,8D3,8D4 | MX3AWT-A1-0000-0009E8 | 2700 K |
| Q2 | 87.4 | 76 | 4C,4D,5A1,5A2,5A3,5A4,5B1,5B2,5B3,5B4 | MX3AWT-A1-0000-000AF5 | 4300 K |
| | | | 5A1,5A2,5A3,5A4,5B1,5B2,5B3,5B4,5C1,5C2,5C3,5C4,5D1,5D2,5D3,5D4 | MX3AWT-A1-0000-000AE5 | 4000 K |
| | | | 5C1,5C2,5C3,5C4,5D1,5D2,5D3,5D4,6A1,6A2,6A3,6A4,6B1,6B2,6B3,6B4 | MX3AWT-A1-0000-000AF6 | 3700 K |
| | | | 6A1,6A2,6A3,6A4,6B1,6B2,6B3,6B4,6C1,6C2,6C3,6C4,6D1,6D2,6D3,6D4 | MX3AWT-A1-0000-000AE6 | 3500 K |
| | | | 6C1,6C2,6C3,6C4,6D1,6D2,6D3,6D4,7A1,7A2,7A3,7A4,7B1,7B2,7B3,7B4 | MX3AWT-A1-0000-000AF7 | 3200 K |
| | | | 7A1,7A2,7A3,7A4,7B1,7B2,7B3,7B4,7C1,7C2,7C3,7C4,7D1,7D2,7D3,7D4 | MX3AWT-A1-0000-000AE7 | 3000 K |
| | | | 7C1,7C2,7C3,7C4,7D1,7D2,7D3,7D4,8A1,8A2,8A3,8A4,8B1,8B2,8B3,8B4 | MX3AWT-A1-0000-000AF8 | 2900 K |
| | | | 8A1,8A2,8A3,8A4,8B1,8B2,8B3,8B4,8C1,8C2,8C3,8C4,8D1,8D2,8D3,8D4 | MX3AWT-A1-0000-000AE8 | 2700 K |

Notes:

- Cree LED maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 16).
- XLamp MX-3 LED order codes specify only a minimum flux bin and not a maximum. LED 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.
- Typical CRI for Cool White (4300 K – 8300 K CCT) is 75.
- Typical CRI for Warm White (2600 K – 4300 K CCT) is 80.

* Calculated values for reference purposes only.

## FLUX CHARACTERISTICS - WARM WHITE ($T_J$ = 25 °C) - CONTINUED

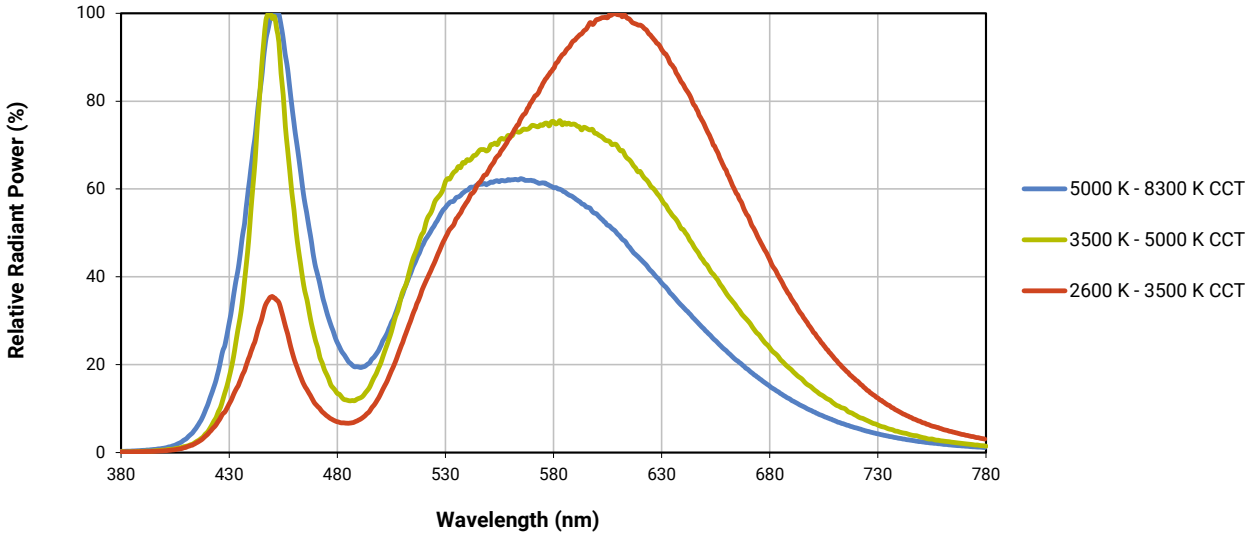
| Minimum Luminous Flux @ 350 mA | | Calculated Minimum Luminous Flux @ 300 mA* | Chromaticity Regions | Order Code | CCT |
|---|---|---|---|---|---|
| Group | Flux (lm) | Flux (lm) | | | |
| Q3 | 93.9 | 82 | 4C,4D,5A1,5A2,5A3,5A4,5B1,5B2,5B3,5B4 | MX3AWT-A1-0000-000BF5 | 4300 K |
| | | | 5A1,5A2,5A3,5A4,5B1,5B2,5B3,5B4,5C1,5C2,5C3,5C4,5D1,5D2,5D3,5D4 | MX3AWT-A1-0000-000BE5 | 4000 K |
| | | | 5C1,5C2,5C3,5C4,5D1,5D2,5D3,5D4,6A1,6A2,6A3,6A4,6B1,6B2,6B3,6B4 | MX3AWT-A1-0000-000BF6 | 3700 K |
| | | | 6A1,6A2,6A3,6A4,6B1,6B2,6B3,6B4,6C1,6C2,6C3,6C4,6D1,6D2,6D3,6D4 | MX3AWT-A1-0000-000BE6 | 3500 K |
| | | | 6C1,6C2,6C3,6C4,6D1,6D2,6D3,6D4,7A1,7A2,7A3,7A4,7B1,7B2,7B3,7B4 | MX3AWT-A1-0000-000BF7 | 3200 K |
| | | | 7A1,7A2,7A3,7A4,7B1,7B2,7B3,7B4,7C1,7C2,7C3,7C4,7D1,7D2,7D3,7D4 | MX3AWT-A1-0000-000BE7 | 3000 K |
| Q4 | 100 | 87 | 4C,4D,5A1,5A2,5A3,5A4,5B1,5B2,5B3,5B4 | MX3AWT-A1-0000-000CF5 | 4300 K |
| | | | 5A1,5A2,5A3,5A4,5B1,5B2,5B3,5B4,5C1,5C2,5C3,5C4,5D1,5D2,5D3,5D4 | MX3AWT-A1-0000-000CE5 | 4000 K |

Notes:

