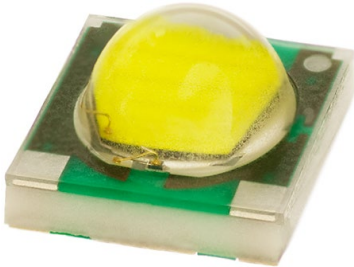


## Cree® XLamp® XP-G LEDs



### PRODUCT DESCRIPTION

The XLamp® XP-G LED delivers unprecedented levels of light output and efficacy for a single die LED. The XLamp XP-G LED continues Cree's history of innovation in LEDs for lighting applications with wide viewing angle, symmetrical package, unlimited floor life and electrically neutral thermal path.

XLamp XP-G LEDs are the ideal choice for lighting applications where high light output and maximum efficacy are required, such as LED light bulbs, outdoor lighting, portable lighting, indoor lighting and solar-powered lighting.

### FEATURES

- Available in white, outdoor white and 80-CRI, 85-CRI and 90-CRI white
- ANSI-compatible chromaticity bins
- Maximum drive current: 1500 mA
- Low thermal resistance: 4 °C/W
- Wide viewing angle: 125°
- Unlimited floor life at  $\leq 30\text{ °C}/85\%\text{ RH}$
- Reflow solderable - JEDEC J-STD-020C
- Electrically neutral thermal path
- RoHS and REACH compliant
- UL® recognized component (E349212)

### TABLE OF CONTENTS

|                                                                                                 |    |
|-------------------------------------------------------------------------------------------------|----|
| Characteristics .....                                                                           | 2  |
| Flux Characteristics .....                                                                      | 3  |
| Relative Spectral Power Distribution .....                                                      | 7  |
| Relative Flux vs. Junction Temperature.....                                                     | 7  |
| Electrical Characteristics.....                                                                 | 8  |
| Relative Flux vs. Current .....                                                                 | 8  |
| Relative Chromaticity vs Current and Temperature .....                                          | 9  |
| Typical Spatial Distribution.....                                                               | 10 |
| Thermal Design.....                                                                             | 10 |
| Performance Groups – Luminous Flux...                                                           | 11 |
| Performance Groups – Chromaticity.....                                                          | 12 |
| Cree's Standard Chromaticity Regions Plotted on the 1931 CIE Curve .....                        | 15 |
| Cree's Standard Cool White Kits Plotted on ANSI Standard Chromaticity Regions.....              | 17 |
| Cree's Standard Warm and Neutral White Kits Plotted on ANSI Standard Chromaticity Regions ..... | 18 |
| Cree's Standard Chromaticity Kits .....                                                         | 20 |
| Bin and Order Code Formats.....                                                                 | 21 |
| Reflow Soldering Characteristics.....                                                           | 22 |
| Notes .....                                                                                     | 23 |
| Mechanical Dimensions .....                                                                     | 25 |
| Tape and Reel.....                                                                              | 26 |
| Packaging.....                                                                                  | 27 |



## CHARACTERISTICS

| Characteristics                              | Unit    | Minimum | Typical | Maximum |
|----------------------------------------------|---------|---------|---------|---------|
| Thermal resistance, junction to solder point | °C/W    |         | 4       |         |
| Viewing angle (FWHM)                         | degrees |         | 125     |         |
| Temperature coefficient of voltage           | mV/°C   |         | -2.1    |         |
| ESD withstand voltage (HBM per Mil-Std-883D) | V       |         |         | 8000    |
| DC forward current                           | mA      |         |         | 1500    |
| Reverse voltage                              | V       |         |         | 5       |
| Forward voltage (@ 350 mA, 25 °C)            | V       |         | 2.9     | 3.25    |
| Forward voltage (@ 700 mA, 25 °C)            | V       |         | 3.05    |         |
| Forward voltage (@ 1000 mA, 25 °C)           | V       |         | 3.15    |         |
| Forward voltage (@ 1500 mA, 25 °C)           | V       |         | 3.25    |         |
| LED junction temperature                     | °C      |         |         | 150     |

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

The following table provides order codes for XLamp XP-G LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 21). For definitions of the chromaticity kits, please see the Cree's Standard Chromaticity Kits section (page 20).

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes          |
|--------------|--------|-------------------------------------|-----------|----------------------|
| Kit          | CCT    | Code                                | Flux (lm) | 70 CRI Typical       |
| 51           | 6200 K | R5                                  | 139       | XPGWHT-L1-0000-00H51 |
|              |        | R4                                  | 130       | XPGWHT-L1-0000-00G51 |
|              |        | R3                                  | 122       | XPGWHT-L1-0000-00F51 |
| 53           | 6000 K | R5                                  | 139       | XPGWHT-L1-0000-00H53 |
|              |        | R4                                  | 130       | XPGWHT-L1-0000-00G53 |
|              |        | R3                                  | 122       | XPGWHT-L1-0000-00F53 |
| 50           | 6200 K | R5                                  | 139       | XPGWHT-L1-0000-00H50 |
|              |        | R4                                  | 130       | XPGWHT-L1-0000-00G50 |
|              |        | R3                                  | 122       | XPGWHT-L1-0000-00F50 |
| E1           | 6500 K | R5                                  | 139       | XPGWHT-L1-0000-00HE1 |
|              |        | R4                                  | 130       | XPGWHT-L1-0000-00GE1 |
|              |        | R3                                  | 122       | XPGWHT-L1-0000-00FE1 |
| E2           | 5700 K | R5                                  | 139       | XPGWHT-L1-0000-00HE2 |
|              |        | R4                                  | 130       | XPGWHT-L1-0000-00GE2 |
|              |        | R3                                  | 122       | XPGWHT-L1-0000-00FE2 |

### Notes

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 23).
- Cree XLamp XP-G LED 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 bin restrictions specified by the order code.

## FLUX CHARACTERISTICS - CONTINUED

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes          |                      |                      |
|--------------|--------|-------------------------------------|-----------|----------------------|----------------------|----------------------|
| Kit          | CCT    | Code                                | Flux (lm) | 70 CRI Typical       | 75 CRI Typical       | 80 CRI Minimum       |
| E3           | 5000 K | R5                                  | 139       | XPGWHT-01-0000-00HE3 |                      |                      |
|              |        | R4                                  | 130       | XPGWHT-01-0000-00GE3 |                      |                      |
|              |        | R3                                  | 122       | XPGWHT-01-0000-00FE3 | XPGWHT-L1-0000-00FE3 |                      |
|              |        | R2                                  | 114       | XPGWHT-01-0000-00EE3 | XPGWHT-L1-0000-00EE3 |                      |
|              |        | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DE3 |                      |
| F4           | 4750 K | R5                                  | 139       | XPGWHT-01-0000-00HF4 |                      |                      |
|              |        | R4                                  | 130       | XPGWHT-01-0000-00GF4 |                      |                      |
|              |        | R3                                  | 122       | XPGWHT-01-0000-00FF4 | XPGWHT-L1-0000-00FF4 |                      |
|              |        | R2                                  | 114       | XPGWHT-01-0000-00EF4 | XPGWHT-L1-0000-00EF4 |                      |
|              |        | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DF4 |                      |
| E4           | 4500 K | R5                                  | 139       | XPGWHT-01-0000-00HE4 |                      |                      |
|              |        | R4                                  | 130       | XPGWHT-01-0000-00GE4 |                      |                      |
|              |        | R3                                  | 122       | XPGWHT-01-0000-00FE4 | XPGWHT-L1-0000-00FE4 |                      |
|              |        | R2                                  | 114       | XPGWHT-01-0000-00EE4 | XPGWHT-L1-0000-00EE4 |                      |
|              |        | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DE4 |                      |
| F5           | 4250 K | R4                                  | 130       | XPGWHT-01-0000-00GF5 |                      |                      |
|              |        | R3                                  | 122       | XPGWHT-01-0000-00FF5 | XPGWHT-L1-0000-00FF5 |                      |
|              |        | R2                                  | 114       | XPGWHT-01-0000-00EF5 | XPGWHT-L1-0000-00EF5 |                      |
|              |        | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DF5 |                      |
| E5           | 4000 K | R4                                  | 130       | XPGWHT-01-0000-00GE5 |                      |                      |
|              |        | R3                                  | 122       | XPGWHT-01-0000-00FE5 | XPGWHT-L1-0000-00FE5 |                      |
|              |        | R2                                  | 114       | XPGWHT-01-0000-00EE5 | XPGWHT-L1-0000-00EE5 | XPGWHT-H1-0000-00EE5 |
|              |        | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DE5 | XPGWHT-H1-0000-00DE5 |
| Z5           | 4000 K | R2                                  | 114       |                      | XPGWHT-L1-0000-00EZ5 | XPGWHT-H1-0000-00EZ5 |
|              |        | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DZ5 | XPGWHT-H1-0000-00DZ5 |

### Notes

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 23).
- Cree XLamp XP-G LED 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 bin restrictions specified by the order code.

