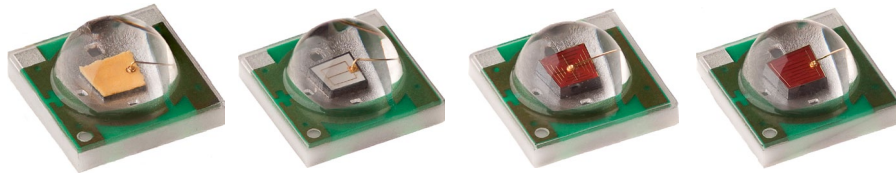


## Cree® XLamp® XP-C LEDs



### PRODUCT DESCRIPTION

The XLamp® XP-C LED combines the proven lighting-class performance and reliability of the XLamp XR-E LED in a package with 80% smaller footprint. The XLamp XP-C 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.

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

### FEATURES

- Available in white (2600 K to 10,000 K CCT), royal blue, blue, green, amber, red-orange, red
- Maximum drive current: up to 500 mA
- Low thermal resistance: as low as 10 °C/W
- Wide viewing angle: 110° - 125°
- Unlimited floor life at ≤ 30 °C/85% RH
- Reflow solderable - JEDEC J-STD-020C compatible
- Electrically neutral thermal path
- RoHS and REACH compliant
- UL® recognized component (E349212)

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## CHARACTERISTICS

| Characteristics                                                               | Unit    | Minimum | Typical | Maximum |
|-------------------------------------------------------------------------------|---------|---------|---------|---------|
| Thermal resistance, junction to solder point - white, royal blue, blue        | °C/W    |         | 12      |         |
| Thermal resistance, junction to solder point - green                          | °C/W    |         | 20      |         |
| Thermal resistance, junction to solder point - amber                          | °C/W    |         | 15      |         |
| Thermal resistance, junction to solder point - red, red-orange                | °C/W    |         | 10      |         |
| Viewing angle (FWHM) - white                                                  | degrees |         | 115     |         |
| Viewing angle (FWHM) - royal blue, blue, green, red, red-orange, amber        | degrees |         | 125     |         |
| Temperature coefficient of voltage - white, blue, royal blue, green           | mV/°C   |         | -4.0    |         |
| Temperature coefficient of voltage - amber, red-orange, red                   | mV/°C   |         | -2.0    |         |
| ESD withstand voltage (HBM per Mil-Std-883D) - white, royal blue, blue, green | V       |         |         | 8000    |
| ESD Classification (HBM per Mil-Std-883D) - amber, red-orange, red            |         |         | Class 2 |         |
| DC forward current - white, royal blue, blue, green                           | mA      |         |         | 500     |
| DC forward current - amber, red-orange, red                                   | mA      |         |         | 350     |
| Reverse voltage                                                               | V       |         |         | 5       |
| Forward voltage (@ 350 mA) - white                                            | V       |         | 3.2     | 3.9     |
| Forward voltage (@ 350 mA) - royal blue, blue                                 | V       |         | 3.3     | 3.9     |
| Forward voltage (@ 350 mA) - green                                            | V       |         | 3.4     | 3.9     |
| Forward voltage (@ 350 mA) - amber, red-orange, red                           | V       |         | 2.2     | 2.5     |
| Forward voltage (@ 125 mA) - royal blue, blue                                 | V       |         | 3.1     |         |
| Forward voltage (@ 125 mA) - green                                            | V       |         | 3.3     |         |
| Forward voltage (@ 125 mA) - red-orange, red                                  | V       |         | 2.0     |         |
| Forward voltage (@ 125 mA) - amber                                            | V       |         | 2.1     |         |
| Forward voltage (@ 500 mA) - royal blue, blue, white                          | V       |         | 3.5     |         |
| Forward voltage (@ 500 mA) - green                                            | V       |         | 3.6     |         |
| LED junction temperature                                                      | °C      |         |         | 150     |

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

The following tables provide order codes for XLamp XP-C white LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 27).

| Minimum Luminous Flux<br>(lm) @ 350 mA |           | Chromaticity Regions                               | Order Codes          |
|----------------------------------------|-----------|----------------------------------------------------|----------------------|
| Group                                  | Flux (lm) |                                                    |                      |
| Q2                                     | 87.4      | WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP | XPCWHT-L1-0000-00A01 |
|                                        |           | WC, WD, WF, WG                                     | XPCWHT-L1-0000-00A02 |
|                                        |           | WC, WD, WF, WG, WH, WJ, WN, WP                     | XPCWHT-L1-0000-00A03 |
| Q3                                     | 93.9      | WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP | XPCWHT-L1-0000-00B01 |
|                                        |           | WC, WD, WF, WG                                     | XPCWHT-L1-0000-00B02 |
|                                        |           | WC, WD, WF, WG, WH, WJ, WN, WP                     | XPCWHT-L1-0000-00B03 |
| Q4                                     | 100       | WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP | XPCWHT-L1-0000-00C01 |
|                                        |           | WC, WD, WF, WG                                     | XPCWHT-L1-0000-00C02 |
|                                        |           | WC, WD, WF, WG, WH, WJ, WN, WP                     | XPCWHT-L1-0000-00C03 |
| Q5                                     | 107       | WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP | XPCWHT-L1-0000-00D01 |
|                                        |           | WC, WD, WF, WG                                     | XPCWHT-L1-0000-00D02 |
|                                        |           | WC, WD, WF, WG, WH, WJ, WN, WP                     | XPCWHT-L1-0000-00D03 |

### 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 29).
- Cree XLamp XP-C 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 - WHITE ( $T_j = 25^\circ\text{C}$ ) - CONTINUED

The following tables provide order codes for XLamp XP-C white LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 27). For definitions of the chromaticity kits, please see the Cree's Standard Chromaticity Kits section (page 27).

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes          |
|--------------|--------|-------------------------------------|-----------|----------------------|
| Kit          | CCT    | Code                                | Flux (lm) | 70 CRI Typical       |
| 51           | 6200 K | Q5                                  | 107       | XPCWHT-L1-0000-00D51 |
|              |        | Q4                                  | 100       | XPCWHT-L1-0000-00C51 |
|              |        | Q3                                  | 93.9      | XPCWHT-L1-0000-00B51 |
|              |        | Q2                                  | 87.4      | XPCWHT-L1-0000-00A51 |
| 53           | 6000 K | Q5                                  | 107       | XPCWHT-L1-0000-00D53 |
|              |        | Q4                                  | 100       | XPCWHT-L1-0000-00C53 |
|              |        | Q3                                  | 93.9      | XPCWHT-L1-0000-00B53 |
|              |        | Q2                                  | 87.4      | XPCWHT-L1-0000-00A53 |
| 50           | 6200 K | Q5                                  | 107       | XPCWHT-L1-0000-00D50 |
|              |        | Q4                                  | 100       | XPCWHT-L1-0000-00C50 |
|              |        | Q3                                  | 93.9      | XPCWHT-L1-0000-00B50 |
|              |        | Q2                                  | 87.4      | XPCWHT-L1-0000-00A50 |
| E1           | 6500 K | Q5                                  | 107       | XPCWHT-L1-0000-00DE1 |
|              |        | Q4                                  | 100       | XPCWHT-L1-0000-00CE1 |
|              |        | Q3                                  | 93.9      | XPCWHT-L1-0000-00BE1 |
|              |        | Q2                                  | 87.4      | XPCWHT-L1-0000-00AE1 |
| E2           | 5700 K | Q5                                  | 107       | XPCWHT-L1-0000-00DE2 |
|              |        | Q4                                  | 100       | XPCWHT-L1-0000-00CE2 |
|              |        | Q3                                  | 93.9      | XPCWHT-L1-0000-00BE2 |
|              |        | Q2                                  | 87.4      | XPCWHT-L1-0000-00AE2 |

### 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 29).
- Cree XLamp XP-C 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 - WHITE ( $T_j = 25\text{ }^{\circ}\text{C}$ ) - CONTINUED

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes          |
|--------------|--------|-------------------------------------|-----------|----------------------|
| Kit          | CCT    | Code                                | Flux (lm) | 75 CRI Typical       |
| E3           | 5000 K | Q2                                  | 87.4      | XPCWHT-L1-0000-00AE3 |
|              |        | P4                                  | 80.6      | XPCWHT-L1-0000-009E3 |
|              |        | P3                                  | 73.9      | XPCWHT-L1-0000-008E3 |
| F4           | 4750 K | Q2                                  | 87.4      | XPCWHT-L1-0000-00AF4 |
|              |        | P4                                  | 80.6      | XPCWHT-L1-0000-009F4 |
|              |        | P3                                  | 73.9      | XPCWHT-L1-0000-008F4 |
| E4           | 4500 K | Q2                                  | 87.4      | XPCWHT-L1-0000-00AE4 |
|              |        | P4                                  | 80.6      | XPCWHT-L1-0000-009E4 |
| F5           | 4250 K | Q2                                  | 87.4      | XPCWHT-L1-0000-00AF5 |
|              |        | P4                                  | 80.6      | XPCWHT-L1-0000-009F5 |
|              |        | P3                                  | 73.9      | XPCWHT-L1-0000-008F5 |
|              |        | P2                                  | 67.2      | XPCWHT-L1-0000-007F5 |
| E5           | 4000 K | Q2                                  | 87.4      | XPCWHT-L1-0000-00AE5 |
|              |        | P4                                  | 80.6      | XPCWHT-L1-0000-009E5 |
|              |        | P3                                  | 73.9      | XPCWHT-L1-0000-008E5 |
|              |        | P2                                  | 67.2      | XPCWHT-L1-0000-007E5 |

## 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 29).
- Cree XLamp XP-C 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 - WHITE ( $T_j = 25\text{ }^{\circ}\text{C}$ ) - CONTINUED

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes          |
|--------------|--------|-------------------------------------|-----------|----------------------|
| Kit          | CCT    | Code                                | Flux (lm) | 80 CRI Typical       |
| F6           | 3750 K | P4                                  | 80.6      | XPCWHT-L1-0000-009F6 |
|              |        | P3                                  | 73.9      | XPCWHT-L1-0000-008F6 |
|              |        | P2                                  | 67.2      | XPCWHT-L1-0000-007F6 |
| E6           | 3500 K | P4                                  | 80.6      | XPCWHT-L1-0000-009E6 |
|              |        | P3                                  | 73.9      | XPCWHT-L1-0000-008E6 |
|              |        | P2                                  | 67.2      | XPCWHT-L1-0000-007E6 |
| F7           | 3250 K | P3                                  | 73.9      | XPCWHT-L1-0000-008F7 |
|              |        | P2                                  | 67.2      | XPCWHT-L1-0000-007F7 |
|              |        | N4                                  | 62        | XPCWHT-L1-0000-006F7 |
| E7           | 3000 K | P3                                  | 73.9      | XPCWHT-L1-0000-008E7 |
|              |        | P2                                  | 67.2      | XPCWHT-L1-0000-007E7 |
|              |        | N4                                  | 62        | XPCWHT-L1-0000-006E7 |
| F8           | 2850 K | P2                                  | 67.2      | XPCWHT-L1-0000-007F8 |
|              |        | N4                                  | 62        | XPCWHT-L1-0000-006F8 |
|              |        | N3                                  | 56.8      | XPCWHT-L1-0000-005F8 |
| E8           | 2700 K | P2                                  | 67.2      | XPCWHT-L1-0000-007E8 |
|              |        | N4                                  | 62        | XPCWHT-L1-0000-006E8 |
|              |        | N3                                  | 56.8      | XPCWHT-L1-0000-005E8 |

### 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 29).
- Cree XLamp XP-C 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 - COLOR ( $T_J = 25\text{ }^{\circ}\text{C}$ )

The following tables provide order codes for XLamp XP-C color LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 27).