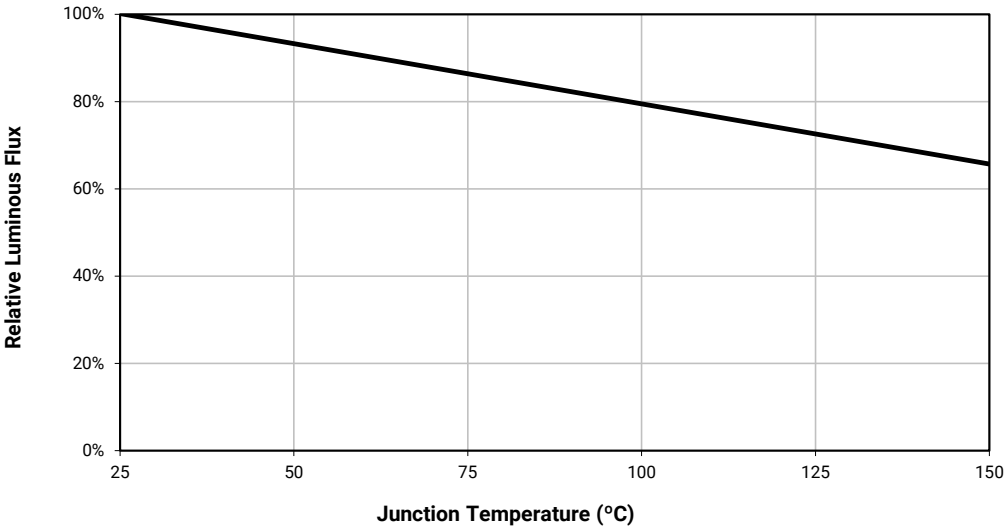
- Cree LED maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 16).
- XLamp MX-3 LED order codes specify only a minimum flux bin and not a maximum. LED Cree may ship reels in flux bins 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.
- Typical CRI for Cool White (4300 K – 8300 K CCT) is 75.
- Typical CRI for Warm White (2600 K – 4300 K CCT) is 80.

* Calculated values for reference purposes only.

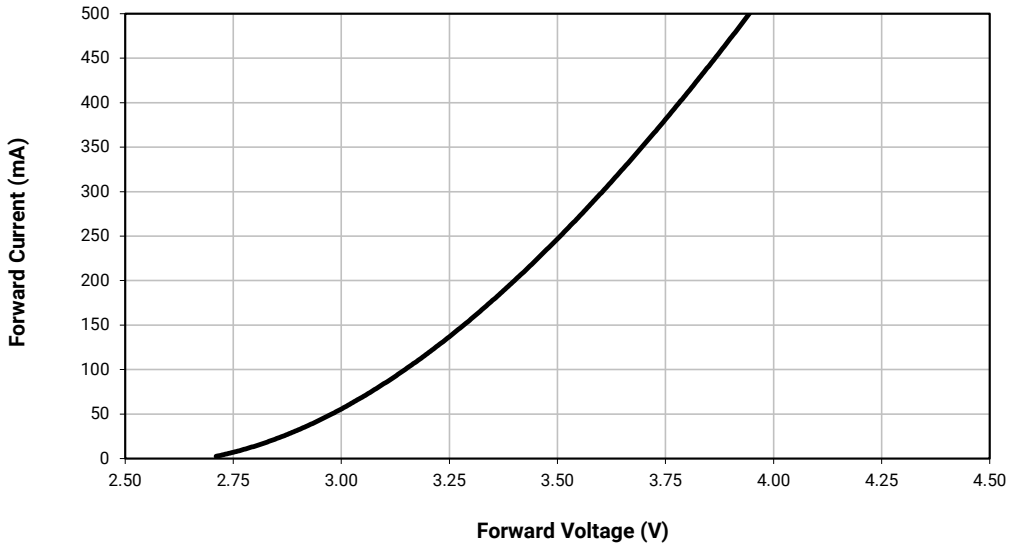
## RELATIVE SPECTRAL POWER DISTRIBUTION



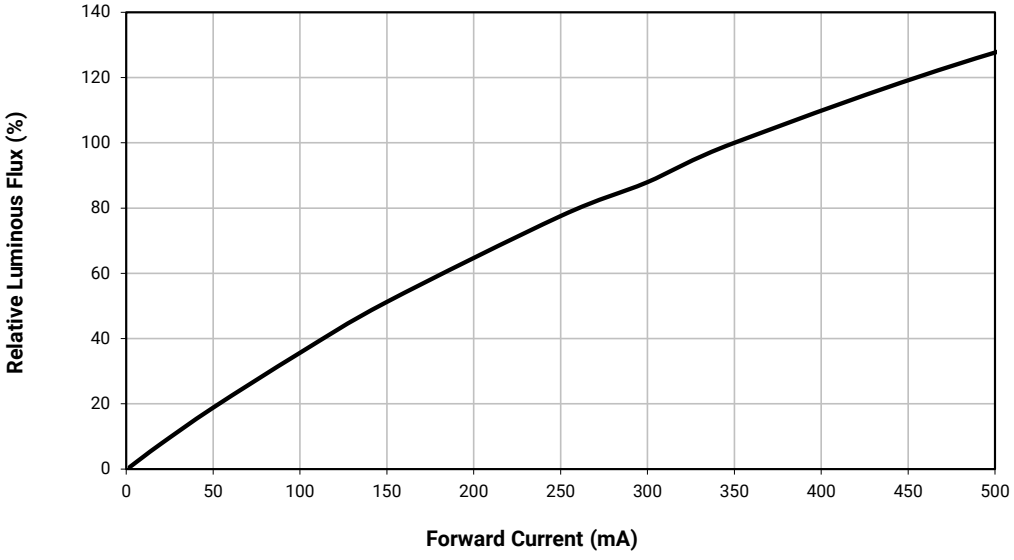

## RELATIVE FLUX VS. JUNCTION TEMPERATURE ($I_F$ = 350 mA)



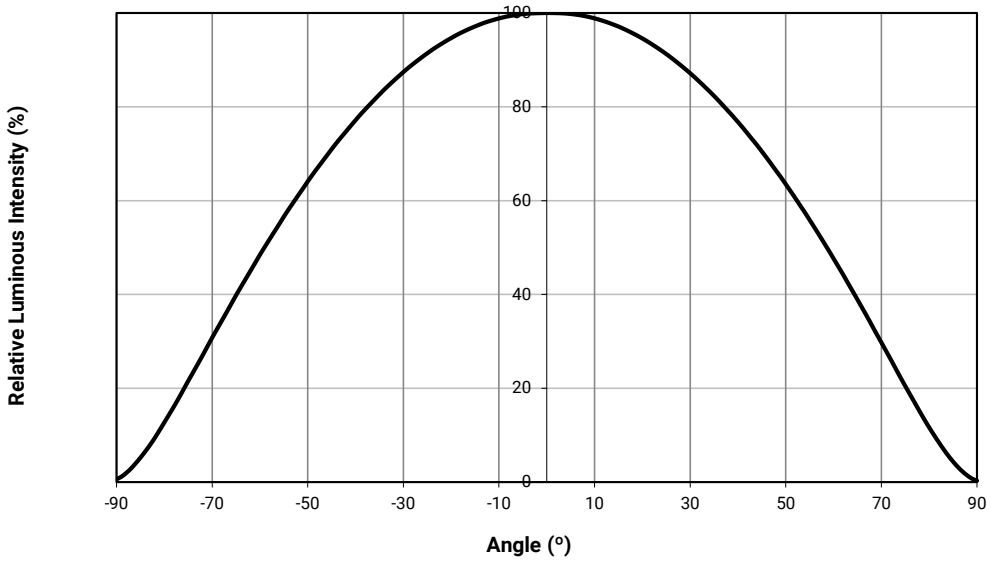
## ELECTRICAL CHARACTERISTICS ($T_J$ = 25 °C)