## FLUX CHARACTERISTICS - CONTINUED

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes          |                      |                      |                      |                      |
|--------------|--------|-------------------------------------|-----------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Kit          | CCT    | Code                                | Flux (lm) | 70 CRI Typical       | 80 CRI Typical       | 80 CRI Minimum       | 85 CRI Minimum       | 90 CRI Minimum       |
| F6           | 3750 K | R3                                  | 122       | XPGWHT-01-0000-00FF6 |                      |                      |                      |                      |
|              |        | R2                                  | 114       | XPGWHT-01-0000-00EF6 | XPGWHT-L1-0000-00EF6 | XPGWHT-H1-0000-00EF6 |                      |                      |
|              |        | Q5                                  | 107       | XPGWHT-01-0000-00DF6 | XPGWHT-L1-0000-00DF6 | XPGWHT-H1-0000-00DF6 |                      |                      |
|              |        | Q4                                  | 100       |                      | XPGWHT-L1-0000-00CF6 | XPGWHT-H1-0000-00CF6 |                      |                      |
| E6           | 3500 K | R3                                  | 122       | XPGWHT-01-0000-00FE6 |                      |                      |                      |                      |
|              |        | R2                                  | 114       | XPGWHT-01-0000-00EE6 | XPGWHT-L1-0000-00EE6 |                      |                      |                      |
|              |        | Q5                                  | 107       | XPGWHT-01-0000-00DE6 | XPGWHT-L1-0000-00DE6 | XPGWHT-H1-0000-00DE6 |                      |                      |
|              |        | Q4                                  | 100       |                      | XPGWHT-L1-0000-00CE6 | XPGWHT-H1-0000-00CE6 |                      |                      |
| Z6           | 3500 K | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DZ6 | XPGWHT-H1-0000-00DZ6 |                      |                      |
|              |        | Q4                                  | 100       |                      | XPGWHT-L1-0000-00CZ6 | XPGWHT-H1-0000-00CZ6 |                      |                      |
| F7           | 3250 K | R2                                  | 114       |                      | XPGWHT-L1-0000-00EF7 |                      |                      |                      |
|              |        | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DF7 | XPGWHT-H1-0000-00DF7 |                      |                      |
|              |        | Q4                                  | 100       |                      | XPGWHT-L1-0000-00CF7 | XPGWHT-H1-0000-00CF7 |                      |                      |
|              |        | Q3                                  | 93.9      |                      | XPGWHT-L1-0000-00BF7 | XPGWHT-H1-0000-00BF7 |                      |                      |
| E7           | 3000 K | R2                                  | 114       |                      | XPGWHT-L1-0000-00EE7 |                      |                      |                      |
|              |        | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DE7 | XPGWHT-H1-0000-00DE7 |                      |                      |
|              |        | Q4                                  | 100       |                      | XPGWHT-L1-0000-00CE7 | XPGWHT-H1-0000-00CE7 |                      |                      |
|              |        | Q3                                  | 93.9      |                      | XPGWHT-L1-0000-00BE7 | XPGWHT-H1-0000-00BE7 | XPGWHT-P1-0000-00BE7 |                      |
|              |        | Q2                                  | 87.4      |                      |                      |                      | XPGWHT-P1-0000-00AE7 |                      |
|              |        | P4                                  | 80.6      |                      |                      |                      | XPGWHT-P1-0000-009E7 | XPGWHT-U1-0000-009E7 |
|              |        | P3                                  | 73.9      |                      |                      |                      | XPGWHT-P1-0000-008E7 | XPGWHT-U1-0000-008E7 |
| Z7           | 3000 K | Q5                                  | 107       |                      | XPGWHT-L1-0000-00DZ7 | XPGWHT-H1-0000-00DZ7 |                      |                      |
|              |        | Q4                                  | 100       |                      | XPGWHT-L1-0000-00CZ7 | XPGWHT-H1-0000-00CZ7 |                      |                      |
|              |        | Q3                                  | 93.9      |                      | XPGWHT-L1-0000-00BZ7 | XPGWHT-H1-0000-00BZ7 |                      |                      |
|              |        | Q2                                  | 87.4      |                      |                      |                      | XPGWHT-P1-0000-00AZ7 |                      |
|              |        | P4                                  | 80.6      |                      |                      |                      | XPGWHT-P1-0000-009Z7 | XPGWHT-U1-0000-009Z7 |
|              |        | P3                                  | 73.9      |                      |                      |                      | XPGWHT-P1-0000-008Z7 | XPGWHT-U1-0000-008Z7 |

### Notes

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 23).
- Cree XLamp XP-G LED 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 bin restrictions specified by the order code.

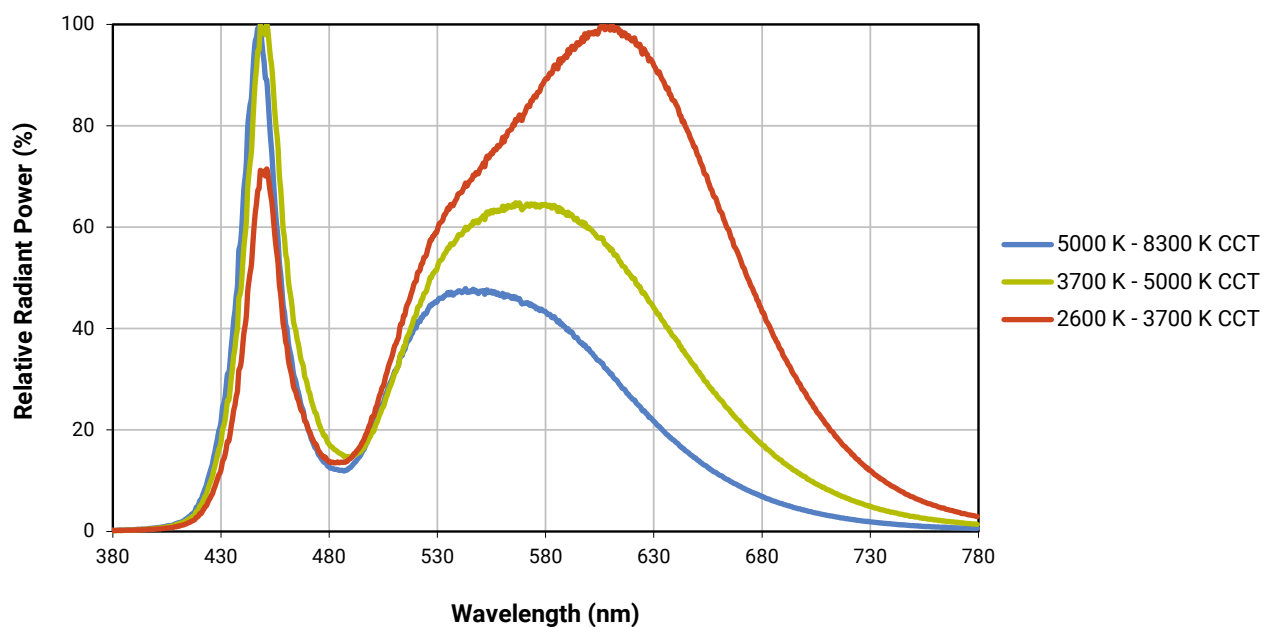
## FLUX CHARACTERISTICS - CONTINUED

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes    |                      |                      |                      |                      |
|--------------|--------|-------------------------------------|-----------|----------------|----------------------|----------------------|----------------------|----------------------|
| Kit          | CCT    | Code                                | Flux (lm) | 70 CRI Typical | 80 CRI Typical       | 80 CRI Minimum       | 85 CRI Minimum       | 90 CRI Minimum       |
| F8           | 2850 K | Q5                                  | 107       |                | XPGWHT-L1-0000-00DF8 |                      |                      |                      |
|              |        | Q4                                  | 100       |                | XPGWHT-L1-0000-00CF8 | XPGWHT-H1-0000-00CF8 |                      |                      |
|              |        | Q3                                  | 93.9      |                | XPGWHT-L1-0000-00BF8 | XPGWHT-H1-0000-00BF8 |                      |                      |
|              |        | Q2                                  | 87.4      |                | XPGWHT-L1-0000-00AF8 | XPGWHT-H1-0000-00AF8 | XPGWHT-P1-0000-00AF8 |                      |
|              |        | P4                                  | 80.6      |                |                      |                      | XPGWHT-P1-0000-009F8 | XPGWHT-U1-0000-009F8 |
|              |        | P3                                  | 73.9      |                |                      |                      | XPGWHT-P1-0000-008F8 | XPGWHT-U1-0000-008F8 |
|              |        | P2                                  | 67.2      |                |                      |                      | XPGWHT-P1-0000-007F8 | XPGWHT-U1-0000-007F8 |
| E8           | 2700 K | Q5                                  | 107       |                | XPGWHT-L1-0000-00DE8 |                      |                      |                      |
|              |        | Q4                                  | 100       |                | XPGWHT-L1-0000-00CE8 | XPGWHT-H1-0000-00CE8 |                      |                      |
|              |        | Q3                                  | 93.9      |                | XPGWHT-L1-0000-00BE8 | XPGWHT-H1-0000-00BE8 |                      |                      |
|              |        | Q2                                  | 87.4      |                | XPGWHT-L1-0000-00AE8 | XPGWHT-H1-0000-00AE8 | XPGWHT-P1-0000-00AE8 |                      |
|              |        | P4                                  | 80.6      |                |                      |                      | XPGWHT-P1-0000-009E8 | XPGWHT-U1-0000-009E8 |
|              |        | P3                                  | 73.9      |                |                      |                      | XPGWHT-P1-0000-008E8 | XPGWHT-U1-0000-008E8 |
|              |        | P2                                  | 67.2      |                |                      |                      | XPGWHT-P1-0000-007E8 | XPGWHT-U1-0000-007E8 |
| Z8           | 2700 K | Q4                                  | 100       |                | XPGWHT-L1-0000-00CZ8 | XPGWHT-H1-0000-00CZ8 |                      |                      |
|              |        | Q3                                  | 93.9      |                | XPGWHT-L1-0000-00BZ8 | XPGWHT-H1-0000-00BZ8 |                      |                      |
|              |        | Q2                                  | 87.4      |                | XPGWHT-L1-0000-00AZ8 | XPGWHT-H1-0000-00AZ8 |                      |                      |
|              |        | P4                                  | 80.6      |                |                      |                      | XPGWHT-P1-0000-009Z8 |                      |
|              |        | P3                                  | 73.9      |                |                      |                      | XPGWHT-P1-0000-008Z8 | XPGWHT-U1-0000-008Z8 |
|              |        | P2                                  | 67.2      |                |                      |                      | XPGWHT-P1-0000-007Z8 | XPGWHT-U1-0000-007Z8 |