| Color      | Minimum Radiant Flux @ 350 mA |     | Calculated Minimum Radiant Flux @ 125 mA* | Dominant Wavelength (nm) |          |         |          | Order Codes          |
|------------|-------------------------------|-----|-------------------------------------------|--------------------------|----------|---------|----------|----------------------|
|            |                               |     |                                           | Minimum                  |          | Maximum |          |                      |
|            |                               |     |                                           | Group                    | DWL (nm) | Group   | DWL (nm) |                      |
| Royal Blue | 12                            | 250 | 104                                       | D3                       | 450      | D5      | 465      | XPCROY-L1-0000-00701 |
|            |                               |     |                                           | D3                       | 450      | D4      | 460      | XPCROY-L1-0000-00702 |
|            |                               |     |                                           | D4                       | 455      | D5      | 465      | XPCROY-L1-0000-00703 |
|            | 13                            | 300 | 124                                       | D3                       | 450      | D5      | 465      | XPCROY-L1-0000-00801 |
|            |                               |     |                                           | D3                       | 450      | D4      | 460      | XPCROY-L1-0000-00802 |
|            |                               |     |                                           | D4                       | 455      | D5      | 465      | XPCROY-L1-0000-00803 |
|            | 14                            | 350 | 145                                       | D3                       | 450      | D5      | 465      | XPCROY-L1-0000-00901 |
|            |                               |     |                                           | D3                       | 450      | D4      | 460      | XPCROY-L1-0000-00902 |

| Color | Minimum Luminous Flux<br>@ 350 mA |           | Calculated Minimum<br>Luminous Flux<br>@ 125 mA* | Dominant Wavelength (nm) |       |          |       | Order Codes          |
|-------|-----------------------------------|-----------|--------------------------------------------------|--------------------------|-------|----------|-------|----------------------|
|       |                                   |           |                                                  | Minimum                  |       | Maximum  |       |                      |
|       | Group                             | Flux (lm) |                                                  | Flux (lm)                | Group | DWL (nm) | Group |                      |
| Blue  | J                                 | 23.5      | 10.8                                             | B3                       | 465   | B6       | 485   | XPCBLU-L1-0000-00W01 |
|       |                                   |           |                                                  | B3                       | 465   | B5       | 480   | XPCBLU-L1-0000-00W02 |
|       |                                   |           |                                                  | B4                       | 470   | B5       | 480   | XPCBLU-L1-0000-00W05 |
|       | K2                                | 30.6      | 13.8                                             | B3                       | 465   | B6       | 485   | XPCBLU-L1-0000-00Y01 |
|       |                                   |           |                                                  | B3                       | 465   | B5       | 480   | XPCBLU-L1-0000-00Y02 |
|       |                                   |           |                                                  | B4                       | 470   | B5       | 480   | XPCBLU-L1-0000-00Y05 |
|       | K3                                | 35.2      | 15.9                                             | B3                       | 465   | B6       | 485   | XPCBLU-L1-0000-00Z01 |
|       |                                   |           |                                                  | B3                       | 465   | B5       | 480   | XPCBLU-L1-0000-00Z02 |
|       |                                   |           |                                                  | B4                       | 470   | B5       | 480   | XPCBLU-L1-0000-00Z05 |

### 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 29).
- Cree XLamp XP-C 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 values at 125 mA are calculated and for reference only.

# FLUX CHARACTERISTICS - COLOR ( $T_J = 25^\circ\text{C}$ ) - CONTINUED

| Color | Minimum Luminous Flux<br>(@ 350 mA) |           | Calculated Minimum<br>Luminous Flux<br>@ 125 mA* | Dominant Wavelength (nm) |       |          |       | Order Codes          |
|-------|-------------------------------------|-----------|--------------------------------------------------|--------------------------|-------|----------|-------|----------------------|
|       |                                     |           |                                                  | Minimum                  |       | Maximum  |       |                      |
|       | Group                               | Flux (lm) |                                                  | Flux (lm)                | Group | DWL (nm) | Group |                      |
| Green | N3                                  | 56.8      | 28.2                                             | G2                       | 520   | G4       | 535   | XPCGRN-L1-0000-00501 |
|       |                                     |           |                                                  | G2                       | 520   | G3       | 530   | XPCGRN-L1-0000-00502 |
|       |                                     |           |                                                  | G3                       | 525   | G4       | 535   | XPCGRN-L1-0000-00503 |
|       | N4                                  | 62.0      | 30.8                                             | G2                       | 520   | G4       | 535   | XPCGRN-L1-0000-00601 |
|       |                                     |           |                                                  | G2                       | 520   | G3       | 530   | XPCGRN-L1-0000-00602 |
|       |                                     |           |                                                  | G3                       | 525   | G4       | 535   | XPCGRN-L1-0000-00603 |
|       | P2                                  | 67.2      | 33.3                                             | G2                       | 520   | G4       | 535   | XPCGRN-L1-0000-00701 |
|       |                                     |           |                                                  | G2                       | 520   | G3       | 530   | XPCGRN-L1-0000-00702 |
|       |                                     |           |                                                  | G3                       | 525   | G4       | 535   | XPCGRN-L1-0000-00703 |
|       | P3                                  | 73.9      | 36.7                                             | G2                       | 520   | G4       | 535   | XPCGRN-L1-0000-00801 |
|       |                                     |           |                                                  | G2                       | 520   | G3       | 530   | XPCGRN-L1-0000-00802 |
|       |                                     |           |                                                  | G3                       | 525   | G4       | 535   | XPCGRN-L1-0000-00803 |
|       | P4                                  | 80.6      | 40.0                                             | G2                       | 520   | G4       | 535   | XPCGRN-L1-0000-00901 |
|       |                                     |           |                                                  | G2                       | 520   | G3       | 530   | XPCGRN-L1-0000-00902 |
|       |                                     |           |                                                  | G3                       | 525   | G4       | 535   | XPCGRN-L1-0000-00903 |

| Color | Minimum Luminous Flux<br>@ 350 mA |           | Calculated Minimum<br>Luminous Flux<br>@ 125 mA* | Dominant Wavelength (nm) |       |          |       | Order Codes          |
|-------|-----------------------------------|-----------|--------------------------------------------------|--------------------------|-------|----------|-------|----------------------|
|       |                                   |           |                                                  | Minimum                  |       | Maximum  |       |                      |
|       | Group                             | Flux (lm) |                                                  | Flux (lm)                | Group | DWL (nm) | Group |                      |
| Amber | M2                                | 39.8      | 14.9                                             | A2                       | 585   | A3       | 595   | XPCAMB-L1-0000-00201 |
|       |                                   |           |                                                  | A3                       | 590   | A3       | 595   | XPCAMB-L1-0000-00203 |
|       | M3                                | 45.7      | 17.1                                             | A2                       | 585   | A3       | 595   | XPCAMB-L1-0000-00301 |
|       |                                   |           |                                                  | A3                       | 590   | A3       | 595   | XPCAMB-L1-0000-00303 |
|       | N2                                | 51.7      | 19.4                                             | A2                       | 585   | A3       | 595   | XPCAMB-L1-0000-00401 |
|       |                                   |           |                                                  | A3                       | 590   | A3       | 595   | XPCAMB-L1-0000-00403 |
|       | N3                                | 56.8      | 21.3                                             | A2                       | 585   | A3       | 595   | XPCAMB-L1-0000-00501 |
|       |                                   |           |                                                  | A3                       | 590   | A3       | 595   | XPCAMB-L1-0000-00503 |
|       | N4                                | 62.0      | 23.3                                             | A2                       | 585   | A3       | 595   | XPCAMB-L1-0000-00601 |
|       |                                   |           |                                                  | A3                       | 590   | A3       | 595   | XPCAMB-L1-0000-00603 |

## 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 29).
- Cree XLamp XP-C 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 values at 125 mA are calculated and for reference only.

# FLUX CHARACTERISTICS - COLOR ( $T_J = 25\text{ }^{\circ}\text{C}$ ) - CONTINUED

| Color      | Minimum Luminous Flux<br>@ 350 mA |           | Calculated Minimum<br>Luminous Flux<br>@ 125 mA* | Dominant Wavelength (nm) |       |          |       | Order Codes          |
|------------|-----------------------------------|-----------|--------------------------------------------------|--------------------------|-------|----------|-------|----------------------|
|            |                                   |           |                                                  | Minimum                  |       | Maximum  |       |                      |
|            | Group                             | Flux (lm) |                                                  | Flux (lm)                | Group | DWL (nm) | Group |                      |
| Red-Orange | N2                                | 51.7      | 19.8                                             | O3                       | 610   | O4       | 620   | XPCRDO-L1-0000-00401 |
|            |                                   |           |                                                  | O3                       | 610   | O3       | 615   | XPCRDO-L1-0000-00402 |
|            |                                   |           |                                                  | O4                       | 615   | O4       | 620   | XPCRDO-L1-0000-00403 |
|            | N3                                | 56.8      | 21.7                                             | O3                       | 610   | O4       | 620   | XPCRDO-L1-0000-00501 |
|            |                                   |           |                                                  | O3                       | 610   | O3       | 615   | XPCRDO-L1-0000-00502 |
|            |                                   |           |                                                  | O4                       | 615   | O4       | 620   | XPCRDO-L1-0000-00503 |
|            | N4                                | 62.0      | 23.7                                             | O3                       | 610   | O4       | 620   | XPCRDO-L1-0000-00601 |
|            |                                   |           |                                                  | O3                       | 610   | O3       | 615   | XPCRDO-L1-0000-00602 |
|            |                                   |           |                                                  | O4                       | 615   | O4       | 620   | XPCRDO-L1-0000-00603 |
|            | P2                                | 67.2      | 25.7                                             | O3                       | 610   | O4       | 620   | XPCRDO-L1-0000-00701 |
|            |                                   |           |                                                  | O3                       | 610   | O3       | 615   | XPCRDO-L1-0000-00702 |
|            |                                   |           |                                                  | O4                       | 615   | O4       | 620   | XPCRDO-L1-0000-00703 |