## RELATIVE FLUX VS. CURRENT ($T_J$ = 25 °C)

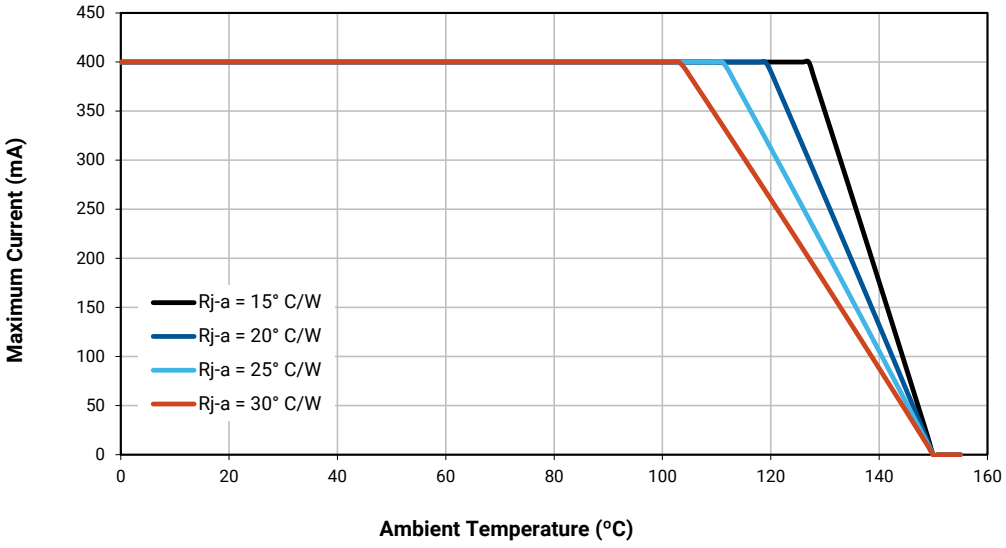


## TYPICAL SPATIAL DISTRIBUTION




## 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.



## PERFORMANCE GROUPS - BRIGHTNESS

MX-3 LEDs are tested for luminous flux and placed into one of the following luminous-flux groups:

| Group Code | Minimum Luminous Flux (lm) | Maximum Luminous Flux (lm) |
|---|---|---|
| P2 | 67.2 | 73.9 |
| P3 | 73.9 | 80.6 |
| P4 | 80.6 | 87.4 |
| Q2 | 87.4 | 93.9 |
| Q3 | 93.9 | 100 |
| Q4 | 100 | 107 |
| Q5 | 107 | 114 |
| R2 | 114 | 122 |
| R3 | 122 | 130 |

## PERFORMANCE GROUPS - FORWARD VOLTAGE

| MX-3 Group Code | Minimum Voltage @ 350 mA | Maximum Voltage @ 350 mA |
|---|---|---|
| D | 2.8 | 3.2 |
| E | 3.2 | 3.6 |
| F | 3.6 | 4.0 |
| 0 | No $V_F$ Binning | |

## PERFORMANCE GROUPS - CHROMATICITY

| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0A | 0.2950 | 0.2970 | 0B | 0.2920 | 0.3060 | 0C | 0.2984 | 0.3133 | 0D | 0.2984 | 0.3133 |
| | 0.2920 | 0.3060 | | 0.2895 | 0.3135 | | 0.2962 | 0.3220 | | 0.3048 | 0.3207 |
| | 0.2984 | 0.3133 | | 0.2962 | 0.3220 | | 0.3028 | 0.3304 | | 0.3068 | 0.3113 |
| | 0.3009 | 0.3042 | | 0.2984 | 0.3133 | | 0.3048 | 0.3207 | | 0.3009 | 0.3042 |
| 0R | 0.2980 | 0.2880 | 0S | 0.2895 | 0.3135 | 0T | 0.2962 | 0.3220 | 0U | 0.3037 | 0.2937 |
| | 0.2950 | 0.2970 | | 0.2870 | 0.3210 | | 0.2937 | 0.3312 | | 0.3009 | 0.3042 |
| | 0.3009 | 0.3042 | | 0.2937 | 0.3312 | | 0.3005 | 0.3415 | | 0.3068 | 0.3113 |
| | 0.3037 | 0.2937 | | 0.2962 | 0.3220 | | 0.3028 | 0.3304 | | 0.3093 | 0.2993 |
| 1A | 0.3048 | 0.3207 | 1B | 0.3028 | 0.3304 | 1C | 0.3115 | 0.3391 | 1D | 0.3130 | 0.3290 |
| | 0.3130 | 0.3290 | | 0.3115 | 0.3391 | | 0.3205 | 0.3481 | | 0.3213 | 0.3373 |
| | 0.3144 | 0.3186 | | 0.3130 | 0.3290 | | 0.3213 | 0.3373 | | 0.3221 | 0.3261 |
| | 0.3068 | 0.3113 | | 0.3048 | 0.3207 | | 0.3130 | 0.3290 | | 0.3144 | 0.3186 |
| 1R | 0.3068 | 0.3113 | 1S | 0.3005 | 0.3415 | 1T | 0.3099 | 0.3509 | 1U | 0.3144 | 0.3186 |
| | 0.3144 | 0.3186 | | 0.3099 | 0.3509 | | 0.3196 | 0.3602 | | 0.3221 | 0.3261 |
| | 0.3161 | 0.3059 | | 0.3115 | 0.3391 | | 0.3205 | 0.3481 | | 0.3231 | 0.3120 |
| | 0.3093 | 0.2993 | | 0.3028 | 0.3304 | | 0.3115 | 0.3391 | | 0.3161 | 0.3059 |
| 2A | 0.3215 | 0.3350 | 2B | 0.3207 | 0.3462 | 2C | 0.3290 | 0.3538 | 2D | 0.3290 | 0.3417 |
| | 0.3290 | 0.3417 | | 0.3290 | 0.3538 | | 0.3376 | 0.3616 | | 0.3371 | 0.3490 |
| | 0.3290 | 0.3300 | | 0.3290 | 0.3417 | | 0.3371 | 0.3490 | | 0.3366 | 0.3369 |
| | 0.3222 | 0.3243 | | 0.3215 | 0.3350 | | 0.3290 | 0.3417 | | 0.3290 | 0.3300 |
| 2R | 0.3222 | 0.3243 | 2S | 0.3196 | 0.3602 | 2T | 0.3290 | 0.3690 | 2U | 0.3290 | 0.3300 |
| | 0.3290 | 0.3300 | | 0.3290 | 0.3690 | | 0.3381 | 0.3762 | | 0.3366 | 0.3369 |
| | 0.3290 | 0.3180 | | 0.3290 | 0.3538 | | 0.3376 | 0.3616 | | 0.3361 | 0.3245 |
| | 0.3231 | 0.3120 | | 0.3207 | 0.3462 | | 0.3290 | 0.3538 | | 0.3290 | 0.3180 |
| 3A | 0.3371 | 0.3490 | 3B | 0.3376 | 0.3616 | 3C | 0.3463 | 0.3687 | 3D | 0.3451 | 0.3554 |
| | 0.3451 | 0.3554 | | 0.3463 | 0.3687 | | 0.3551 | 0.3760 | | 0.3533 | 0.3620 |
| | 0.3440 | 0.3427 | | 0.3451 | 0.3554 | | 0.3533 | 0.3620 | | 0.3515 | 0.3487 |
| | 0.3366 | 0.3369 | | 0.3371 | 0.3490 | | 0.3451 | 0.3554 | | 0.3440 | 0.3427 |
| 3R | 0.3366 | 0.3369 | 3S | 0.3381 | 0.3762 | 3T | 0.3480 | 0.3840 | 3U | 0.3440 | 0.3428 |
| | 0.3440 | 0.3428 | | 0.3480 | 0.3840 | | 0.3571 | 0.3907 | | 0.3515 | 0.3487 |
| | 0.3429 | 0.3307 | | 0.3463 | 0.3687 | | 0.3551 | 0.3760 | | 0.3495 | 0.3339 |
| | 0.3361 | 0.3245 | | 0.3376 | 0.3616 | | 0.3463 | 0.3687 | | 0.3429 | 0.3307 |
| 4A | 0.3530 | 0.3597 | 4B | 0.3548 | 0.3736 | 4C | 0.3641 | 0.3804 | 4D | 0.3615 | 0.3659 |
| | 0.3615 | 0.3659 | | 0.3641 | 0.3804 | | 0.3736 | 0.3874 | | 0.3702 | 0.3722 |
| | 0.3590 | 0.3521 | | 0.3615 | 0.3659 | | 0.3702 | 0.3722 | | 0.3670 | 0.3578 |
| | 0.3512 | 0.3465 | | 0.3530 | 0.3597 | | 0.3615 | 0.3659 | | 0.3590 | 0.3521 |