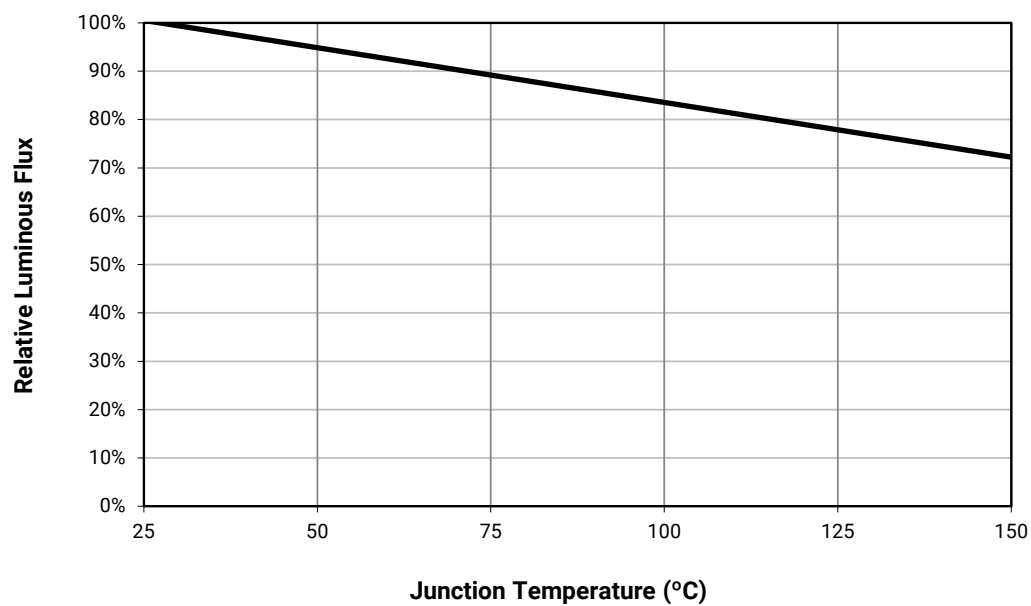
### Notes

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 23).
- Cree XLamp XP-G LED 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 bin restrictions specified by the order code.

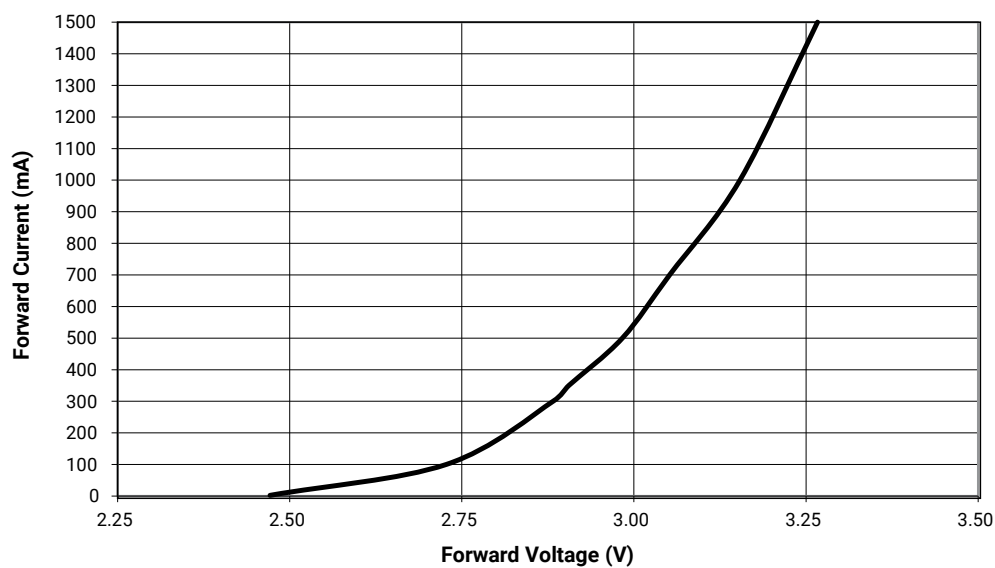
## RELATIVE SPECTRAL POWER DISTRIBUTION



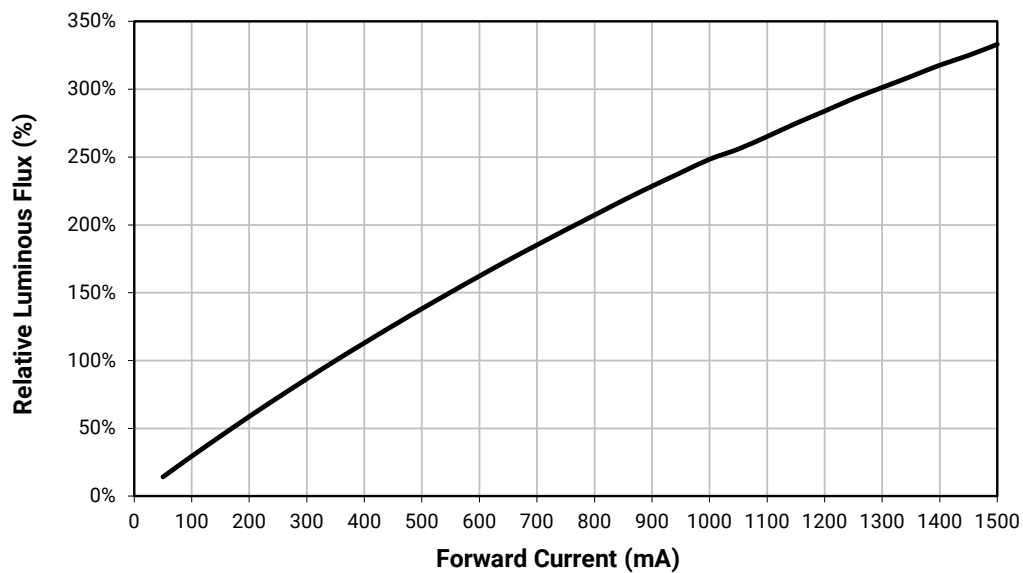
## RELATIVE FLUX VS. JUNCTION TEMPERATURE ( $I_F = 350$ mA)



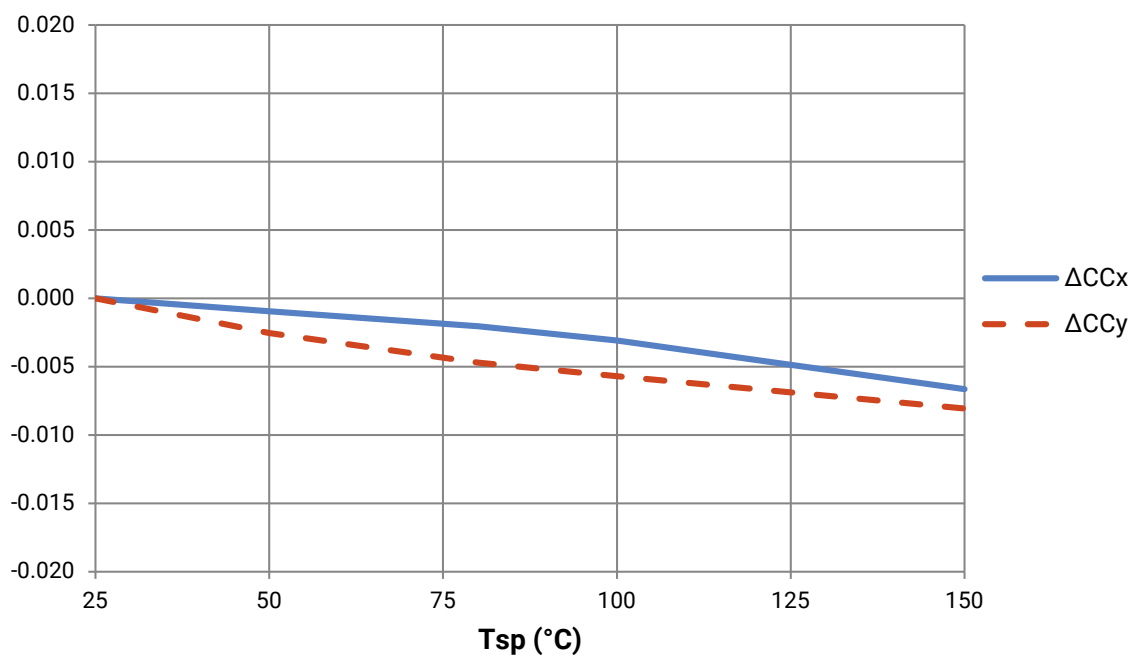
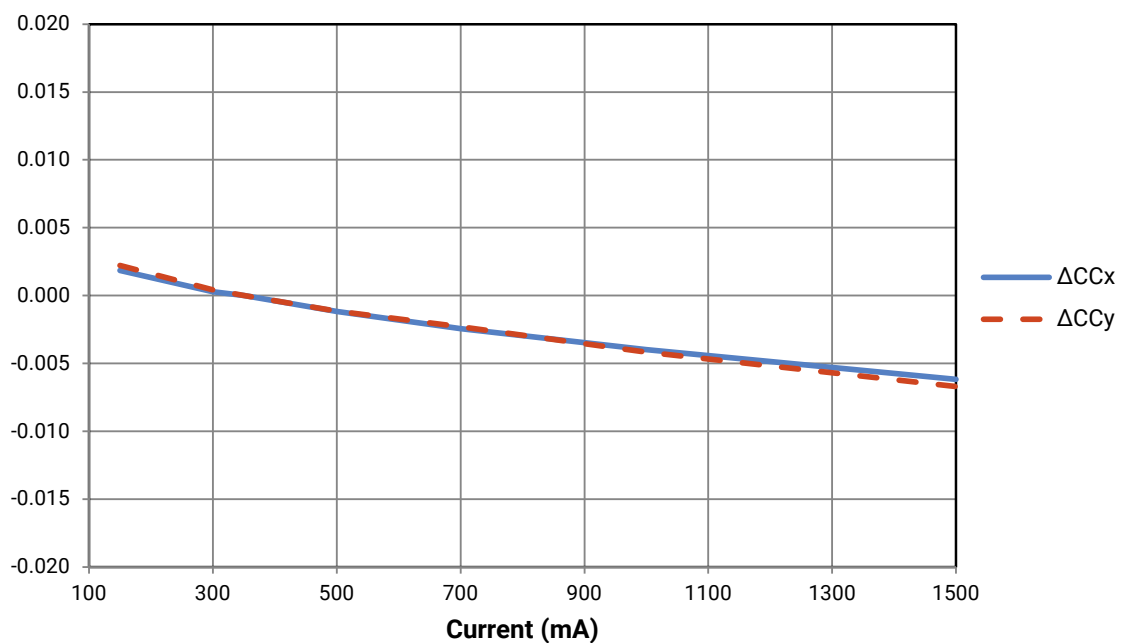
## ELECTRICAL CHARACTERISTICS ( $T_j = 25\text{ }^{\circ}\text{C}$ )