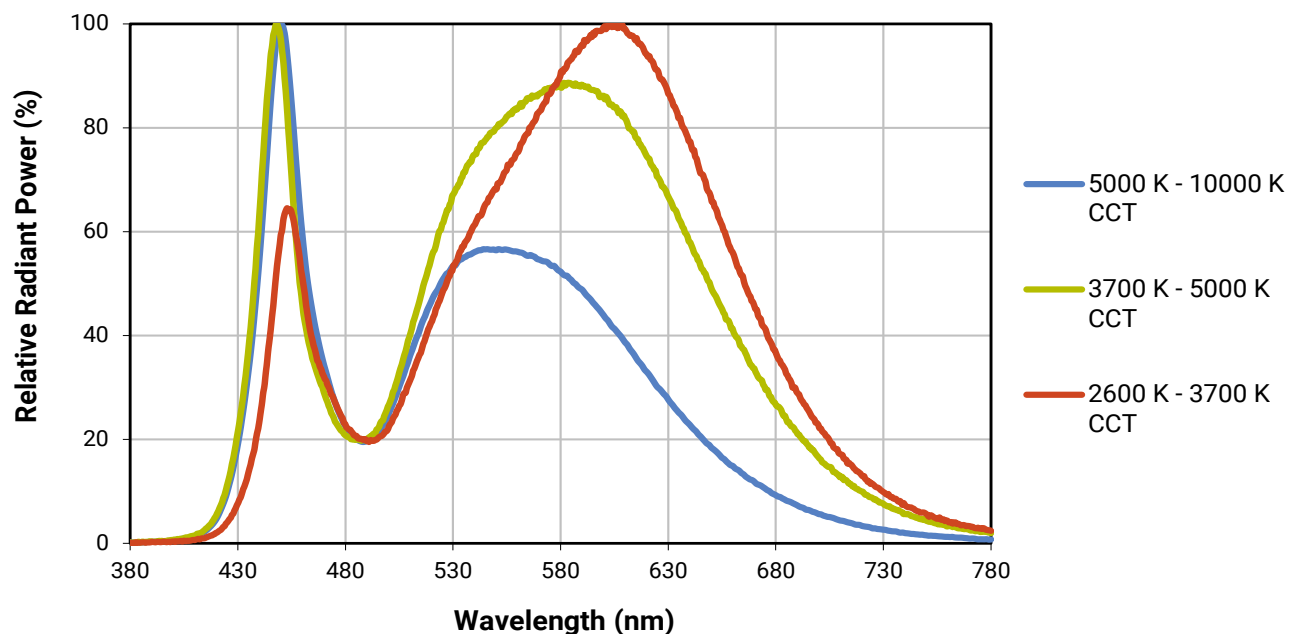
| Color | Minimum Luminous Flux<br>(@ 350 mA) |           | Calculated Minimum<br>Luminous Flux<br>@ 125 mA* | Dominant Wavelength (nm) |          |         |          | Order Codes          |
|-------|-------------------------------------|-----------|--------------------------------------------------|--------------------------|----------|---------|----------|----------------------|
|       |                                     |           |                                                  | Minimum                  |          | Maximum |          |                      |
|       | Group                               | Flux (lm) | Flux (lm)                                        | Group                    | DWL (nm) | Group   | DWL (nm) |                      |
| Red   | M2                                  | 39.8      | 15.2                                             | R2                       | 620      | R3      | 630      | XPCRED-L1-0000-00201 |
|       |                                     |           |                                                  | R2                       | 620      | R2      | 625      | XPCRED-L1-0000-00202 |
|       | M3                                  | 45.7      | 17.5                                             | R2                       | 620      | R3      | 630      | XPCRED-L1-0000-00301 |
|       |                                     |           |                                                  | R2                       | 620      | R2      | 625      | XPCRED-L1-0000-00302 |
|       | N2                                  | 51.7      | 19.7                                             | R2                       | 620      | R3      | 630      | XPCRED-L1-0000-00401 |
|       |                                     |           |                                                  | R2                       | 620      | R2      | 625      | XPCRED-L1-0000-00402 |
|       | N3                                  | 56.8      | 21.7                                             | R2                       | 620      | R3      | 630      | XPCRED-L1-0000-00501 |
|       |                                     |           |                                                  | R2                       | 620      | R2      | 625      | XPCRED-L1-0000-00502 |

## Notes:

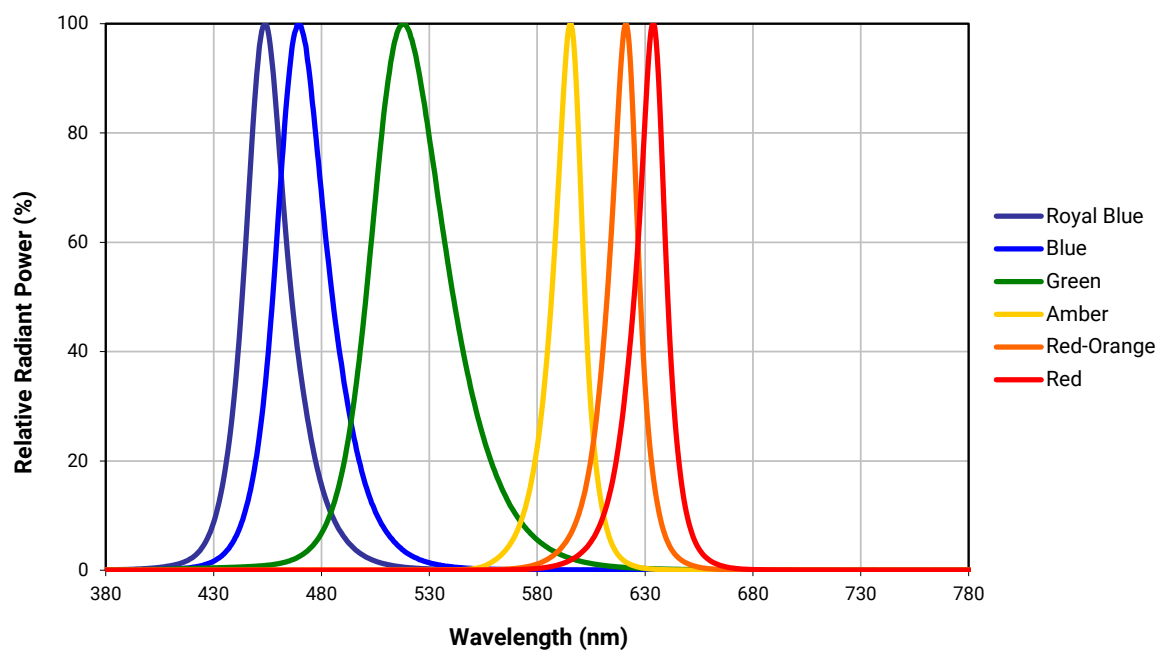
- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 29).
- Cree XLamp XP-C LED order codes specify only a minimum flux bin and not a maximum. 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 values at 125 mA are calculated and for reference only.

## RELATIVE SPECTRAL POWER DISTRIBUTION

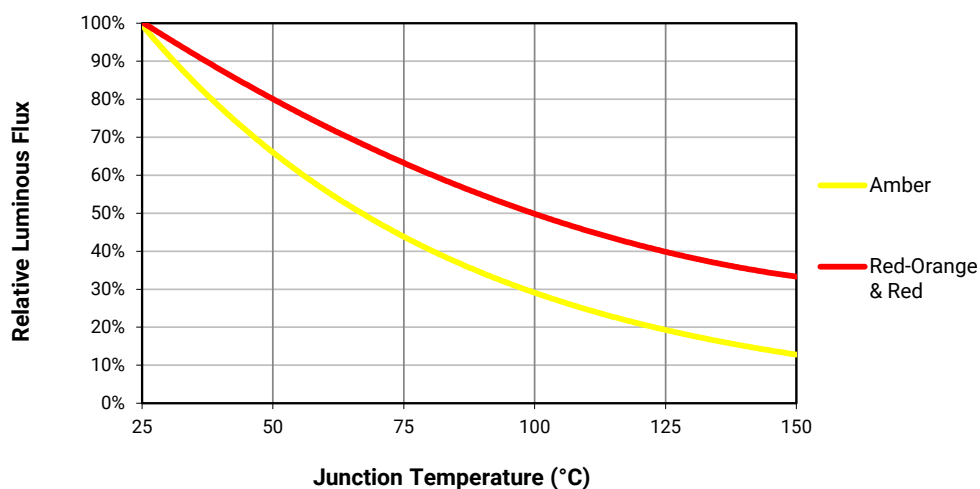
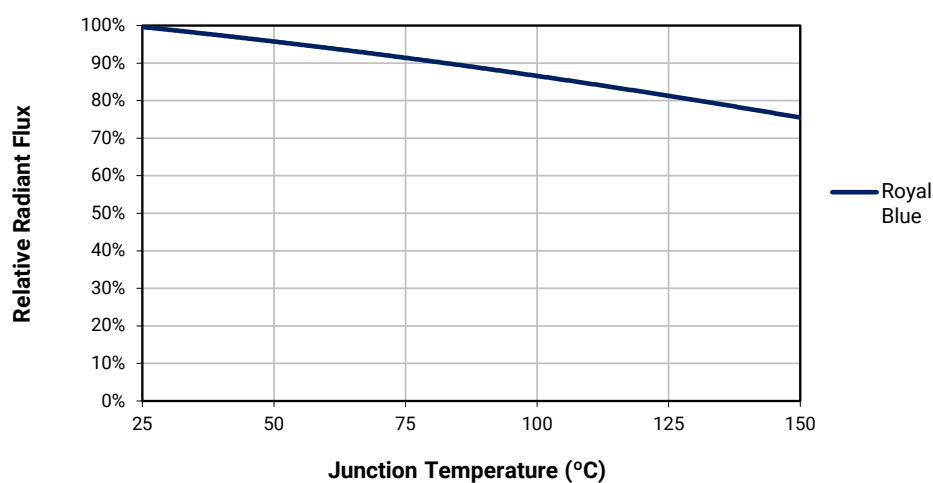
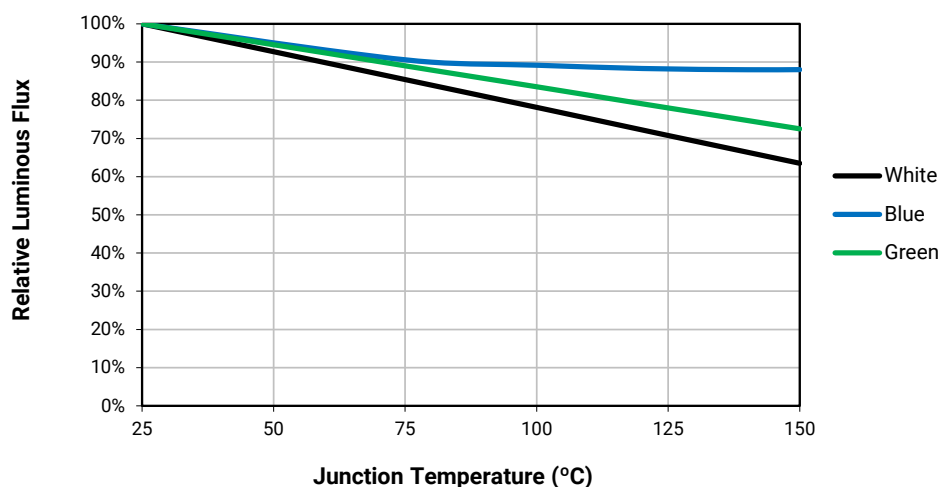
### White



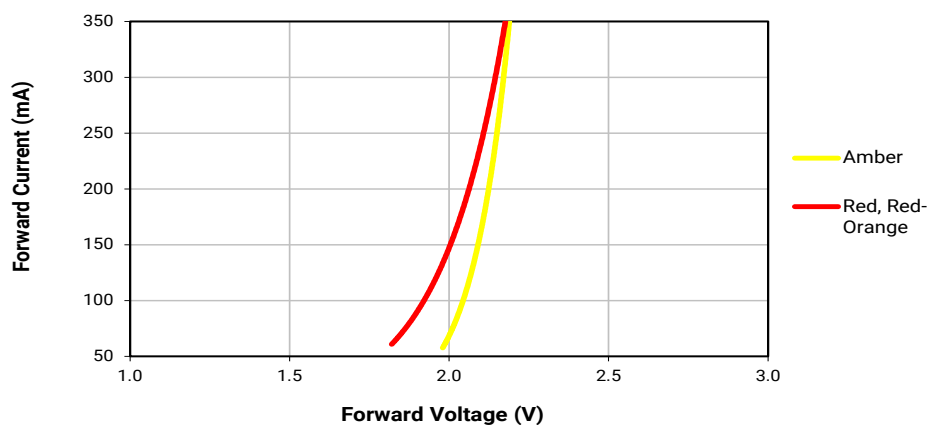
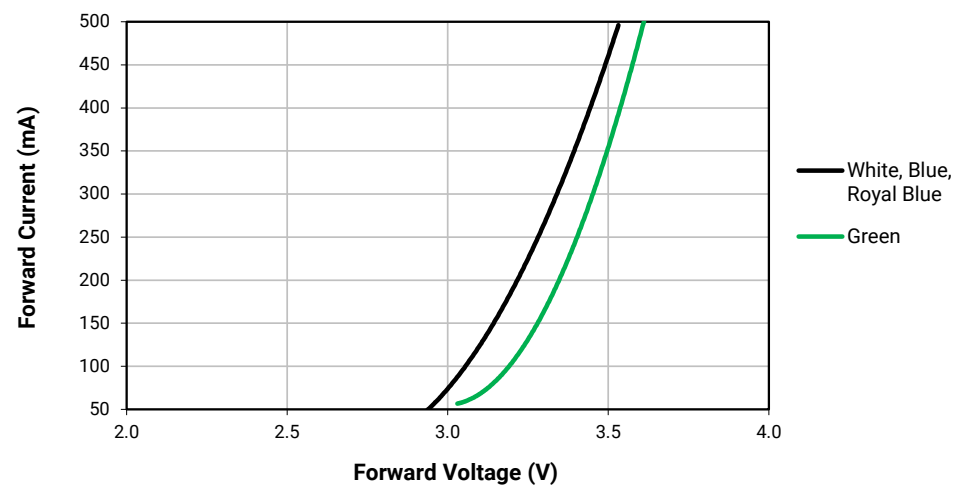
### Color