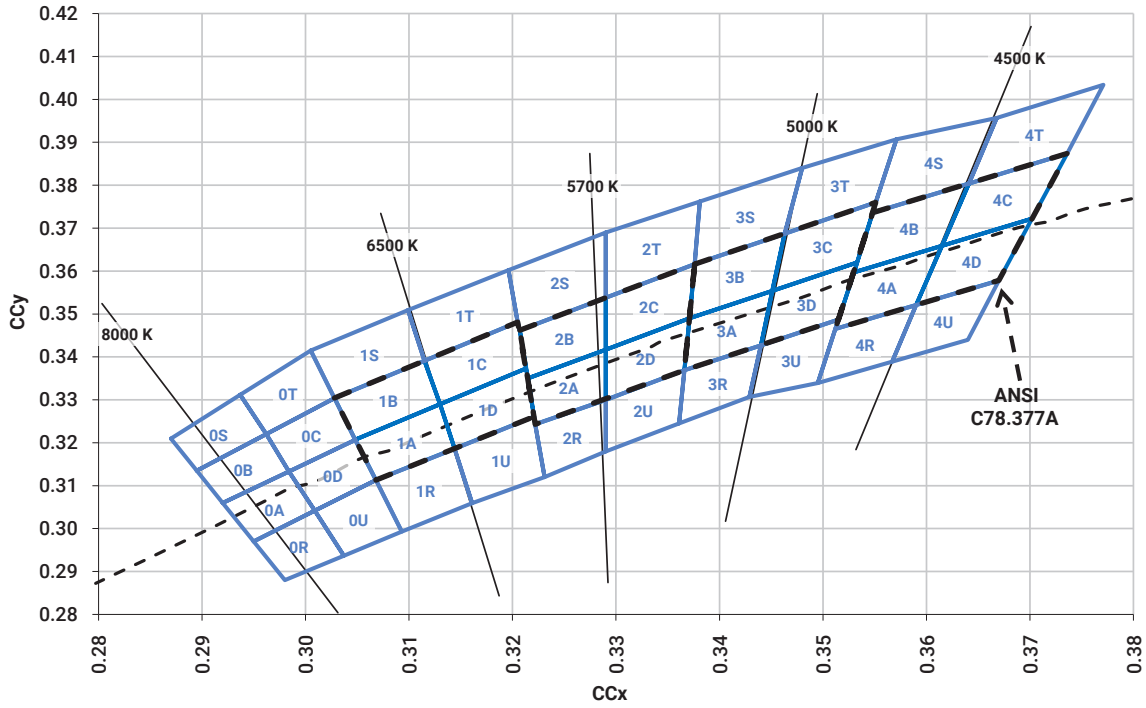
## PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