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

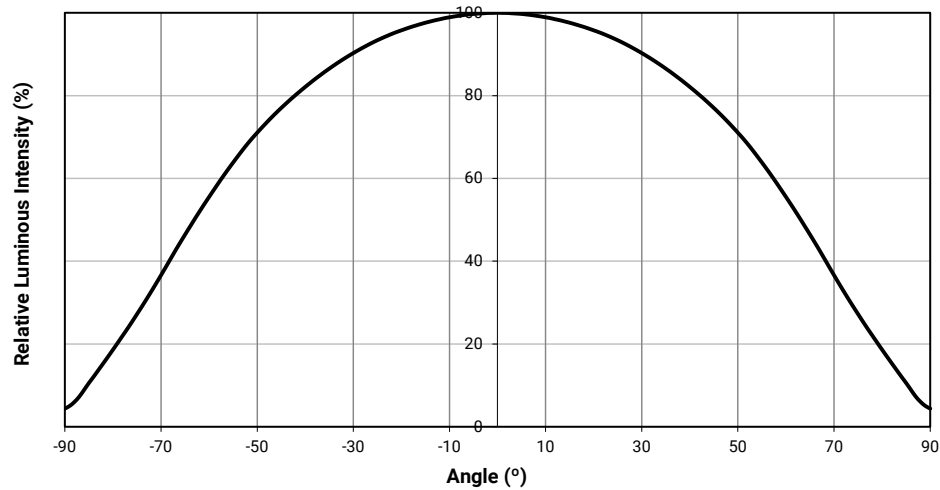


# RELATIVE CHROMATICITY VS CURRENT AND TEMPERATURE (WARM WHITE\*)



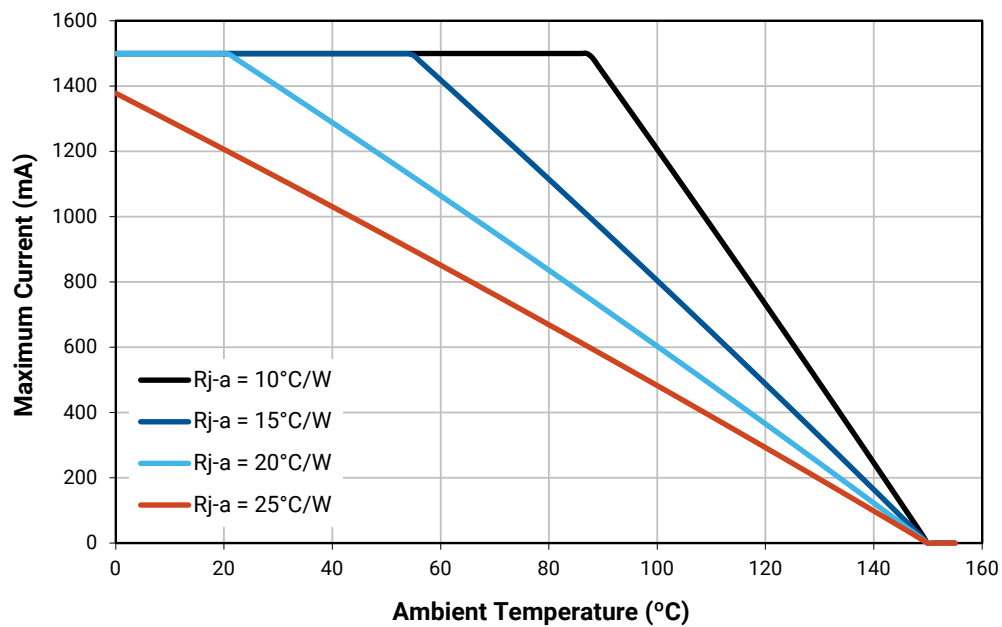
\* Warm White XLamp XP-G LEDs have a typical CRI of 80.

## 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 – LUMINOUS FLUX

XLamp XP-G LEDs are tested for luminous flux and placed into one of the following luminous-flux groups:

| Group Code | Minimum Luminous Flux (lm) @ 350 mA | Maximum Luminous Flux (lm) @ 350 mA |
|------------|-------------------------------------|-------------------------------------|
| 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                                 |
| R4         | 130                                 | 139                                 |
| R5         | 139                                 | 148                                 |
| S2         | 148                                 | 156                                 |
| S3         | 156                                 | 164                                 |

# 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 | 3R     | 0.3366 | 0.3369 | 3S     | 0.3381 | 0.3762 |
|        | 0.3451 | 0.3554 |        | 0.3463 | 0.3687 |        | 0.3440 | 0.3428 |        | 0.3480 | 0.3840 |
|        | 0.3440 | 0.3427 |        | 0.3451 | 0.3554 |        | 0.3429 | 0.3307 |        | 0.3463 | 0.3687 |
|        | 0.3366 | 0.3369 |        | 0.3371 | 0.3490 |        | 0.3361 | 0.3245 |        | 0.3376 | 0.3616 |
| 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 |
| 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 |

# PERFORMANCE GROUPS – CHROMATICITY (CONTINUED)

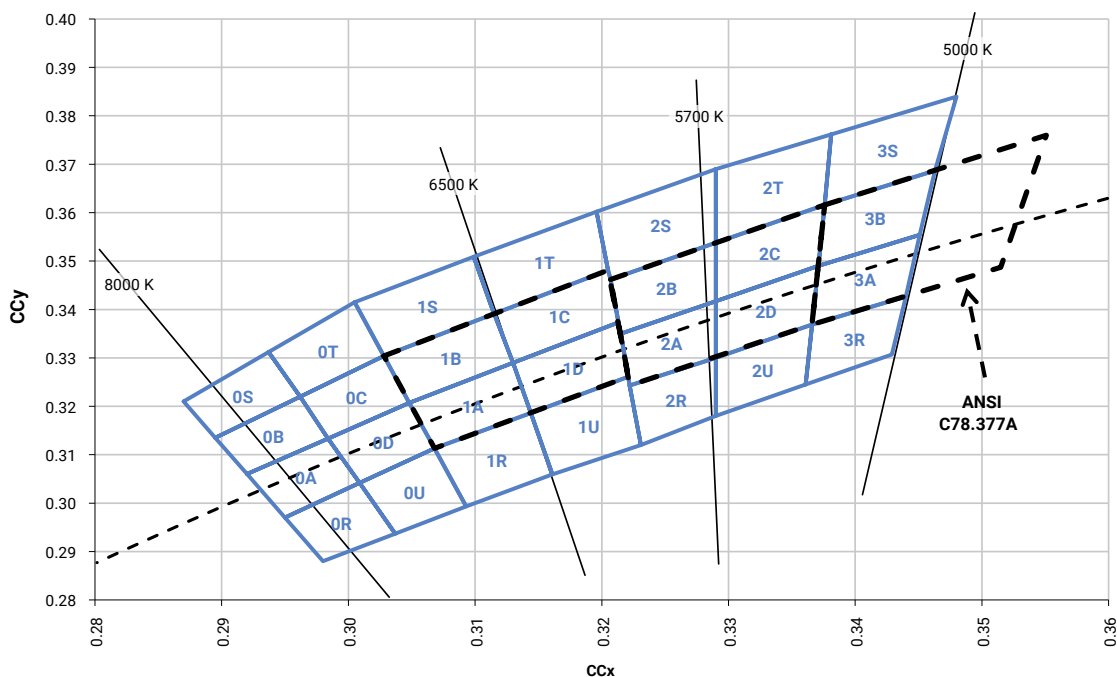
| Region | x      | y      | Region | x      | y      | Region | x      | y      | Region | x      | y      |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 5A1    | 0.3670 | 0.3578 | 5A2    | 0.3686 | 0.3649 | 5A3    | 0.3744 | 0.3685 | 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)