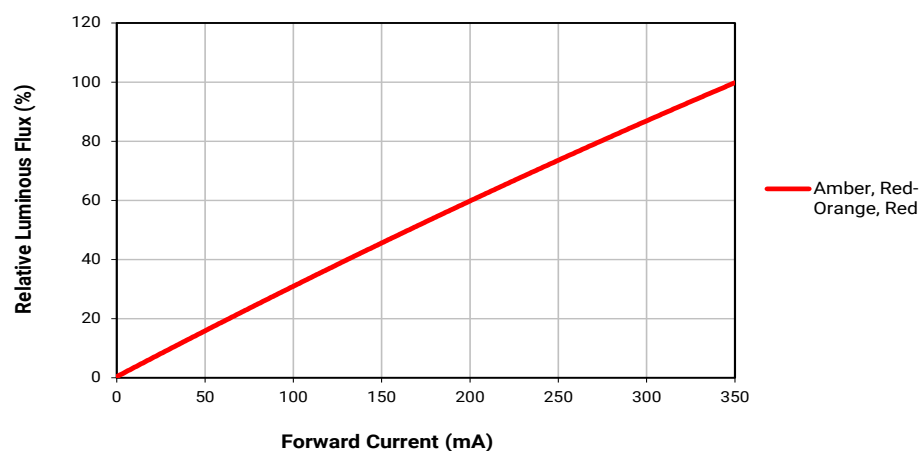
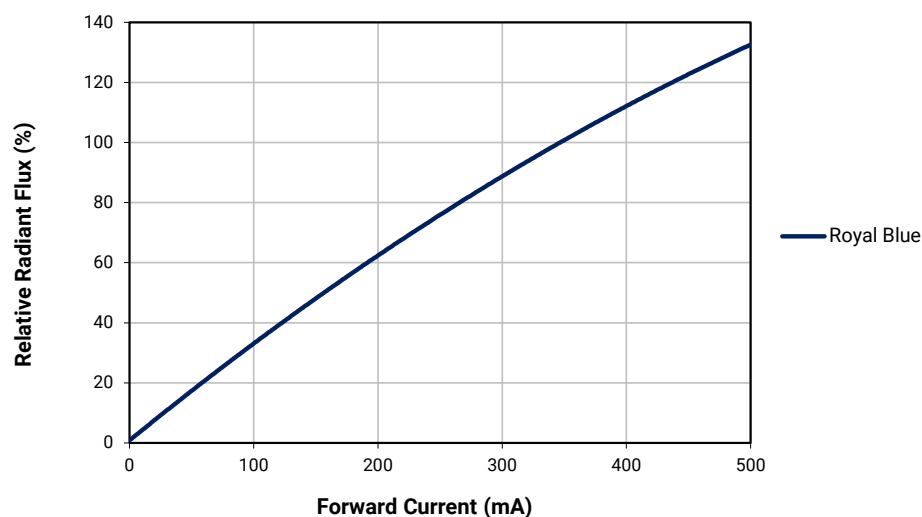
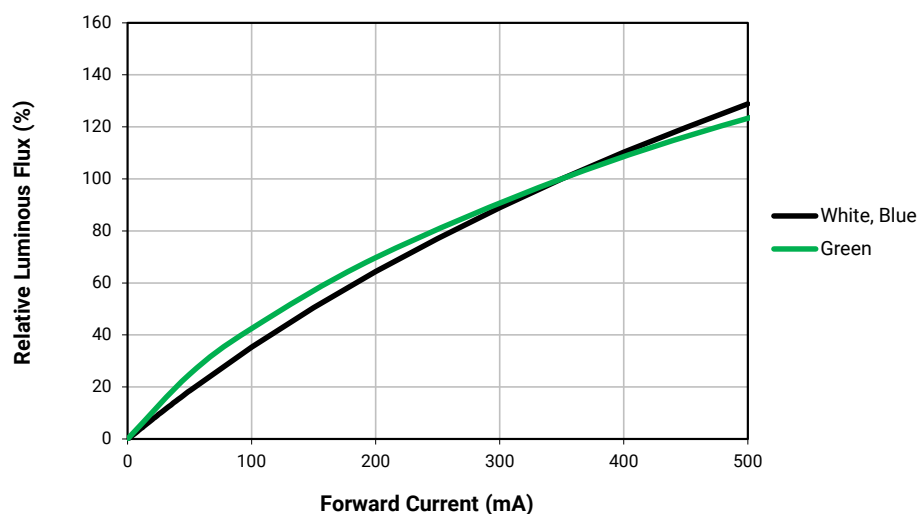
# RELATIVE FLUX VS. JUNCTION TEMPERATURE ( $I_F = 350$ mA)



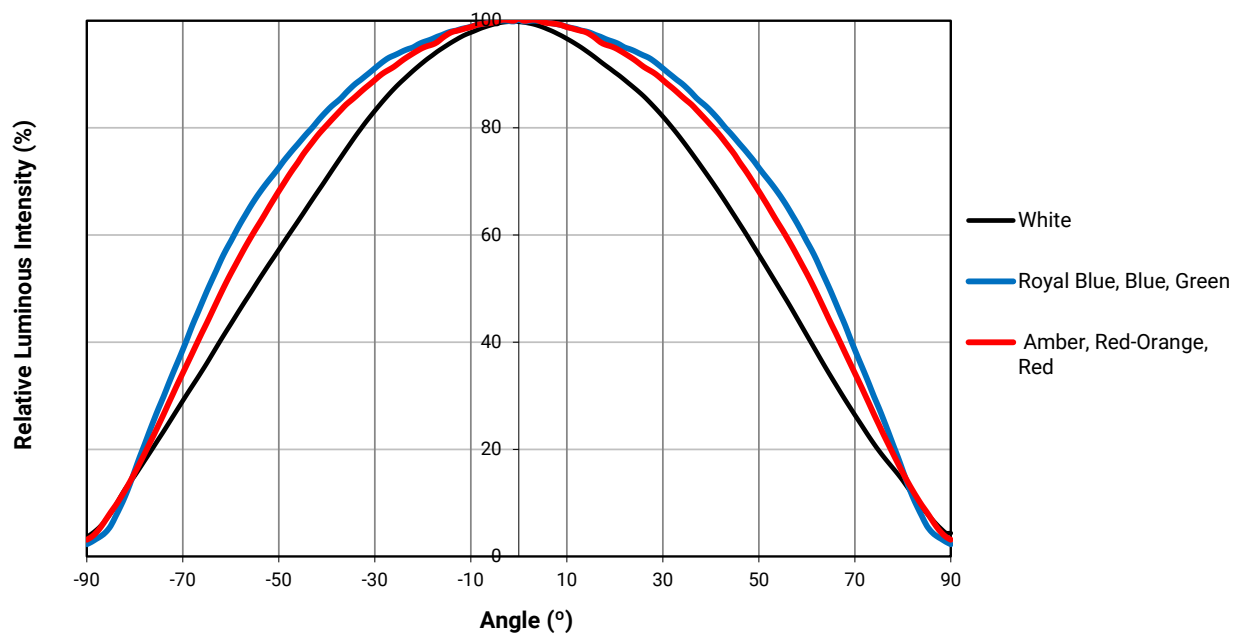
## ELECTRICAL CHARACTERISTICS ( $T_j = 25^\circ\text{C}$ )



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



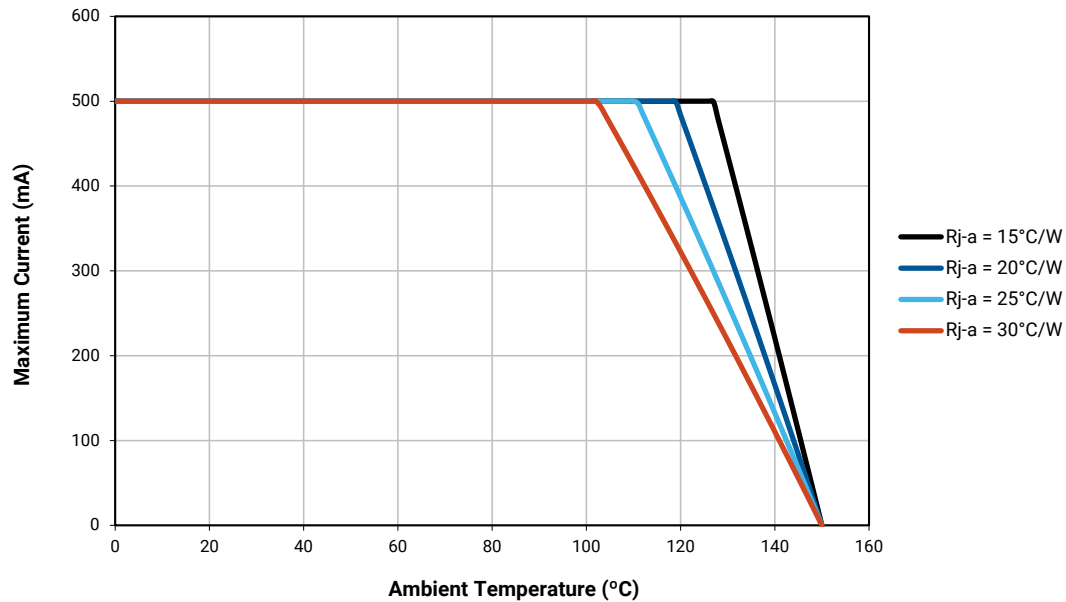
## TYPICAL SPATIAL DISTRIBUTION



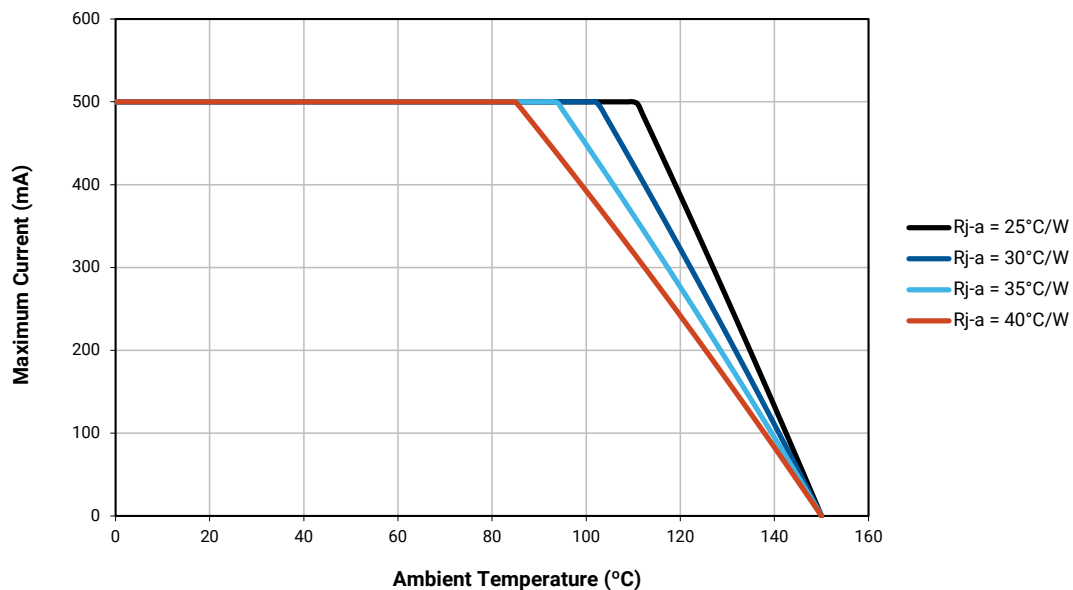
## THERMAL DESIGN

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.