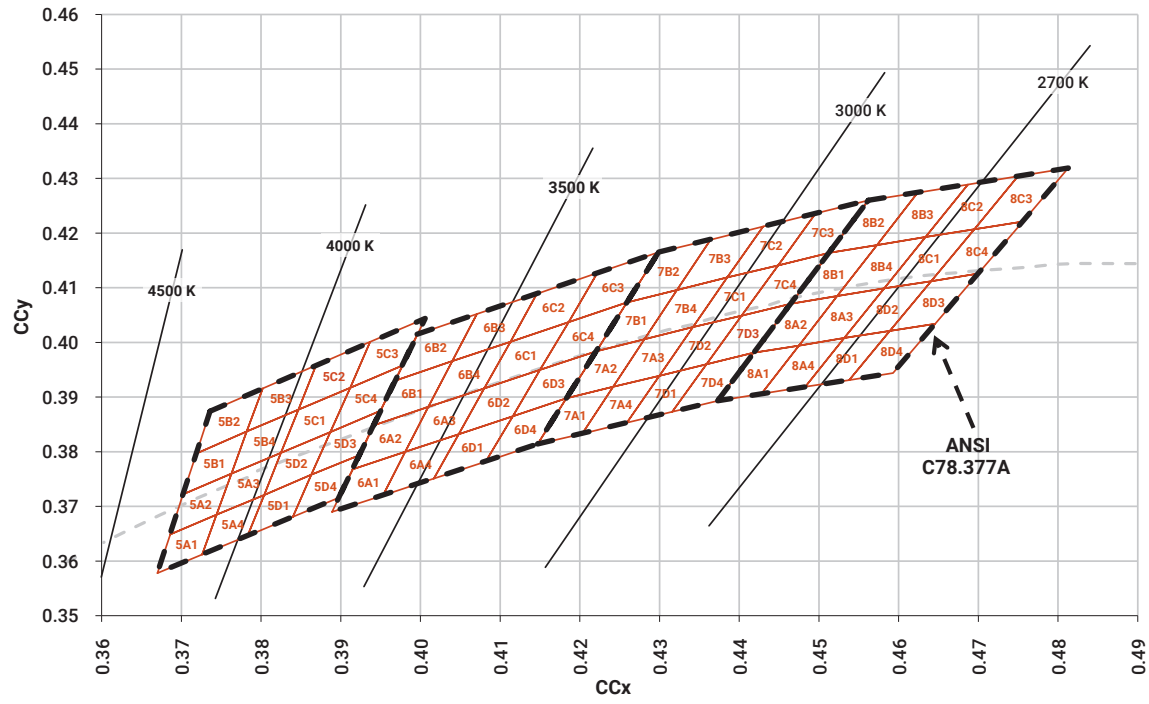
| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4R | 0.3512 | 0.3465 | 4S | 0.3571 | 0.3907 | 4T | 0.3668 | 0.3957 | 4U | 0.3590 | 0.3521 |
| | 0.3590 | 0.3521 | | 0.3668 | 0.3957 | | 0.3771 | 0.4034 | | 0.3670 | 0.3578 |
| | 0.3567 | 0.3389 | | 0.3641 | 0.3804 | | 0.3736 | 0.3874 | | 0.3640 | 0.3440 |
| | 0.3495 | 0.3339 | | 0.3548 | 0.3736 | | 0.3641 | 0.3804 | | 0.3567 | 0.3389 |
| 5A1 | 0.3670 | 0.3578 | 5A2 | 0.3686 | 0.3649 | 5A3 | 0.3744 | 0.3685 | 5A4 | 0.3726 | 0.3612 |
| | 0.3686 | 0.3649 | | 0.3702 | 0.3722 | | 0.3763 | 0.3760 | | 0.3744 | 0.3685 |
| | 0.3744 | 0.3685 | | 0.3763 | 0.3760 | | 0.3825 | 0.3798 | | 0.3804 | 0.3721 |
| | 0.3726 | 0.3612 | | 0.3744 | 0.3685 | | 0.3804 | 0.3721 | | 0.3783 | 0.3646 |
| 5B1 | 0.3702 | 0.3722 | 5B2 | 0.3719 | 0.3797 | 5B3 | 0.3782 | 0.3837 | 5B4 | 0.3763 | 0.3760 |
| | 0.3719 | 0.3797 | | 0.3736 | 0.3874 | | 0.3802 | 0.3916 | | 0.3782 | 0.3837 |
| | 0.3782 | 0.3837 | | 0.3802 | 0.3916 | | 0.3869 | 0.3958 | | 0.3847 | 0.3877 |
| | 0.3763 | 0.3760 | | 0.3782 | 0.3837 | | 0.3847 | 0.3877 | | 0.3825 | 0.3798 |
| 5C1 | 0.3825 | 0.3798 | 5C2 | 0.3847 | 0.3877 | 5C3 | 0.3912 | 0.3917 | 5C4 | 0.3887 | 0.3836 |
| | 0.3847 | 0.3877 | | 0.3869 | 0.3958 | | 0.3937 | 0.4001 | | 0.3912 | 0.3917 |
| | 0.3912 | 0.3917 | | 0.3937 | 0.4001 | | 0.4006 | 0.4044 | | 0.3978 | 0.3958 |
| | 0.3887 | 0.3836 | | 0.3912 | 0.3917 | | 0.3978 | 0.3958 | | 0.3950 | 0.3875 |
| 5D1 | 0.3783 | 0.3646 | 5D2 | 0.3804 | 0.3721 | 5D3 | 0.3863 | 0.3758 | 5D4 | 0.3840 | 0.3681 |
| | 0.3804 | 0.3721 | | 0.3825 | 0.3798 | | 0.3887 | 0.3836 | | 0.3863 | 0.3758 |
| | 0.3863 | 0.3758 | | 0.3887 | 0.3836 | | 0.3950 | 0.3875 | | 0.3924 | 0.3794 |
| | 0.3840 | 0.3681 | | 0.3863 | 0.3758 | | 0.3924 | 0.3794 | | 0.3898 | 0.3716 |
| 6A1 | 0.3889 | 0.3690 | 6A2 | 0.3915 | 0.3768 | 6A3 | 0.3981 | 0.3800 | 6A4 | 0.3953 | 0.3720 |
| | 0.3915 | 0.3768 | | 0.3941 | 0.3848 | | 0.4010 | 0.3882 | | 0.3981 | 0.3800 |
| | 0.3981 | 0.3800 | | 0.4010 | 0.3882 | | 0.4080 | 0.3916 | | 0.4048 | 0.3832 |
| | 0.3953 | 0.3720 | | 0.3981 | 0.3800 | | 0.4048 | 0.3832 | | 0.4017 | 0.3751 |
| 6B1 | 0.3941 | 0.3848 | 6B2 | 0.3968 | 0.3930 | 6B3 | 0.4040 | 0.3966 | 6B4 | 0.4010 | 0.3882 |
| | 0.3968 | 0.3930 | | 0.3996 | 0.4015 | | 0.4071 | 0.4052 | | 0.4040 | 0.3966 |
| | 0.4040 | 0.3966 | | 0.4071 | 0.4052 | | 0.4146 | 0.4089 | | 0.4113 | 0.4001 |
| | 0.4010 | 0.3882 | | 0.4040 | 0.3966 | | 0.4113 | 0.4001 | | 0.4080 | 0.3916 |
| 6C1 | 0.4080 | 0.3916 | 6C2 | 0.4113 | 0.4001 | 6C3 | 0.4186 | 0.4037 | 6C4 | 0.4150 | 0.3950 |
| | 0.4113 | 0.4001 | | 0.4146 | 0.4089 | | 0.4222 | 0.4127 | | 0.4186 | 0.4037 |
| | 0.4186 | 0.4037 | | 0.4222 | 0.4127 | | 0.4299 | 0.4165 | | 0.4259 | 0.4073 |
| | 0.4150 | 0.3950 | | 0.4186 | 0.4037 | | 0.4259 | 0.4073 | | 0.4221 | 0.3984 |
| 6D1 | 0.4017 | 0.3751 | 6D2 | 0.4048 | 0.3832 | 6D3 | 0.4116 | 0.3865 | 6D4 | 0.4082 | 0.3782 |
| | 0.4048 | 0.3832 | | 0.4080 | 0.3916 | | 0.4150 | 0.3950 | | 0.4116 | 0.3865 |
| | 0.4116 | 0.3865 | | 0.4150 | 0.3950 | | 0.4221 | 0.3984 | | 0.4183 | 0.3898 |
| | 0.4082 | 0.3782 | | 0.4116 | 0.3865 | | 0.4183 | 0.3898 | | 0.4147 | 0.3814 |
| 7A1 | 0.4147 | 0.3814 | 7A2 | 0.4183 | 0.3898 | 7A3 | 0.4242 | 0.3919 | 7A4 | 0.4203 | 0.3833 |
| | 0.4183 | 0.3898 | | 0.4221 | 0.3984 | | 0.4281 | 0.4006 | | 0.4242 | 0.3919 |
| | 0.4242 | 0.3919 | | 0.4281 | 0.4006 | | 0.4342 | 0.4028 | | 0.4300 | 0.3939 |
| | 0.4203 | 0.3833 | | 0.4242 | 0.3919 | | 0.4300 | 0.3939 | | 0.4259 | 0.3853 |

## PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7B1 | 0.4221 | 0.3984 | 7B2 | 0.4259 | 0.4073 | 7B3 | 0.4322 | 0.4096 | 7B4 | 0.4281 | 0.4006 |
| | 0.4259 | 0.4073 | | 0.4299 | 0.4165 | | 0.4364 | 0.4188 | | 0.4322 | 0.4096 |
| | 0.4322 | 0.4096 | | 0.4364 | 0.4188 | | 0.4430 | 0.4212 | | 0.4385 | 0.4119 |
| | 0.4281 | 0.4006 | | 0.4322 | 0.4096 | | 0.4385 | 0.4119 | | 0.4342 | 0.4028 |
| 7C1 | 0.4342 | 0.4028 | 7C2 | 0.4385 | 0.4119 | 7C3 | 0.4449 | 0.4141 | 7C4 | 0.4403 | 0.4049 |
| | 0.4385 | 0.4119 | | 0.4430 | 0.4212 | | 0.4496 | 0.4236 | | 0.4449 | 0.4141 |
| | 0.4449 | 0.4141 | | 0.4496 | 0.4236 | | 0.4562 | 0.4260 | | 0.4513 | 0.4164 |
| | 0.4403 | 0.4049 | | 0.4449 | 0.4141 | | 0.4513 | 0.4164 | | 0.4465 | 0.4071 |
| 7D1 | 0.4259 | 0.3853 | 7D2 | 0.4300 | 0.3939 | 7D3 | 0.4359 | 0.3960 | 7D4 | 0.4316 | 0.3873 |
| | 0.4300 | 0.3939 | | 0.4342 | 0.4028 | | 0.4403 | 0.4049 | | 0.4359 | 0.3960 |
| | 0.4359 | 0.3960 | | 0.4403 | 0.4049 | | 0.4465 | 0.4071 | | 0.4418 | 0.3981 |
| | 0.4316 | 0.3873 | | 0.4359 | 0.3960 | | 0.4418 | 0.3981 | | 0.4373 | 0.3893 |
| 8A1 | 0.4373 | 0.3893 | 8A2 | 0.4418 | 0.3981 | 8A3 | 0.4475 | 0.3994 | 8A4 | 0.4428 | 0.3906 |
| | 0.4418 | 0.3981 | | 0.4465 | 0.4071 | | 0.4523 | 0.4085 | | 0.4475 | 0.3994 |
| | 0.4475 | 0.3994 | | 0.4523 | 0.4085 | | 0.4582 | 0.4099 | | 0.4532 | 0.4008 |
| | 0.4428 | 0.3906 | | 0.4475 | 0.3994 | | 0.4532 | 0.4008 | | 0.4483 | 0.3919 |
| 8B1 | 0.4465 | 0.4071 | 8B2 | 0.4513 | 0.4164 | 8B3 | 0.4573 | 0.4178 | 8B4 | 0.4523 | 0.4085 |
| | 0.4513 | 0.4164 | | 0.4562 | 0.4260 | | 0.4624 | 0.4274 | | 0.4573 | 0.4178 |
| | 0.4573 | 0.4178 | | 0.4624 | 0.4274 | | 0.4687 | 0.4289 | | 0.4634 | 0.4193 |
| | 0.4523 | 0.4085 | | 0.4573 | 0.4178 | | 0.4634 | 0.4193 | | 0.4582 | 0.4099 |
| 8C1 | 0.4582 | 0.4099 | 8C2 | 0.4634 | 0.4193 | 8C3 | 0.4695 | 0.4207 | 8C4 | 0.4641 | 0.4112 |
| | 0.4634 | 0.4193 | | 0.4687 | 0.4289 | | 0.4750 | 0.4304 | | 0.4695 | 0.4207 |
| | 0.4695 | 0.4207 | | 0.4750 | 0.4304 | | 0.4813 | 0.4319 | | 0.4756 | 0.4221 |
| | 0.4641 | 0.4112 | | 0.4695 | 0.4207 | | 0.4756 | 0.4221 | | 0.4700 | 0.4126 |
| 8D1 | 0.4483 | 0.3919 | 8D2 | 0.4532 | 0.4008 | 8D3 | 0.4589 | 0.4021 | 8D4 | 0.4538 | 0.3931 |
| | 0.4532 | 0.4008 | | 0.4582 | 0.4099 | | 0.4641 | 0.4112 | | 0.4589 | 0.4021 |
| | 0.4589 | 0.4021 | | 0.4641 | 0.4112 | | 0.4700 | 0.4126 | | 0.4646 | 0.4034 |
| | 0.4538 | 0.3931 | | 0.4589 | 0.4021 | | 0.4646 | 0.4034 | | 0.4593 | 0.3944 |