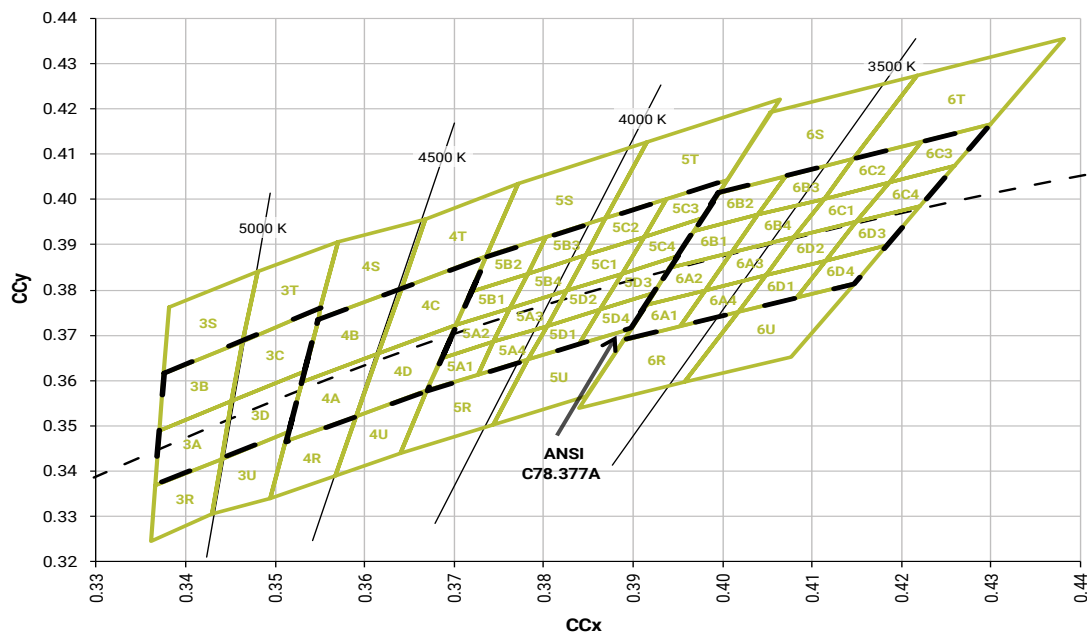
| Region | x      | y      | Region | x      | y      | Region | x      | y      | Region | x      | y      |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 7B1    | 0.4221 | 0.3984 | 7B2    | 0.4259 | 0.4073 | 7B3    | 0.4322 | 0.4096 | 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 |