### White, Royal Blue, Blue

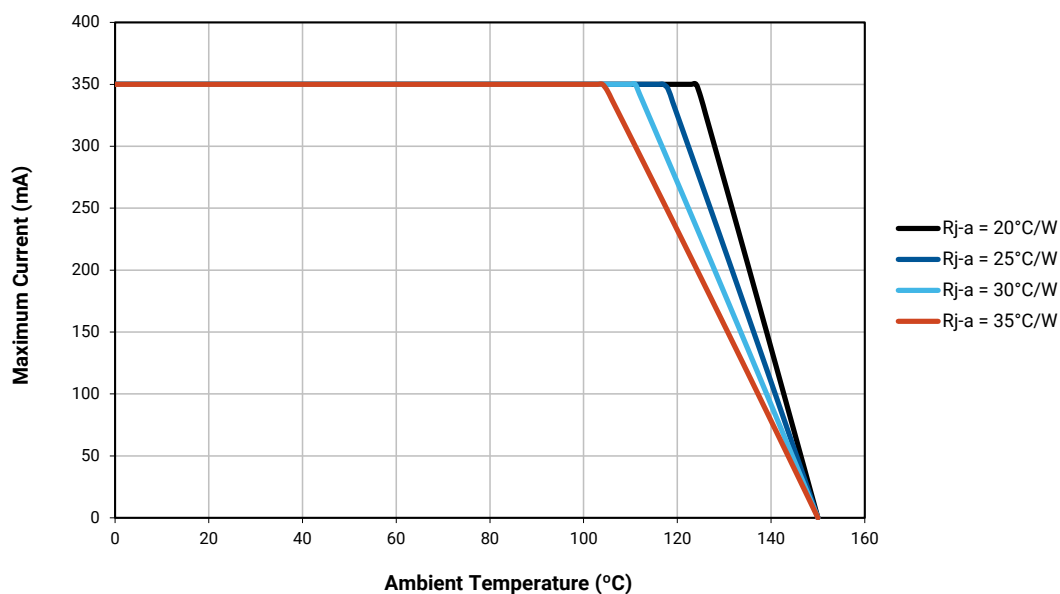


### Green

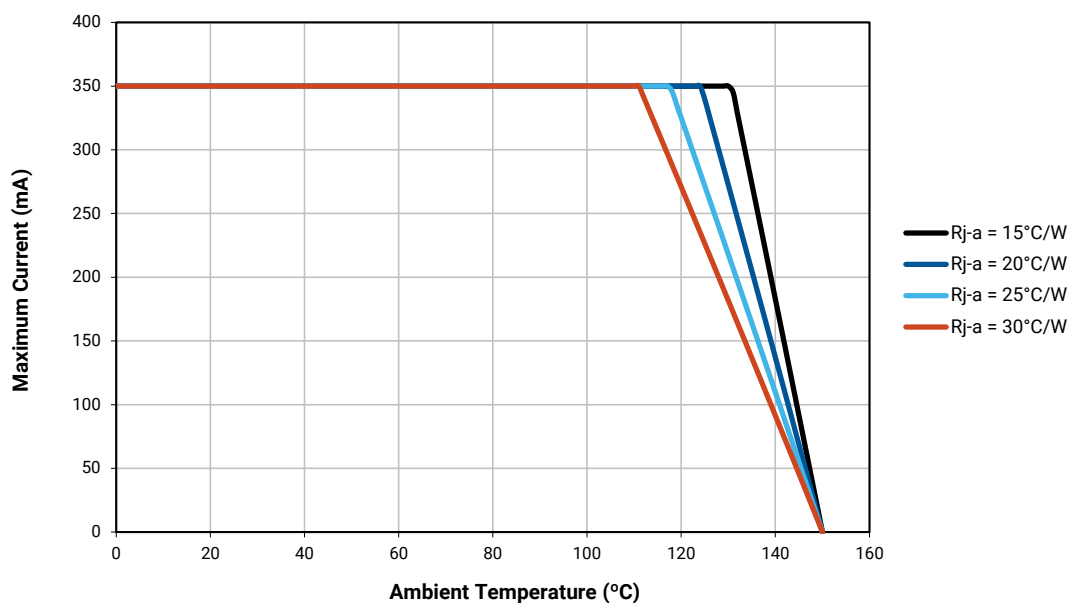


## THERMAL DESIGN - CONTINUED

### Amber



### Red-Orange, Red



## PERFORMANCE GROUPS - LUMINOUS FLUX

XLamp XP-C LEDs (except royal blue) 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 |
|------------|-------------------------------------|-------------------------------------|
| J          | 23.5                                | 30.6                                |
| K2         | 30.6                                | 35.2                                |
| K3         | 35.2                                | 39.8                                |
| M2         | 39.8                                | 45.7                                |
| M3         | 45.7                                | 51.7                                |
| N2         | 51.7                                | 56.8                                |
| N3         | 56.8                                | 62.0                                |
| N4         | 62.0                                | 67.2                                |
| 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                                 |

## PERFORMANCE GROUPS - RADIANT FLUX ( $T_J = 25\text{ }^{\circ}\text{C}$ )

XLamp XP-C royal blue LEDs are tested for radiant flux and sorted into one of the following radiant-flux bins:

| Group | Minimum Radiant Flux (mW) @ 350 mA | Maximum Radiant Flux (mW) @ 350 mA |
|-------|------------------------------------|------------------------------------|
| 12    | 250                                | 300                                |
| 13    | 300                                | 350                                |
| 14    | 350                                | 425                                |

## PERFORMANCE GROUPS - CHROMATICITY

White XLamp XP-C LEDs are tested for chromaticity and placed into one of the regions defined by the bounding coordinates on the following pages.

| Region | x    | y    | Region | x    | y    |
|--------|------|------|--------|------|------|
| WK     | .283 | .284 | WF     | .314 | .355 |
|        | .295 | .297 |        | .316 | .332 |
|        | .298 | .288 |        | .306 | .322 |
|        | .287 | .276 |        | .301 | .342 |
| WA     | .292 | .306 | WP     | .317 | .319 |
|        | .295 | .297 |        | .329 | .330 |
|        | .283 | .284 |        | .329 | .318 |
|        | .279 | .291 |        | .318 | .308 |
| WM     | .295 | .297 | WD     | .329 | .345 |
|        | .308 | .311 |        | .329 | .330 |
|        | .310 | .300 |        | .317 | .319 |
|        | .298 | .288 |        | .316 | .332 |
| WB     | .306 | .322 | WG     | .329 | .369 |
|        | .308 | .311 |        | .329 | .345 |
|        | .295 | .297 |        | .316 | .332 |
|        | .292 | .306 |        | .314 | .355 |
| WE     | .301 | .342 | WJ     | .329 | .330 |
|        | .306 | .322 |        | .329 | .345 |
|        | .292 | .306 |        | .346 | .359 |
|        | .287 | .321 |        | .344 | .342 |
| WN     | .308 | .311 | WH     | .348 | .384 |
|        | .317 | .319 |        | .346 | .359 |
|        | .318 | .308 |        | .329 | .345 |
|        | .310 | .300 |        | .329 | .369 |
| WC     | .316 | .332 |        |      |      |
|        | .317 | .319 |        |      |      |
|        | .308 | .311 |        |      |      |
|        | .306 | .322 |        |      |      |

# PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

| 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 |        |        |        |        |        |        |
|        | 0.3440 | 0.3428 |        | 0.3480 | 0.3840 |        |        |        |        |        |        |
|        | 0.3429 | 0.3307 |        | 0.3463 | 0.3687 |        |        |        |        |        |        |
|        | 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 |
| 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 |

# PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

| Region | x      | y      | Region | x      | y      | Region | x      | y      | Region | x      | y      |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 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 |
| 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 |

# PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

| Region | x      | y      | Region | x      | y      | Region | x      | y      | Region | x      | y      |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 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 |

## PERFORMANCE GROUPS - DOMINANT WAVELENGTH

Color XLamp XP-C LEDs are tested for dominant wavelength (DWL) and sorted into one of the DWL bins defined below.

| Color      | DWL Group | Minimum DWL (nm)<br>@ 350 mA | Maximum DWL (nm)<br>@ 350 mA |
|------------|-----------|------------------------------|------------------------------|
| Royal Blue | D3        | 450                          | 455                          |
|            | D4        | 455                          | 460                          |
|            | D5        | 460                          | 465                          |
| Blue       | B3        | 465                          | 470                          |
|            | B4        | 470                          | 475                          |
|            | B5        | 475                          | 480                          |
|            | B6        | 480                          | 485                          |
| Green      | G2        | 520                          | 525                          |
|            | G3        | 525                          | 530                          |
|            | G4        | 530                          | 535                          |
| Amber      | A2        | 585                          | 590                          |
|            | A3        | 590                          | 595                          |
| Red-Orange | O3        | 610                          | 615                          |
|            | O4        | 615                          | 620                          |
| Red        | R2        | 620                          | 625                          |
|            | R3        | 625                          | 630                          |

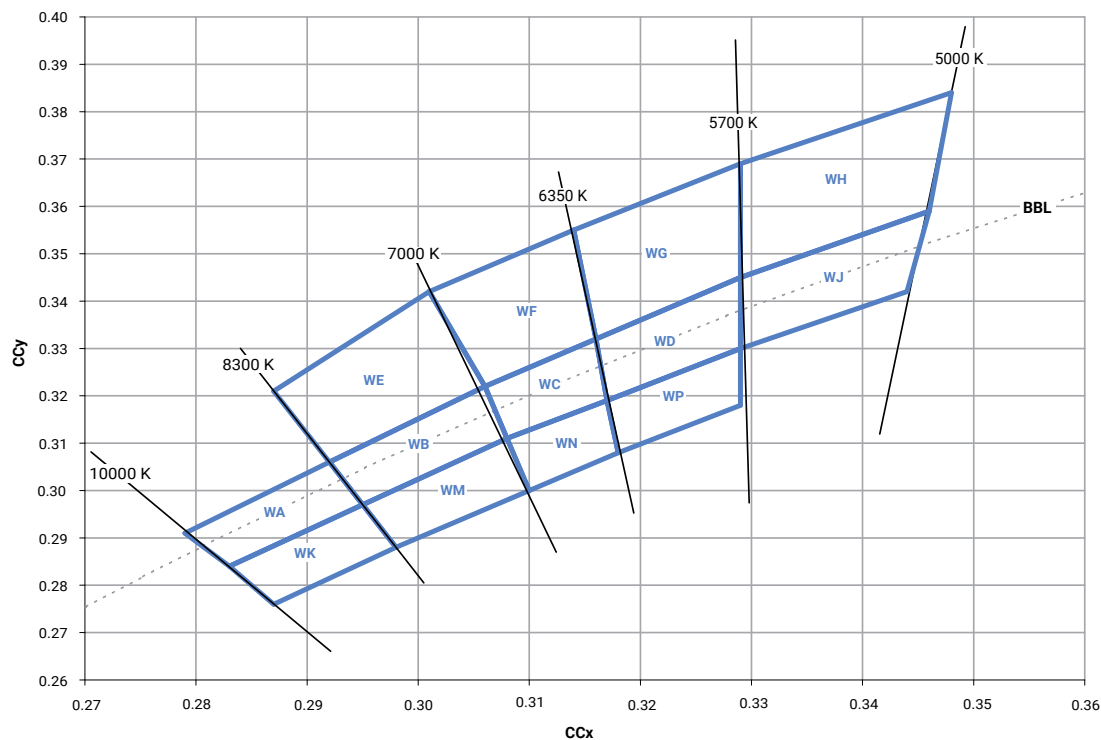
## PERFORMANCE GROUPS - FORWARD VOLTAGE

Amber, red-orange and, red XLamp XP-C LEDs are tested for forward voltage and sorted into one of the forward voltage bins defined below.