## STANDARD CHROMATICITY REGIONS PLOTTED ON THE 1931 CIE CURVE

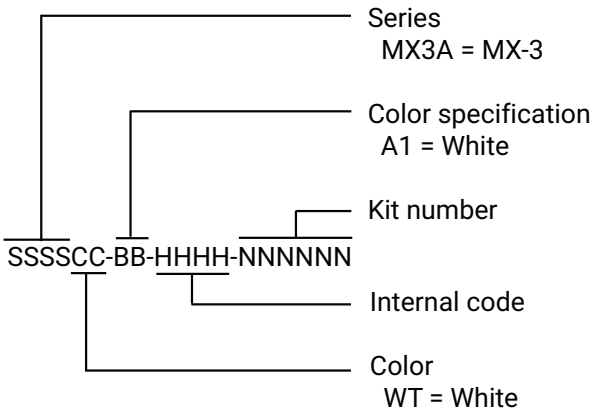


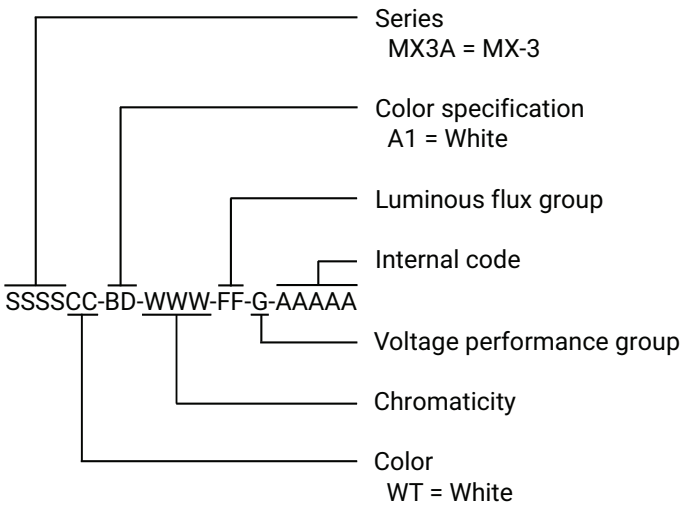
## BIN AND ORDER-CODE FORMATS

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

**Order Code**



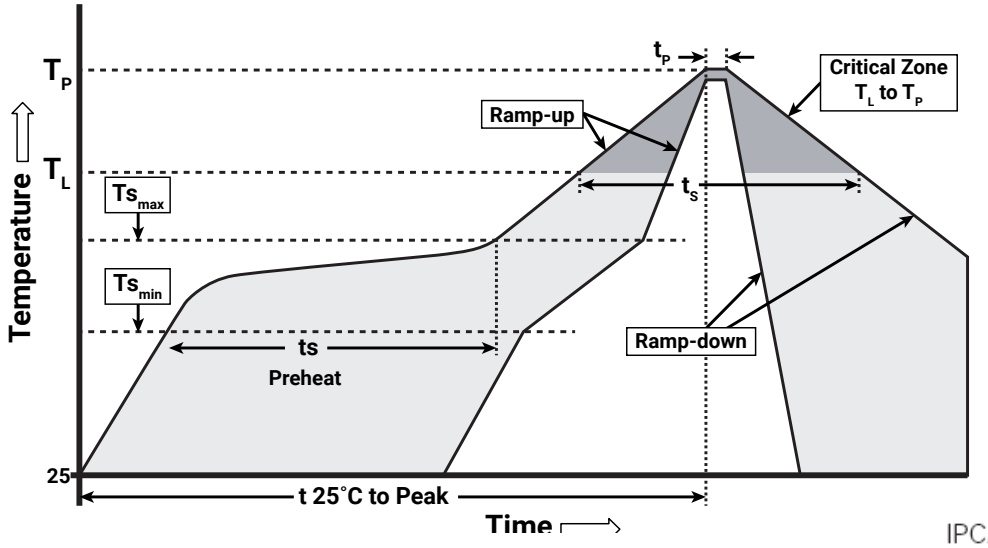

**Bin Code**



## REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp MX-3 LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline, Cree LED recommends that users follow the recommended soldering profile provided by the manufacturer of the solder paste used, and therefore it is the lamp or luminaire manufacturer's responsibility to determine applicable soldering requirements.

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 ($Ts_{max}$ to $T_p$) | 1.2 °C/second |
| Preheat: Temperature Min ($Ts_{min}$) | 120 °C |
| Preheat: Temperature Max ($Ts_{max}$) | 170 °C |
| Preheat: Time ($ts_{min}$ to $ts_{max}$) | 65-150 seconds |
| Time Maintained Above: Temperature ($T_L$) | 217 °C |
| Time Maintained Above: Time ($t_L$) | 45-90 seconds |
| Peak/Classification Temperature (Tp) | 235 - 245 °C |
| Time Within 5 °C of Actual Peak Temperature (tp) | 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 LED'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 or provided as specifications.

**Pre-Release Qualification Testing**

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

**Lumen Maintenance**

Cree LED 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 LED'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 LED recommends keeping XLamp MX-3 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 MX-3 LEDs should be handled and stored as MSL 2a per JEDEC J-STD-033, meaning they have limited exposure time before damage to the LED may occur during the soldering operation. The table on the right specifies the maximum exposure time in days depending on temperature and humidity conditions. LEDs with exposure time longer than the specified maximums 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 |

**Baking Conditions**

It is not necessary to bake all XLamp MX-3 LEDs. Only the LEDs that meet all of the following criteria must be baked:

1. LEDs that have been removed from the original MBP.
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 70 °C for 24 hours. LEDs may be baked on the original reels. Remove LEDs from the MBP before baking. Do not bake parts at temperatures higher than 70 °C. This baking operation resets the exposure time as defined in the Moisture Sensitivity section above.

## NOTES - CONTINUED

**Storage Conditions**

XLamp MX-3 LEDs that have been removed from the original MBP 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 °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° and the RH at no greater than 60%.
- For short-term store only: LEDs can be resealed in the original MBP 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 MX-3 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 LED representative or from the Product Ecology section of the Cree LED 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 LED 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**

This product meets the requirements to be considered a UL Recognized Component with Level 4 enclosure consideration. The LED package or a portion thereof has been investigated as a fire and electrical enclosure per ANSI/UL 8750.

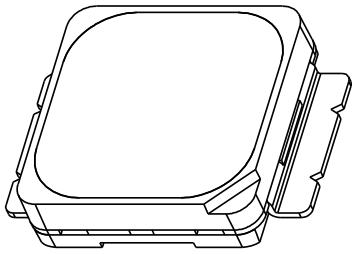
**Vision Advisory**

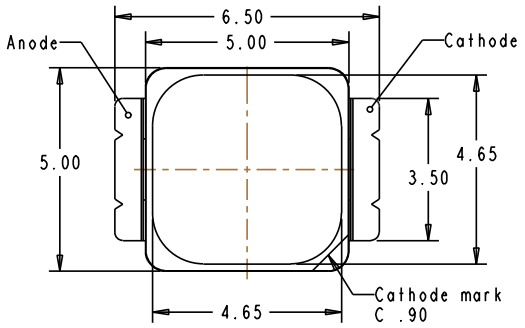
WARNING: Do not look at an exposed lamp in operation. Eye injury can result. For more information about LEDs and eye safety, please refer to the LED Eye Safety application note.

## MECHANICAL DIMENSIONS

All measurements are ±.13 mm unless otherwise indicated.