## CREE'S STANDARD CHROMATICITY REGIONS PLOTTED ON THE 1931 CIE CURVE

### ANSI Cool White

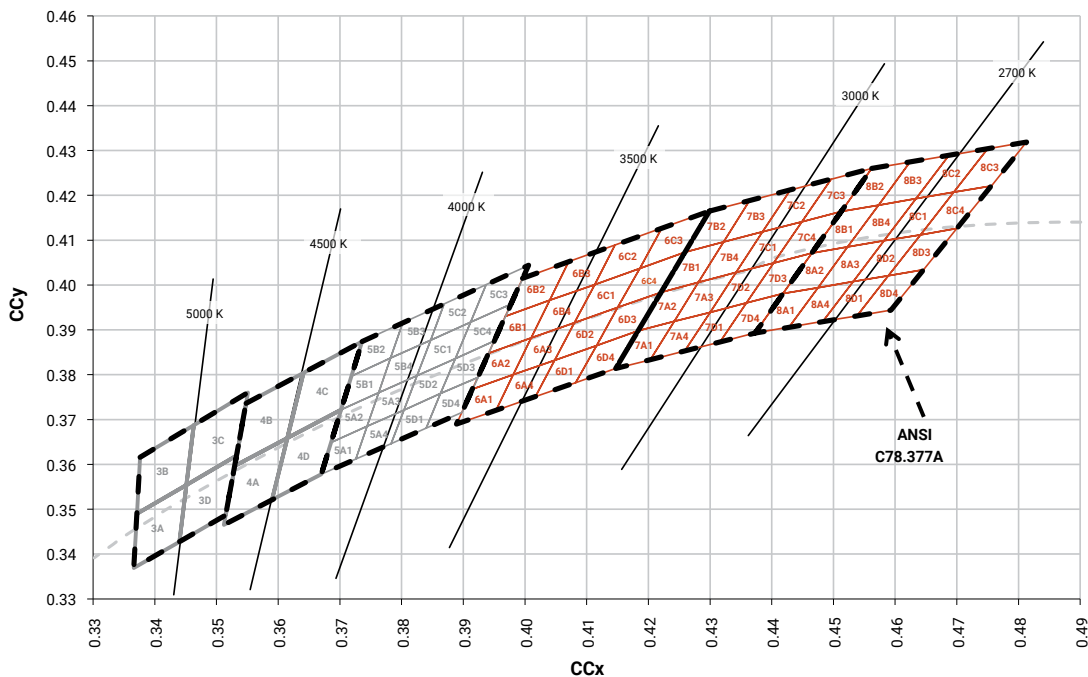


### Neutral White

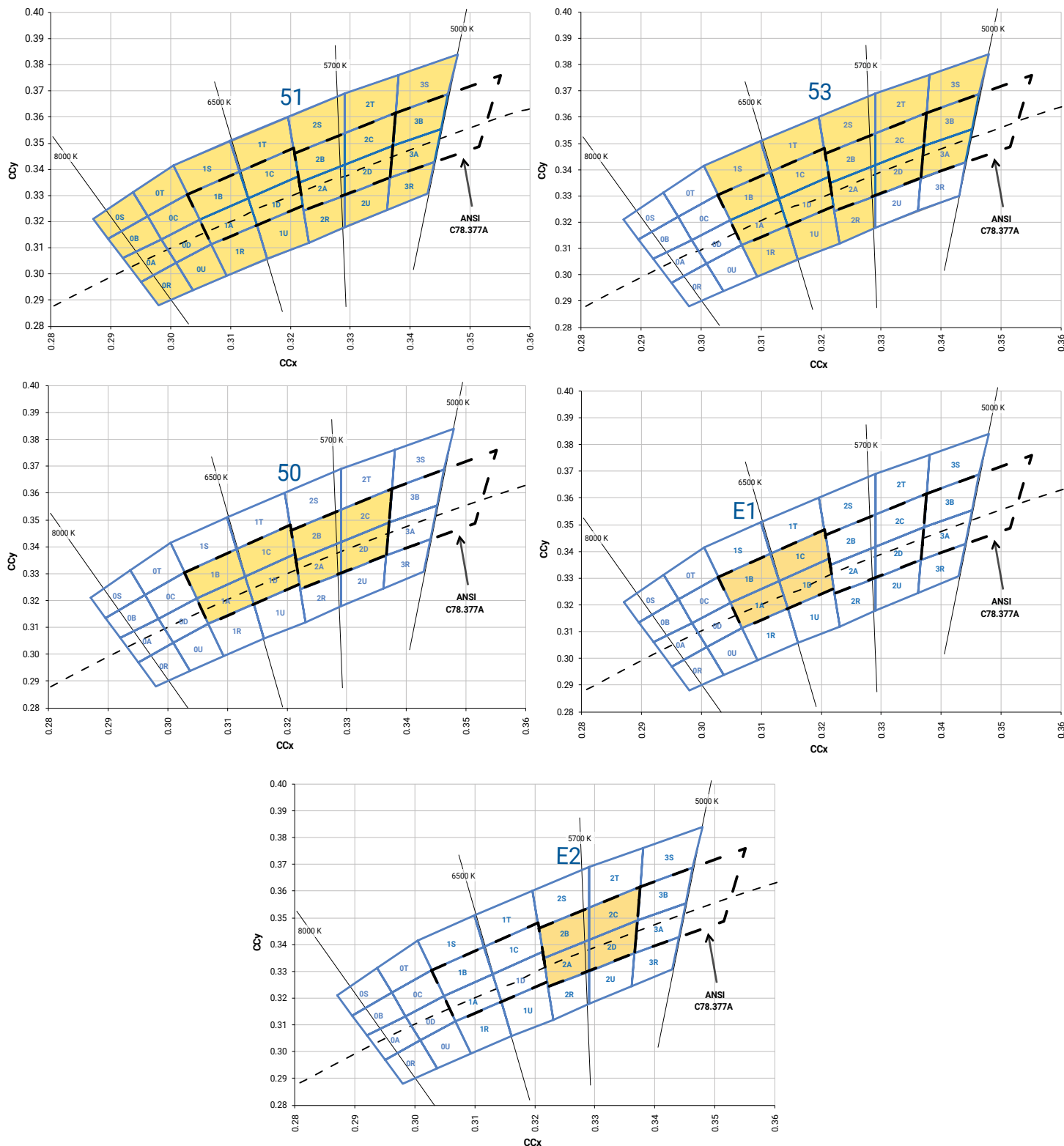


## CREE'S STANDARD CHROMATICITY REGIONS PLOTTED ON THE 1931 CIE CURVE - CONTINUED

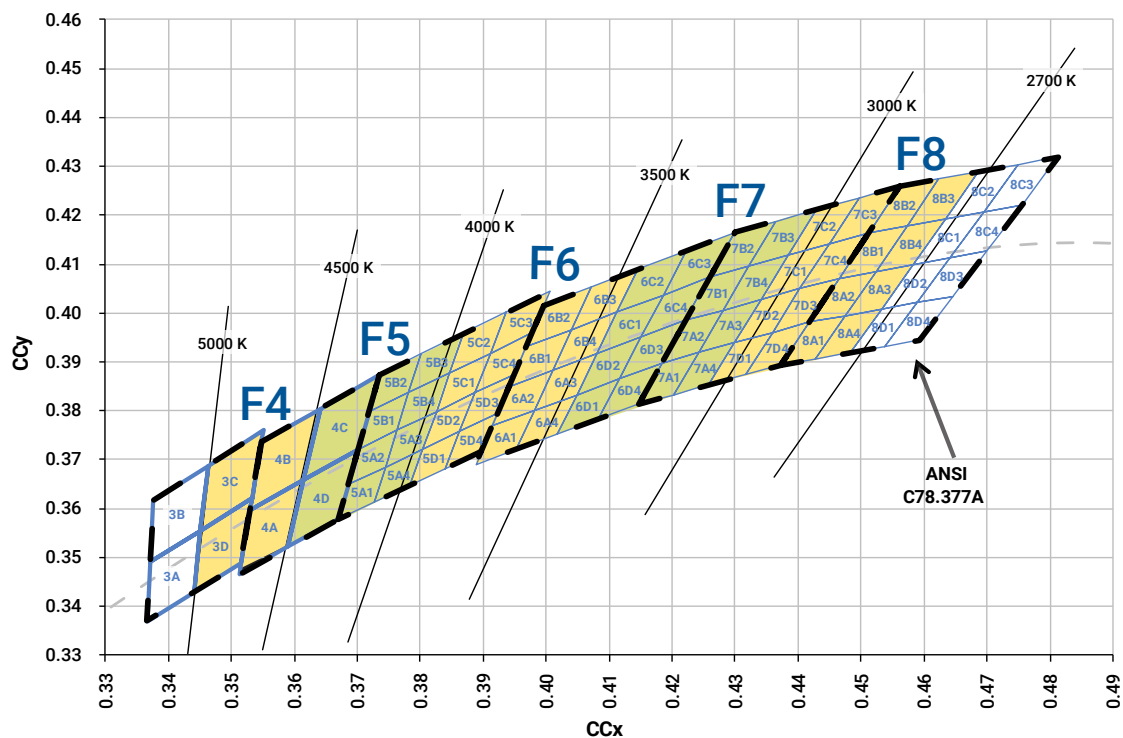
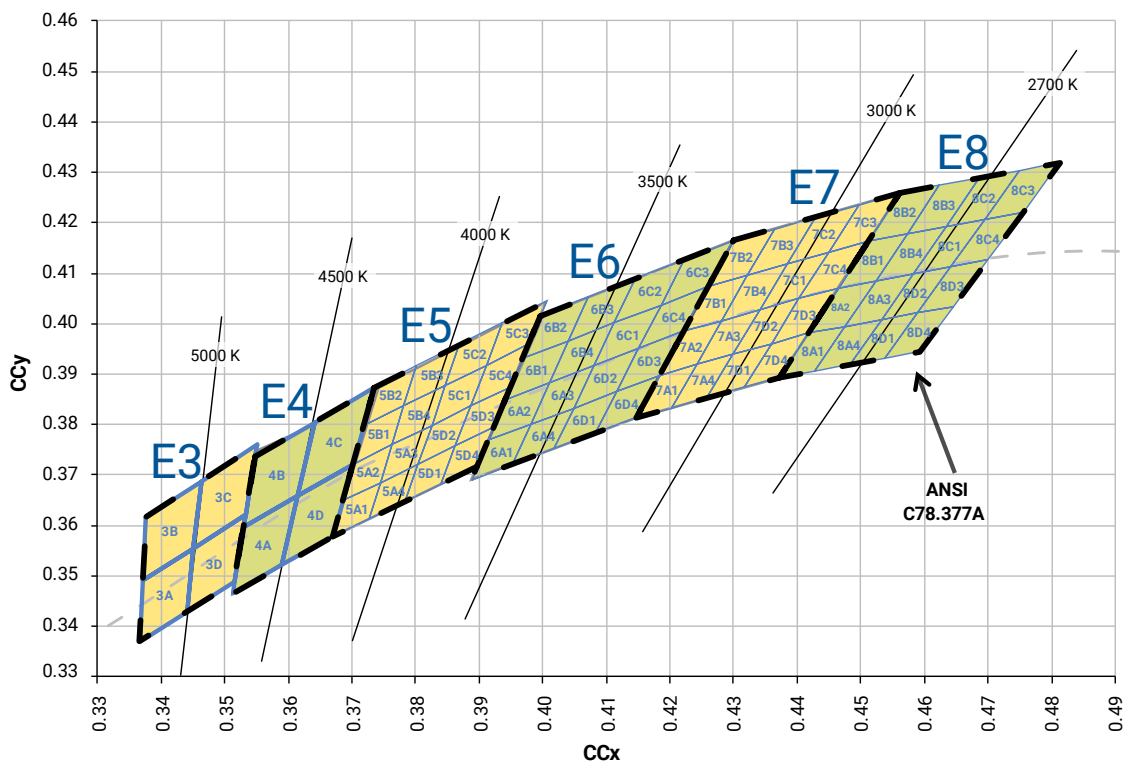
### ANSI Neutral White and ANSI Warm White



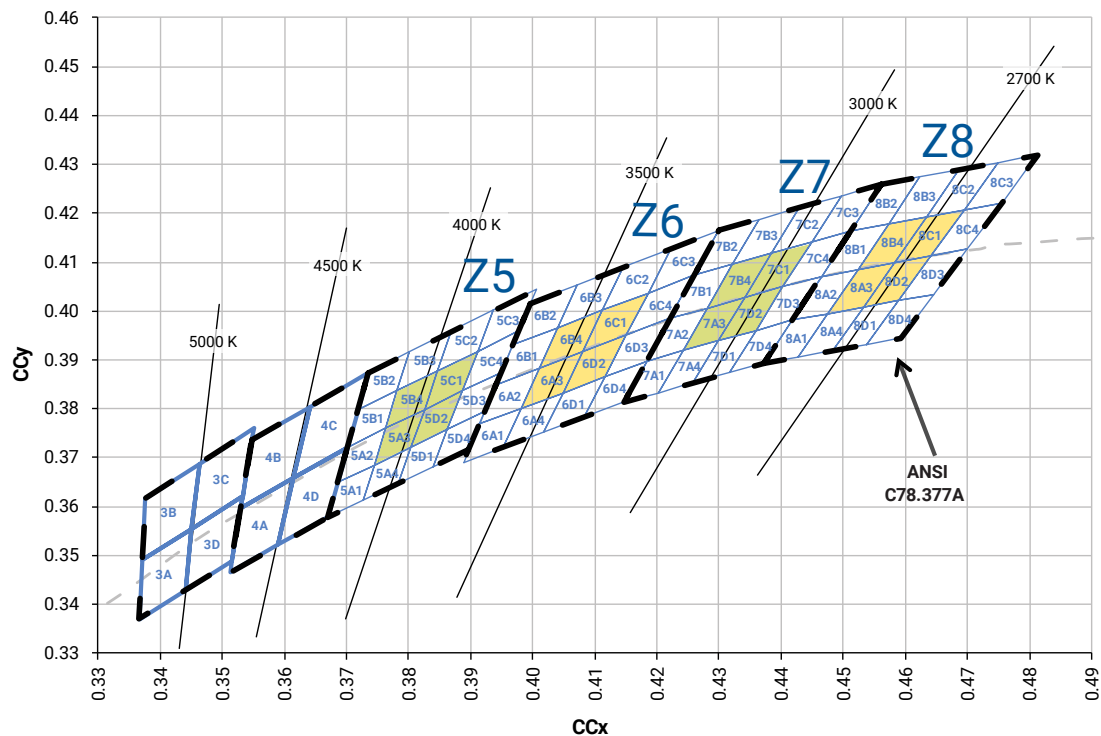
## CREE'S STANDARD COOL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS



CREE'S STANDARD WARM AND NEUTRAL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS