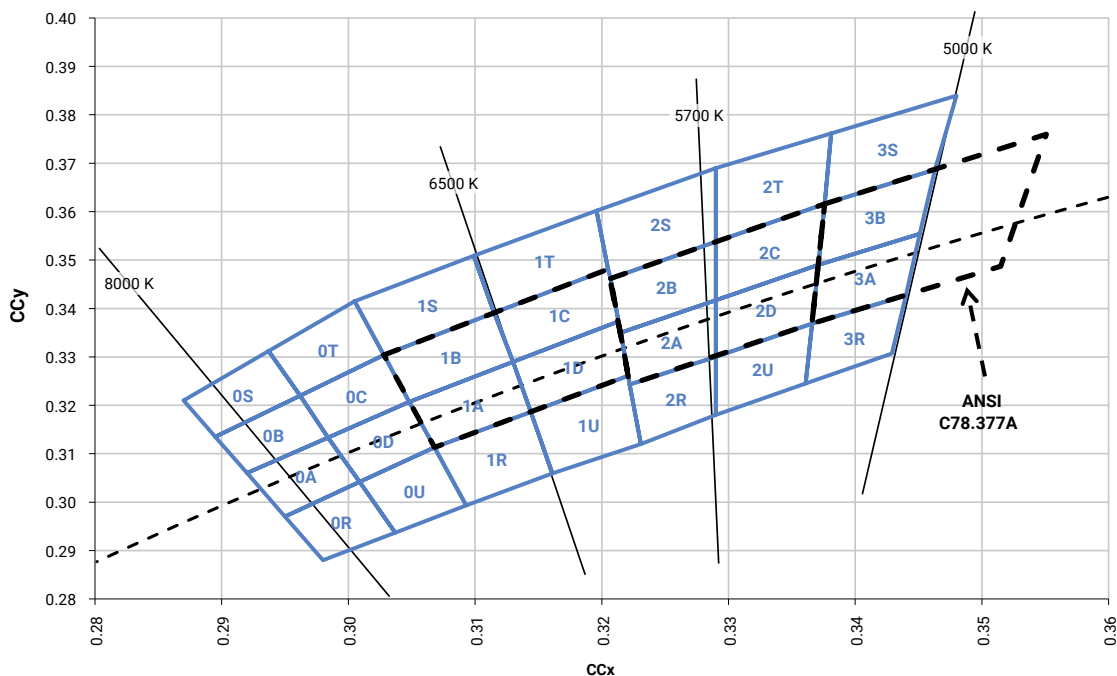
| Forward Voltage Group | Minimum Forward Voltage (V) @ 350 mA | Maximum Forward Voltage (V) @ 350 mA |
|-----------------------|--------------------------------------|--------------------------------------|
| B                     | 1.75                                 | 2.0                                  |
| C                     | 2.0                                  | 2.25                                 |
| D                     | 2.25                                 | 2.5                                  |
| E                     | 2.5                                  | 2.75                                 |
| F                     | 2.75                                 | 3.0                                  |
| G                     | 3.0                                  | 3.25                                 |
| H                     | 3.25                                 | 3.5                                  |
| J                     | 3.5                                  | 3.75                                 |