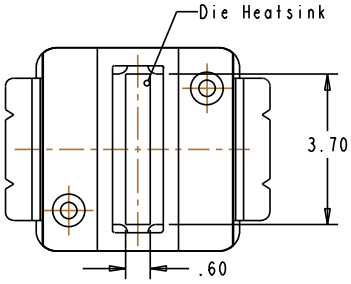
**Top View**

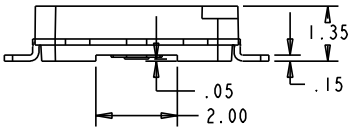




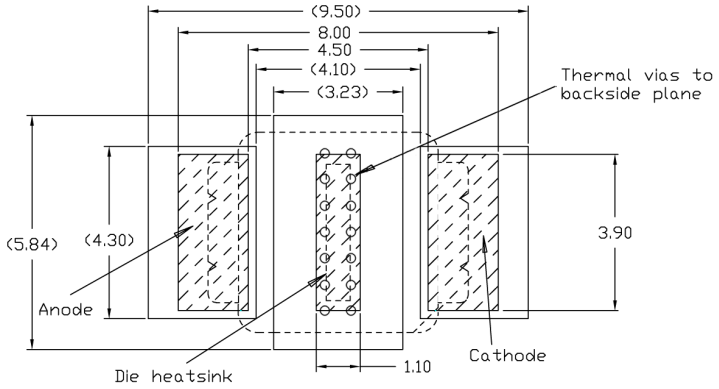

**Top View**

**Bottom View**

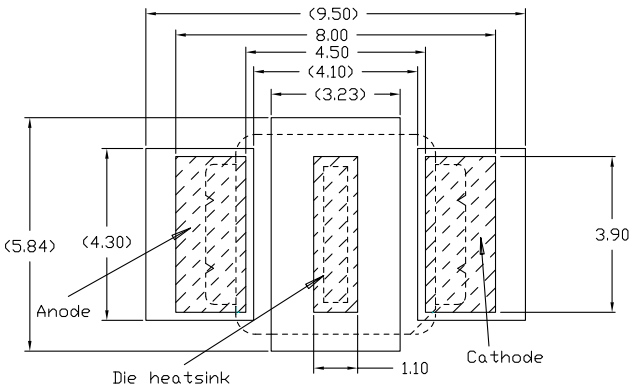


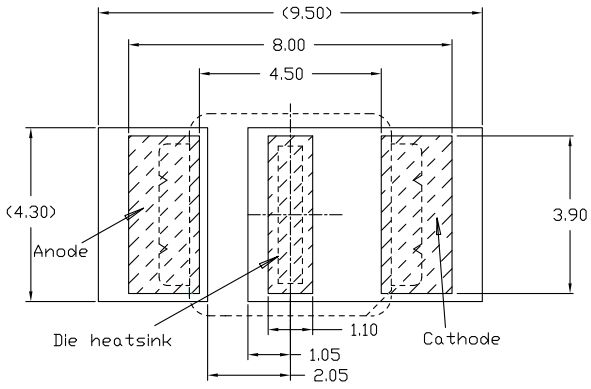

**Side View**




**Recommended FR4 Solder Pad**




**Recommended MCPCB Solder Pad**

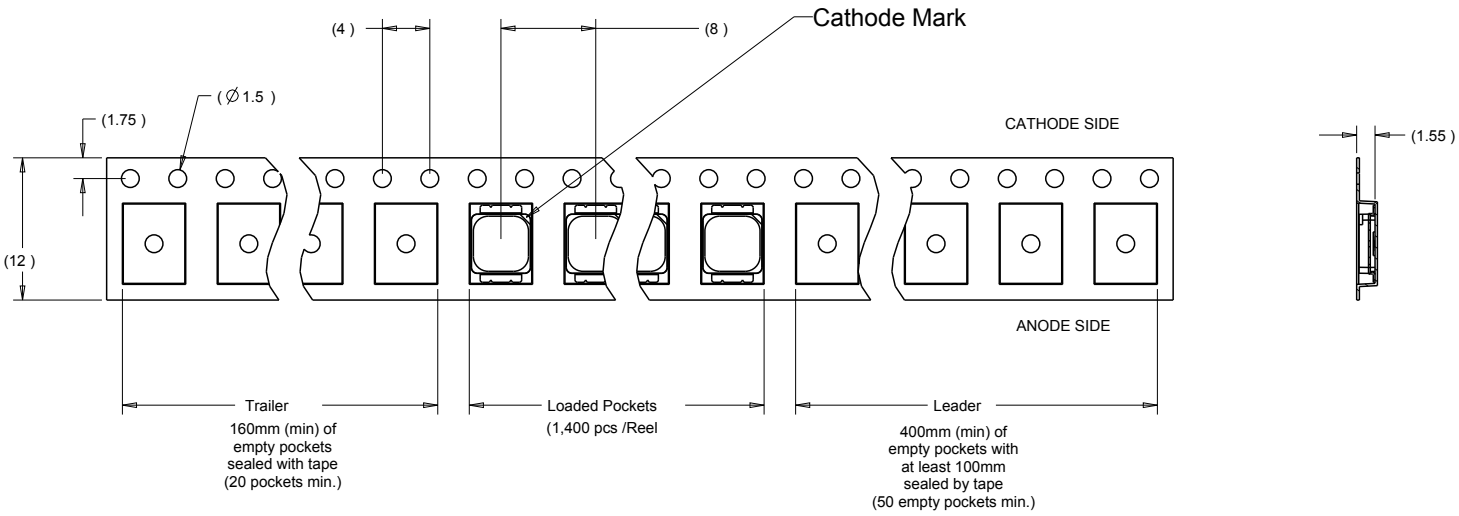


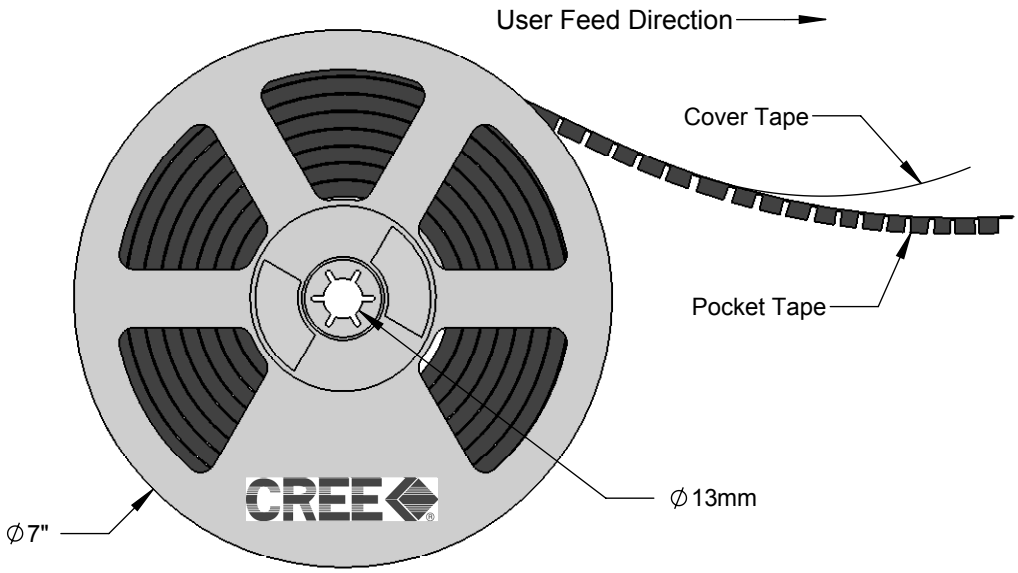

**Alternative Solder Pad**

## TAPE AND REEL

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

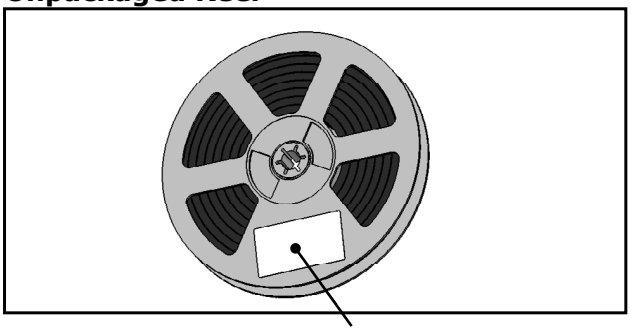
Except as noted, all dimensions in mm.



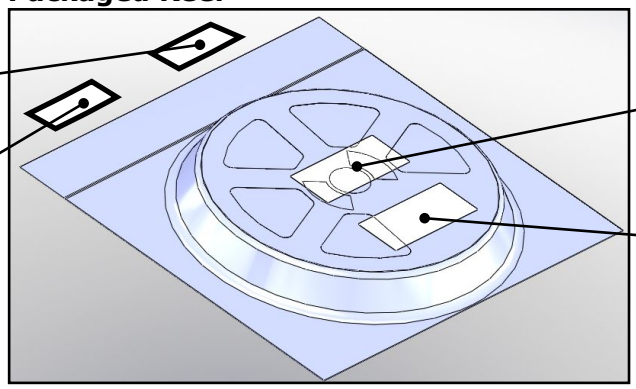



## PACKAGING

**Unpackaged Reel**




**Packaged Reel**




**Boxed Reel**