CREE'S STANDARD WARM AND NEUTRAL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS - CONTINUED



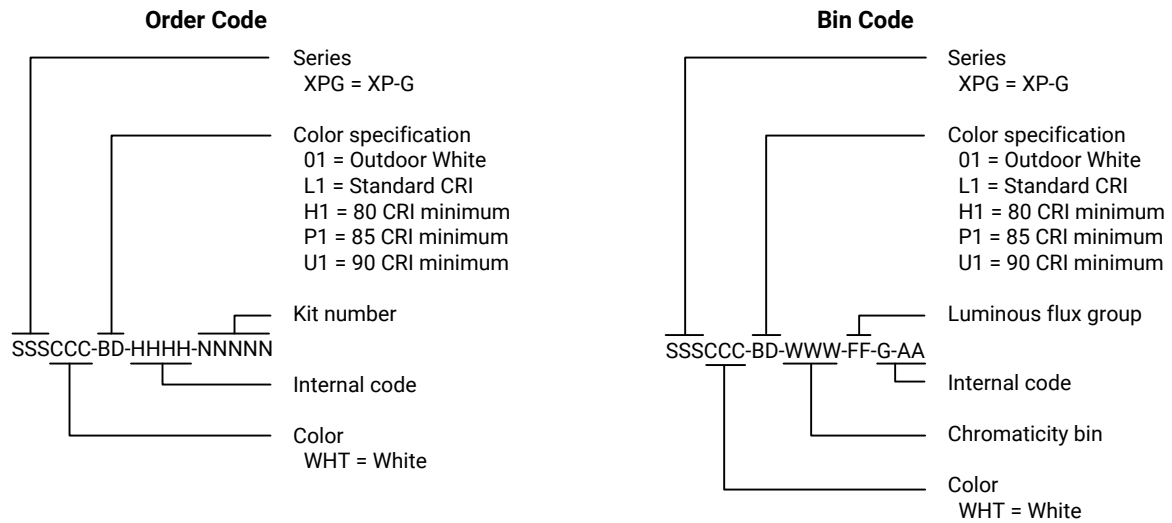
## CREE'S STANDARD CHROMATICITY KITS

The following table provides the chromaticity bins associated with chromaticity kits.

| Color         | CCT    | Kit | Chromaticity Bins                                                                                              |
|---------------|--------|-----|----------------------------------------------------------------------------------------------------------------|
| Cool White    | 6200 K | 51  | 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 |
|               | 6000 K | 53  | 1A, 1B, 1C, 1D, 1R, 1S, 1T, 1U, 2A, 2B, 2C, 2D, 2R, 2S, 2T, 3A, 3B, 3S                                         |
|               | 6200 K | 50  | 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D                                                                                 |
|               | 6500 K | E1  | 1A, 1B, 1C, 1D                                                                                                 |
|               | 5700 K | E2  | 2A, 2B, 2C, 2D                                                                                                 |
| Neutral White | 5000 K | E3  | 3A, 3B, 3C, 3D                                                                                                 |
|               | 4750 K | F4  | 3C, 3D, 4A, 4B                                                                                                 |
|               | 4500 K | E4  | 4A, 4B, 4C, 4D                                                                                                 |
|               | 4250 K | F5  | 4C, 4D, 5A1, 5A2, 5A3, 5A4, 5B1, 5B2, 5B3, 5B4                                                                 |
|               | 4000 K | E5  | 5A1, 5A2, 5A3, 5A4, 5B1, 5B2, 5B3, 5B4, 5C1, 5C2, 5C3, 5C4, 5D1, 5D2, 5D3, 5D4                                 |
|               | 4000 K | Z5  | 5A3, 5B4, 5C1, 5D2                                                                                             |
| Warm White    | 3750 K | F6  | 5C1, 5C2, 5C3, 5C4, 5D1, 5D2, 5D3, 5D4, 6A1, 6A2, 6A3, 6A4, 6B1, 6B2, 6B3, 6B4                                 |
|               | 3500 K | E6  | 6A1, 6A2, 6A3, 6A4, 6B1, 6B2, 6B3, 6B4, 6C1, 6C2, 6C3, 6C4, 6D1, 6D2, 6D3, 6D4                                 |
|               | 3500 K | Z6  | 6A3, 6B4, 6C1, 6D2                                                                                             |
|               | 3250 K | F7  | 6C1, 6C2, 6C3, 6C4, 6D1, 6D2, 6D3, 6D4, 7A1, 7A2, 7A3, 7A4, 7B1, 7B2, 7B3, 7B4                                 |
|               | 3000 K | E7  | 7A1, 7A2, 7A3, 7A4, 7B1, 7B2, 7B3, 7B4, 7C1, 7C2, 7C3, 7C4, 7D1, 7D2, 7D3, 7D4                                 |
|               | 3000 K | Z7  | 7A3, 7B4, 7C1, 7D2                                                                                             |
|               | 2850 K | F8  | 7C1, 7C2, 7C3, 7C4, 7D1, 7D2, 7D3, 7D4, 8A1, 8A2, 8A3, 8A4, 8B1, 8B2, 8B3, 8B4                                 |
|               | 2700 K | E8  | 8A1, 8A2, 8A3, 8A4, 8B1, 8B2, 8B3, 8B4, 8C1, 8C2, 8C3, 8C4, 8D1, 8D2, 8D3, 8D4                                 |
|               | 2700 K | Z8  | 8A3, 8B4, 8C1, 8D2                                                                                             |

## BIN AND ORDER CODE FORMATS

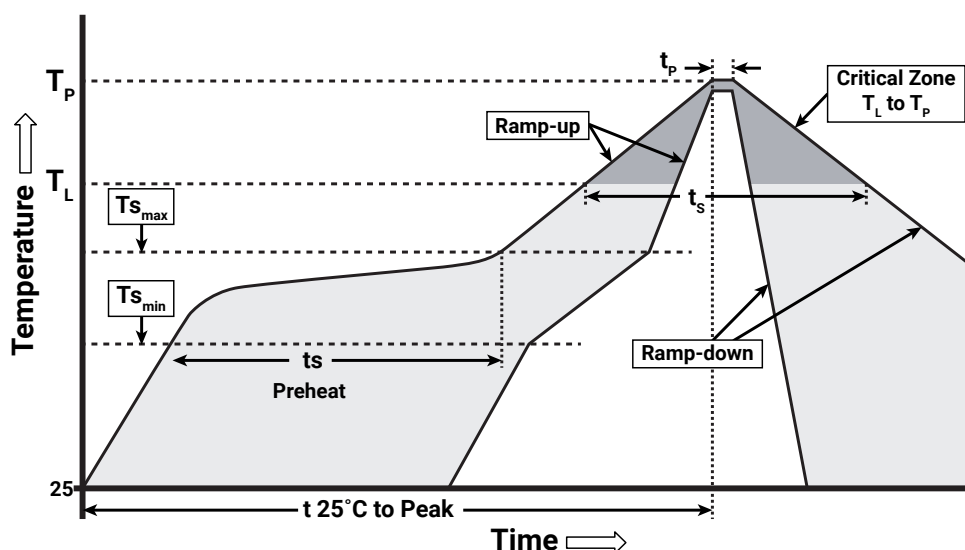
XP-G bin codes and order codes are configured in the following manner:



## REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XP-G 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, 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 ( $T_{s_{max}}$ 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 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 or provided 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 XP-G LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of  $\leq 30^{\circ}\text{C}/85\%$  relative humidity (RH). Regardless of the 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**

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**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.