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

## Cool White

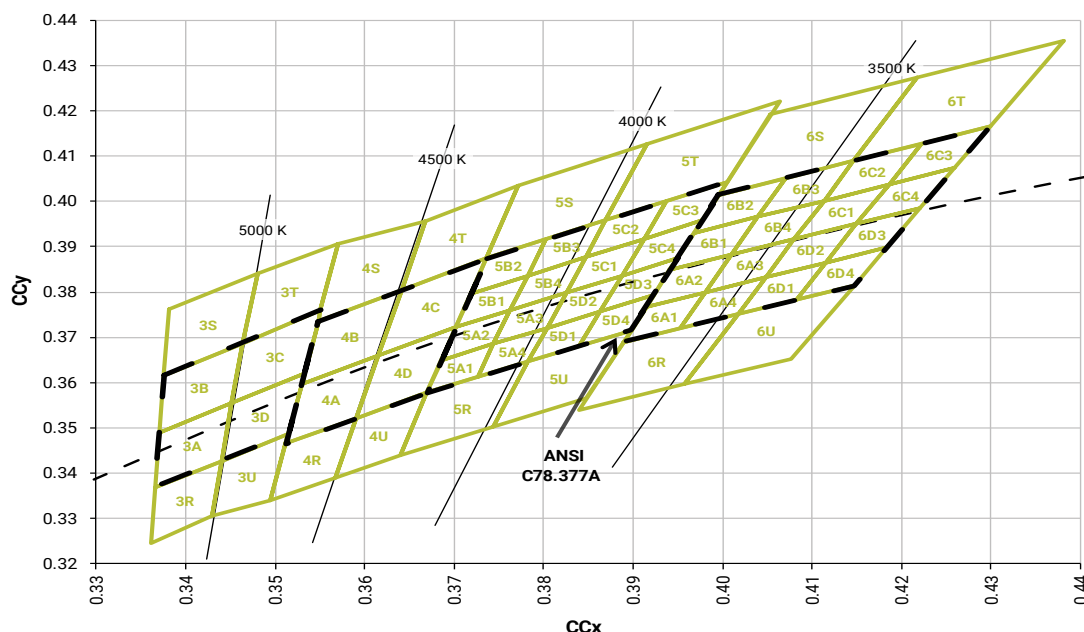


## ANSI Cool White

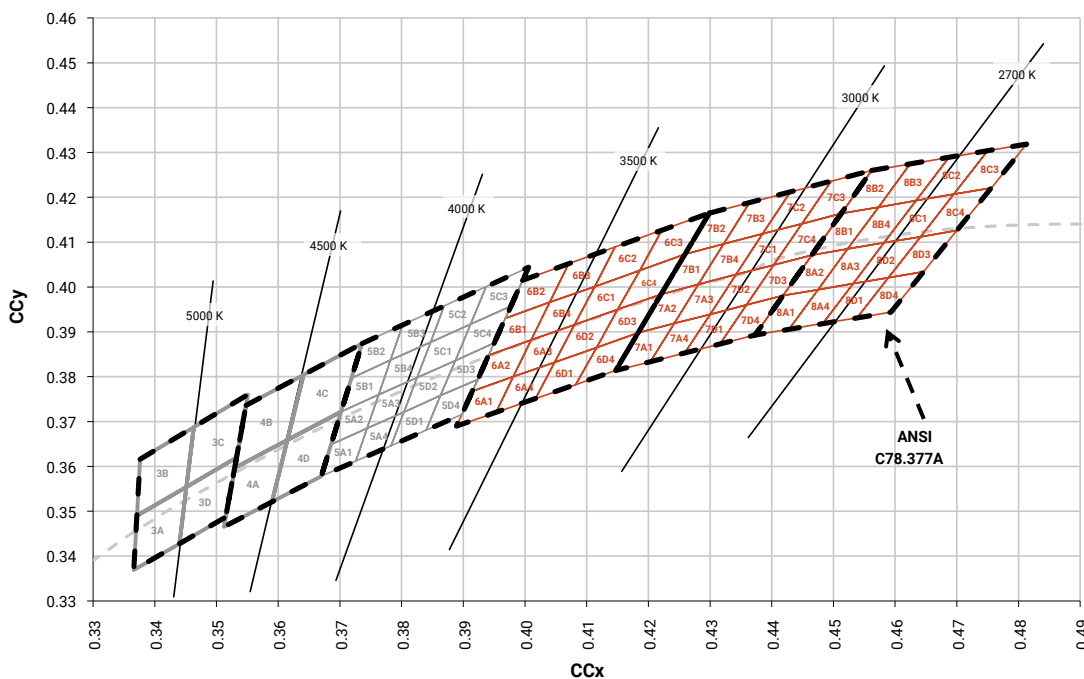


## CREE'S STANDARD CHROMATICITY REGIONS PLOTTED ON THE 1931 CIE CURVE - CONTINUED

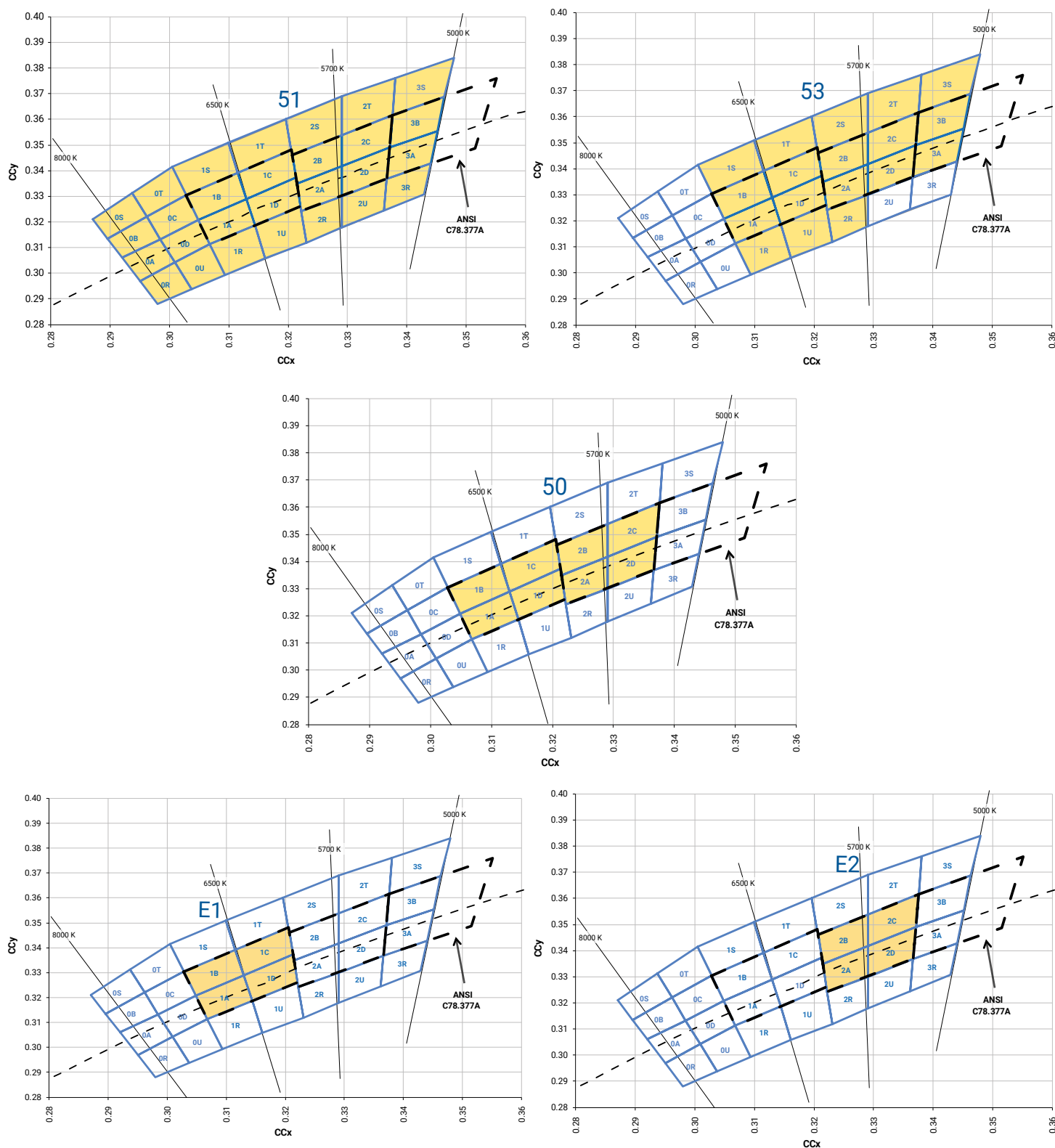
### Neutral White



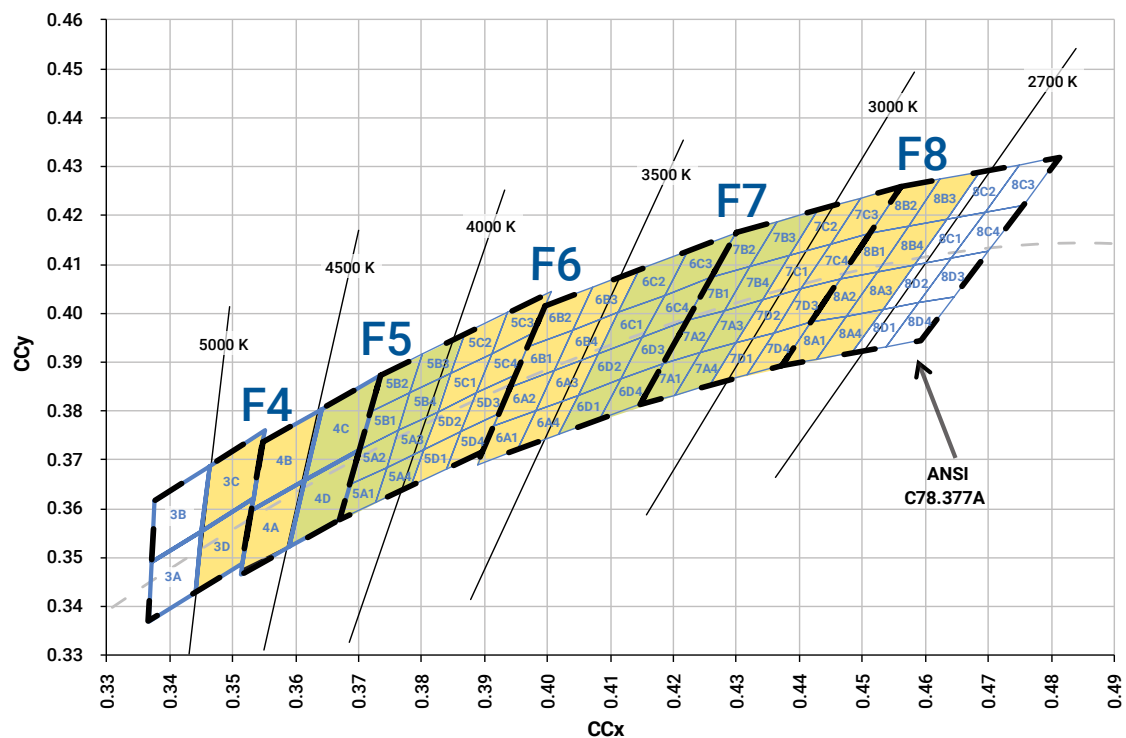
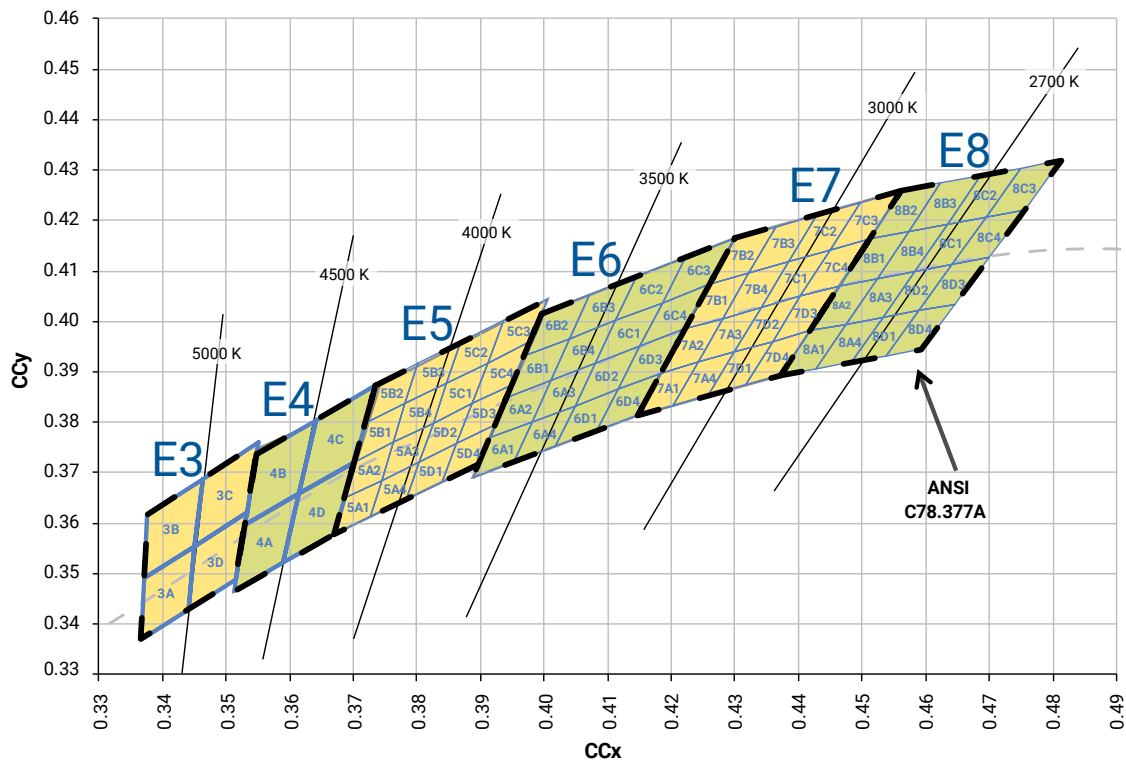
### ANSI Neutral White and ANSI Warm White



## 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**



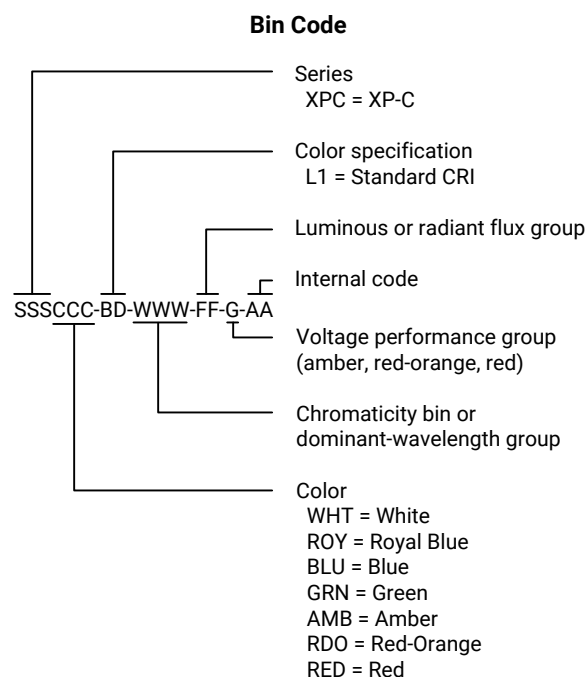
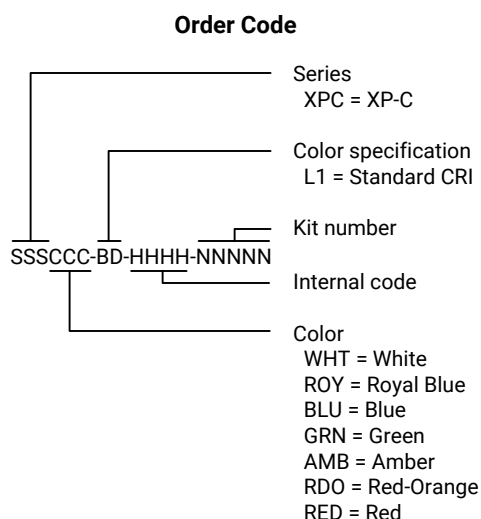
## CREE'S STANDARD CHROMATICITY KITS

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                                 |
| 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                                 |
|               | 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                                 |
|               | 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                                 |

## BIN AND ORDER CODE FORMATS

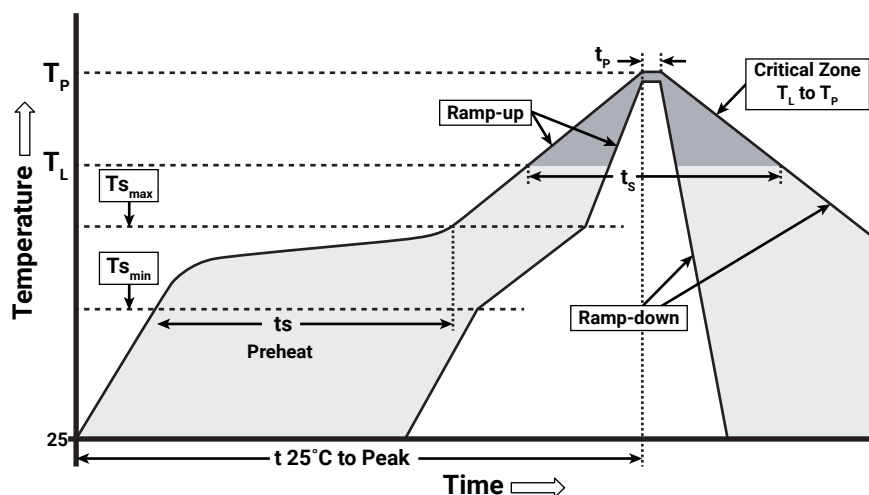
XP-C bin codes and order codes are configured in the following manner:



## REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XP-C 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 ( $t_t$ )                 | 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

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### 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.

### 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-C 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.

### 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](#).

**NOTES - CONTINUED**

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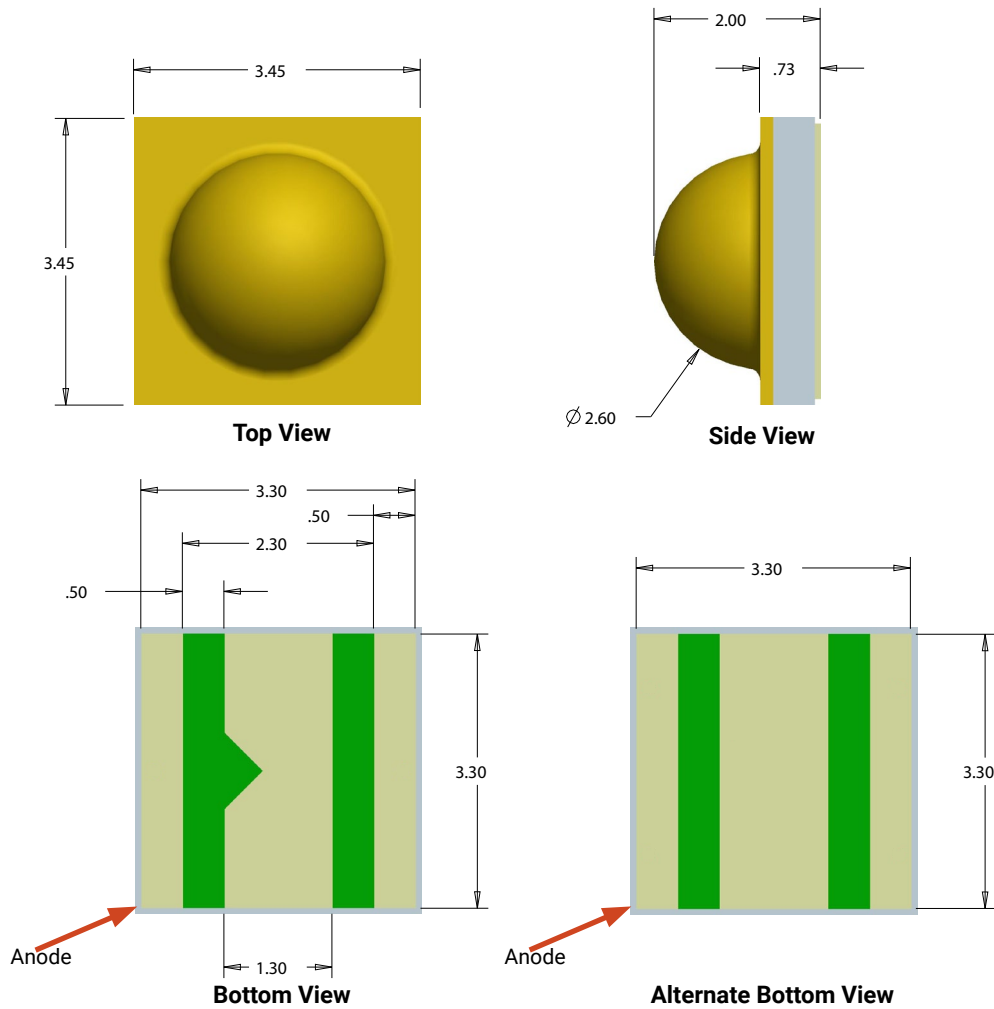
**Intellectual Property**

For remote phosphor applications, a separate license to certain Cree patents is required.

## MECHANICAL DIMENSIONS (T<sub>A</sub> = 25 °C)

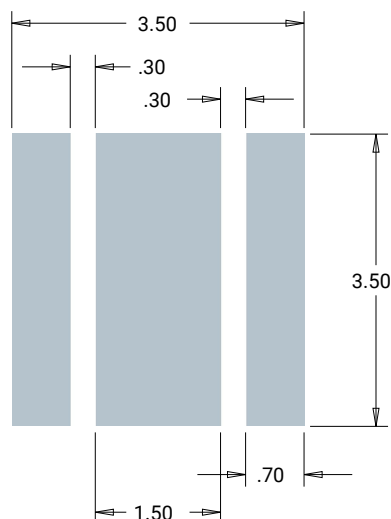
Thermal vias, if present, are not shown on these drawings.

All measurements are ±.13 mm unless otherwise indicated.

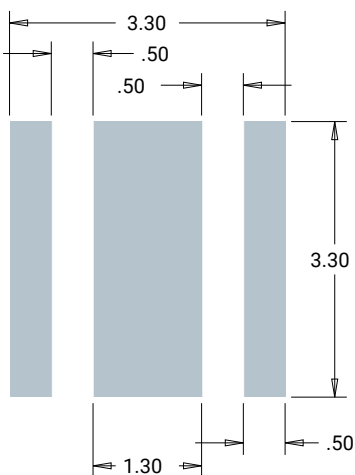


## MECHANICAL DIMENSIONS ( $T_A = 25\text{ }^{\circ}\text{C}$ ) - CONTINUED

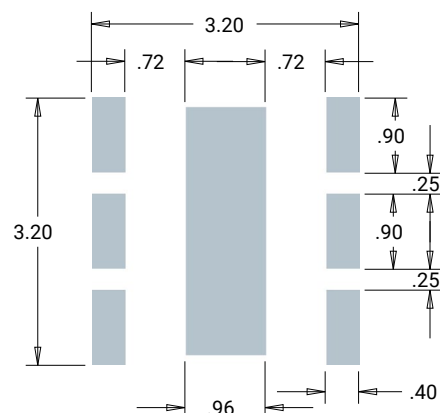
All measurements are  $\pm 0.13\text{ mm}$  unless otherwise indicated.



**Recommended Copper Layout**



**Recommended Solder Pad  
(Solder Mask Pattern)**



**Recommended Stencil Openings\***

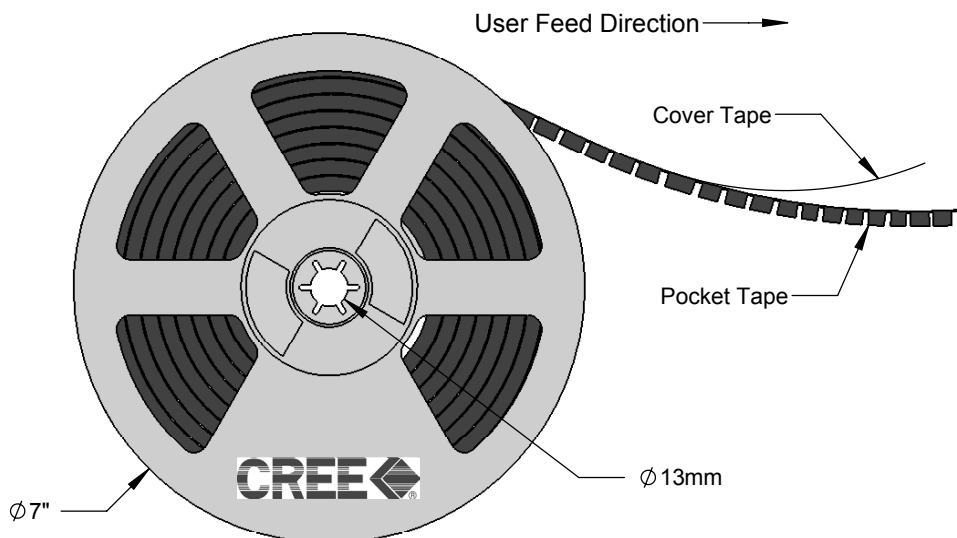
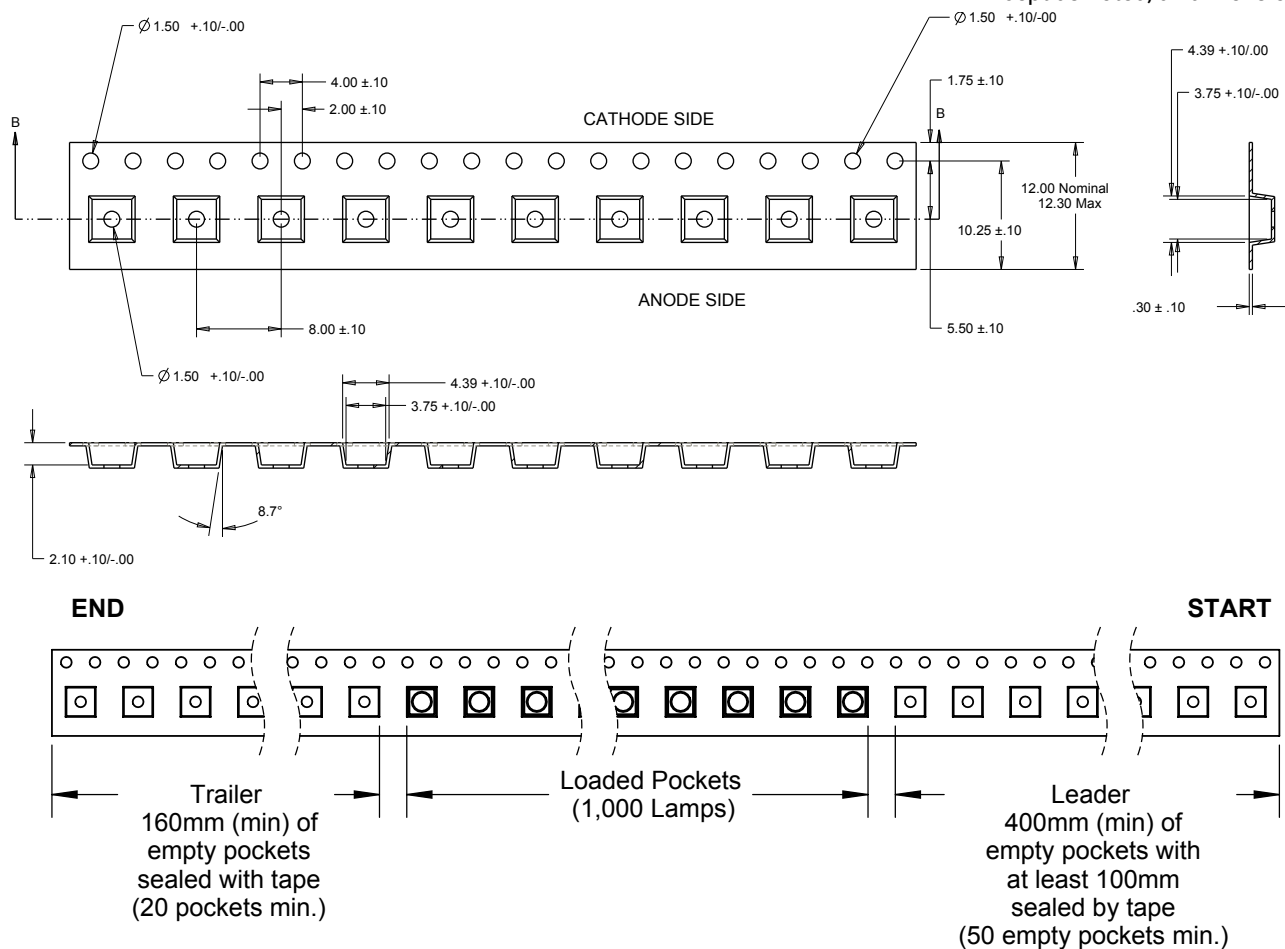
### Notes:

- Cree recommends using thermal pad kickouts to maximize component thermal performance.
- Cree recommends using white solder mask material to minimize system optical loss.
- \* This stencil has been tested and optimized for the avoidance of voiding when using ALPHA® LUMET® P30 Maxrel solder paste. For other solder pastes, a "window pane" design for the thermal pad stencil may result in a lower voiding percentage. Contact your local Cree Field Applications Engineer for consultation regarding your specific application.

## TAPE AND REEL

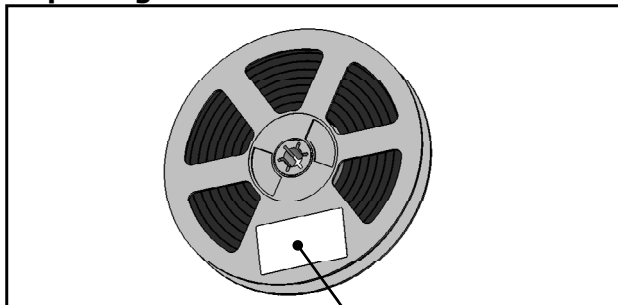
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

Except as noted, all dimensions in mm.



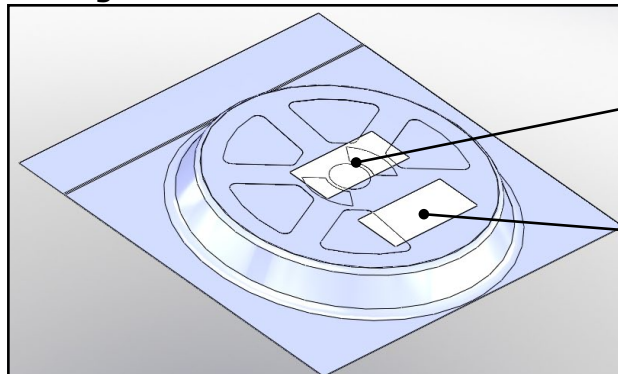
## PACKAGING

### Unpackaged Reel



Label with Cree Bin Code,  
Quantity, Reel ID

### Packaged Reel



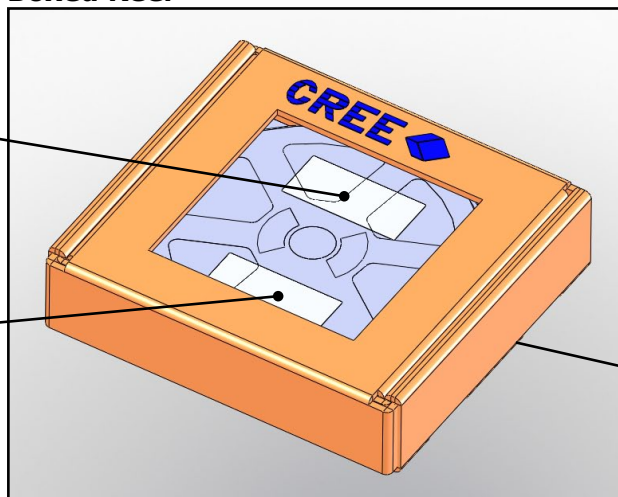
Label with Cree Order Code,  
Quantity, Reel ID, PO #

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)