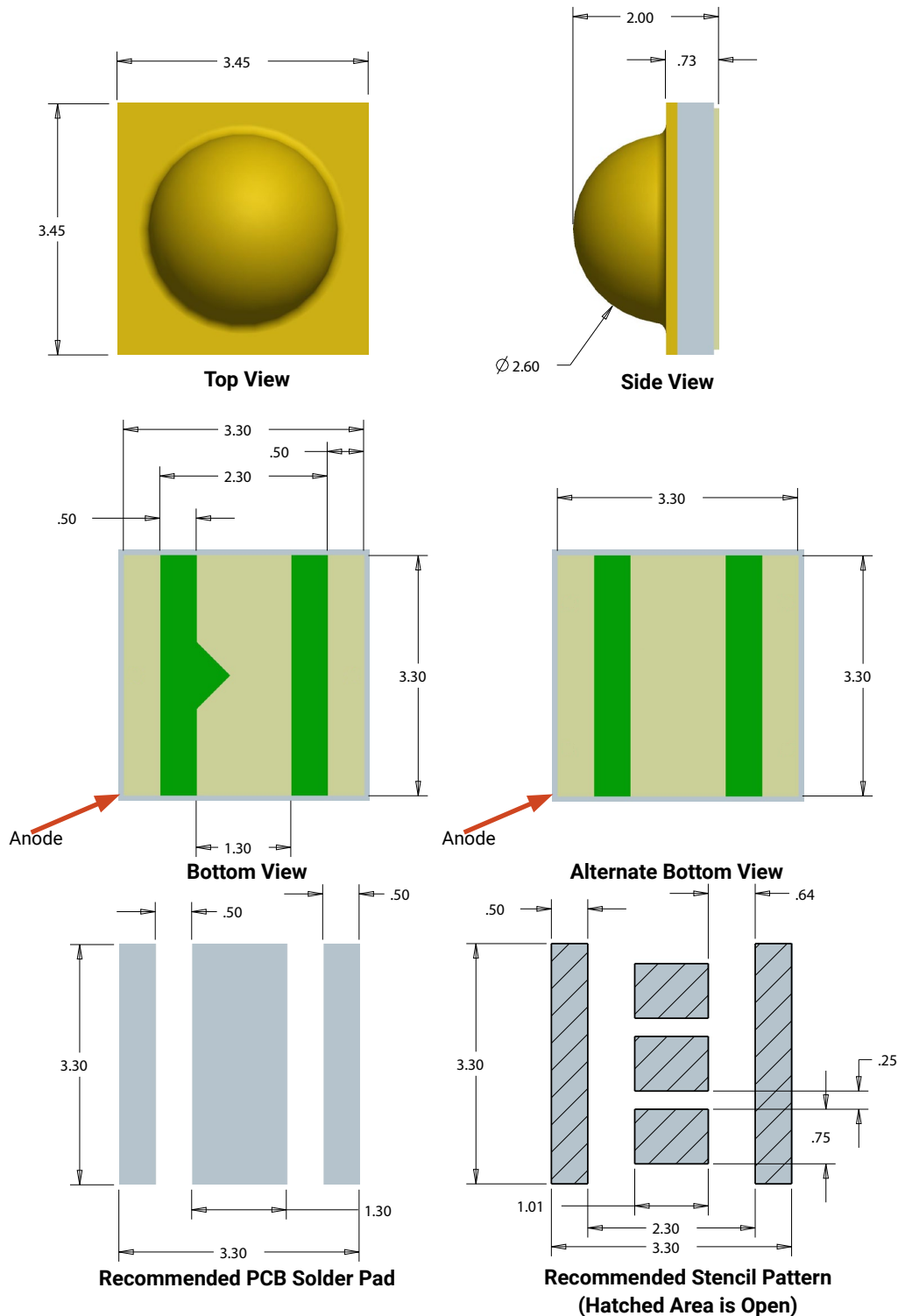
**Vision Advisory**

**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 ( $T_A = 25\text{ }^{\circ}\text{C}$ )

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

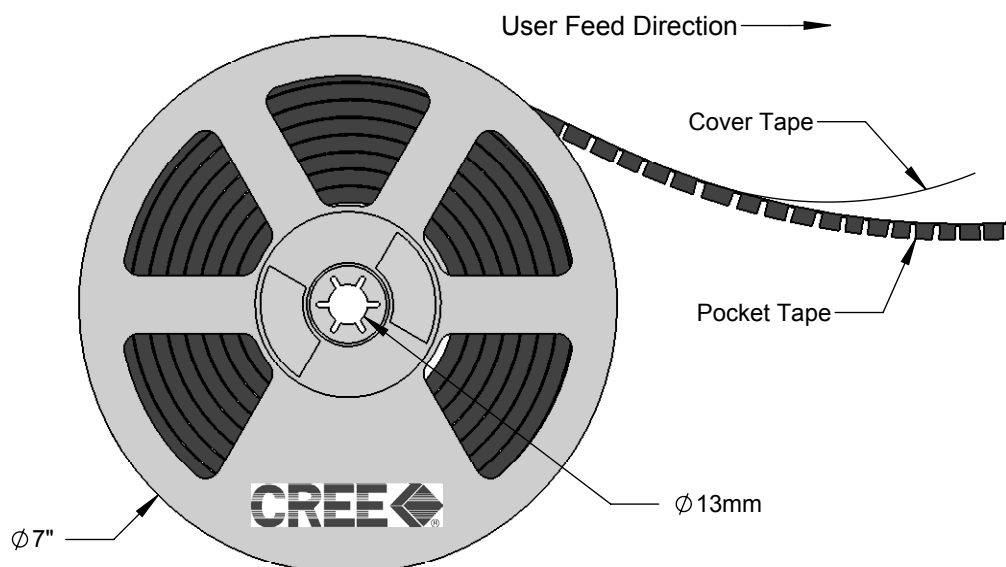
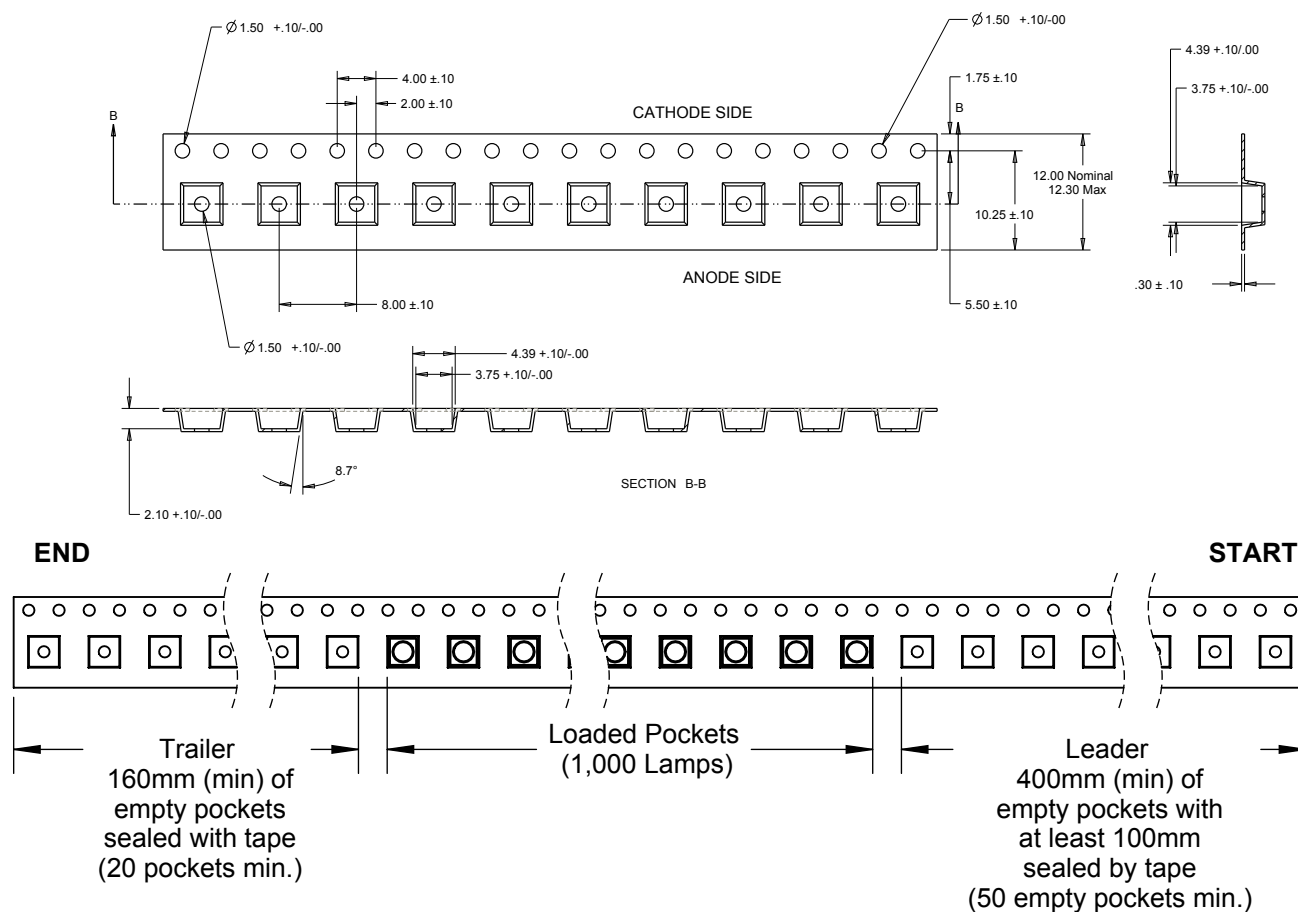
All measurements are  $\pm .13\text{ mm}$  unless otherwise indicated.



## TAPE AND REEL

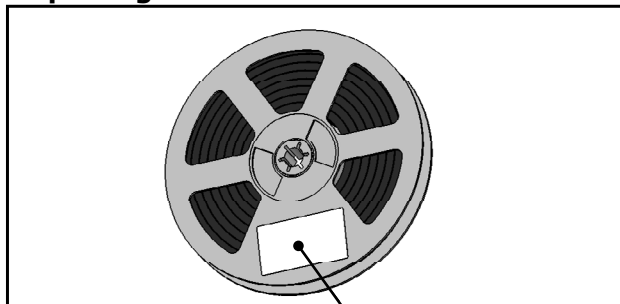
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

Except as noted, all dimensions in mm.



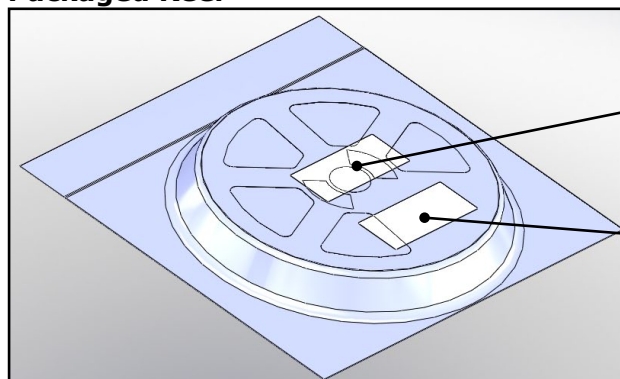
## PACKAGING

### Unpackaged Reel



Label with Cree Bin Code,  
Quantity, Reel ID

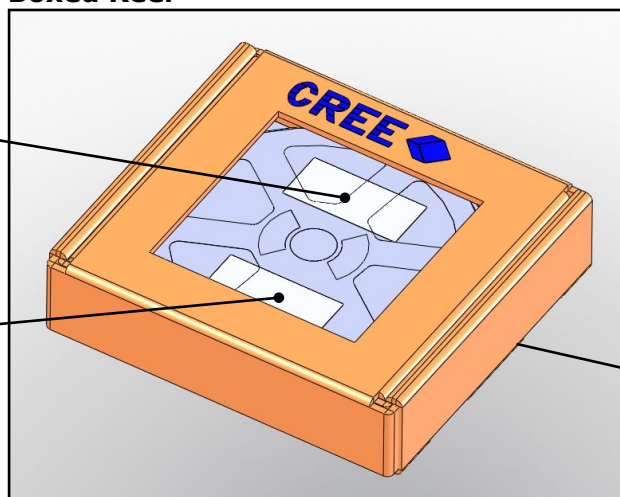
### Packaged Reel



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 #

Label with Cree Bin Code,  
Quantity, Reel ID

Patent Label  
(on bottom of box)

# Mouser Electronics

Authorized Distributor

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