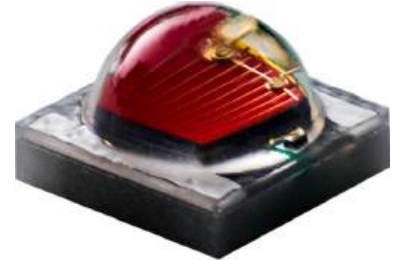
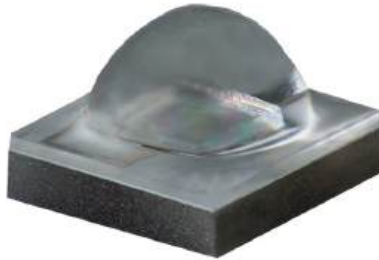
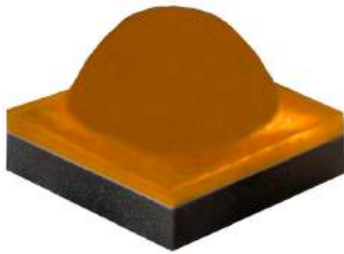


## XLamp® XB-D LEDs



### PRODUCT DESCRIPTION

The XLamp® XB-D LED brings next-generation performance, price and size to all LED lighting applications. The XB-D's footprint enables smaller designs with densely packed arrays for better light mixing and concentration.

The XB-D shares common footprint and uniform package design across all white and color configurations, simplifying board and optical designs for many LED systems. The XB-D is optimized to dramatically lower system cost in any illumination application, from indoor and outdoor lighting to architectural and transportation lighting.

### FEATURES

- XB-D white binned @ 85 °C; XB-D color binned @ 25 °C
- Up to 136 lm/W in cool white (@ 85 °C, 350 mA)
- Available in white, 80-minimum CRI white, and 70-minimum CRI cool white, royal blue, blue, green, PC amber, amber, red-orange & red
- 1 A maximum drive current
- Wide viewing angle: from 110° (PC amber) to 140° (red)
- Reflow solderable - JEDEC J-STD-020C compatible
- Unlimited floor life at ≤ 30 °C/85% RH
- Electrically neutral thermal path
- RoHS and REACH compliant
- UL® recognized component (E349212)



Cree LED / 4400 Silicon Drive / Durham, NC 27703 USA / +1.919.313.5330 / [www.cree-led.com](http://www.cree-led.com)

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## CHARACTERISTICS

| Characteristics                                                               | Unit    | Minimum | Typical  | Maximum |
|-------------------------------------------------------------------------------|---------|---------|----------|---------|
| Thermal resistance, junction to solder point - white, royal blue, blue        | °C/W    |         | 6.5      |         |
| Thermal resistance, junction to solder point - green                          | °C/W    |         | 11       |         |
| Thermal resistance, junction to solder point - PC amber                       | °C/W    |         | 8.5      |         |
| Thermal resistance, junction to solder point - amber                          | °C/W    |         | 7.8      |         |
| Thermal resistance, junction to solder point - red-orange, red                | °C/W    |         | 5        |         |
| Viewing angle (FWHM) - white                                                  | degrees |         | 115      |         |
| Viewing angle (FWHM) - royal blue                                             | degrees |         | 120      |         |
| Viewing angle (FWHM) - blue, green                                            | degrees |         | 125      |         |
| Viewing angle (FWHM) - PC amber,                                              | degrees |         | 110      |         |
| Viewing angle (FWHM) - amber, red-orange, red                                 | degrees |         | 140      |         |
| Temperature coefficient of voltage - white                                    | mV/°C   |         | -1.2     |         |
| Temperature coefficient of voltage - royal blue                               | mV/°C   |         | -2.0     |         |
| Temperature coefficient of voltage - blue, green                              | mV/°C   |         | -1.2     |         |
| Temperature coefficient of voltage - PC amber                                 | mV/°C   |         | -2.4     |         |
| Temperature coefficient of voltage - amber, red-orange, red                   | mV/°C   |         | -1.8     |         |
| ESD withstand voltage (HBM per Mil-Std-883D) - white, royal blue, blue, green | V       |         |          | 8000    |
| ESD classification (HBM per Mil-Std-883D) - PC amber                          |         |         | Class 3A |         |
| ESD classification (HBM per Mil-Std-883D) - amber, red-orange, red            |         |         | Class 2  |         |
| DC forward current                                                            | mA      |         |          | 1000    |
| Reverse voltage                                                               | V       |         |          | 1       |
| Forward voltage (@ 350 mA, 85 °C) - white                                     | V       |         | 2.9      | 3.5     |
| Forward voltage (@ 350 mA, 25 °C) - royal blue                                | V       |         | 2.95     | 3.5     |
| Forward voltage (@ 350 mA, 25 °C) - blue                                      | V       |         | 2.95     | 3.5     |
| Forward voltage (@ 350 mA, 25 °C) - green                                     | V       |         | 2.97     | 3.4     |
| Forward voltage (@ 350 mA, 25 °C) - PC amber                                  | V       |         | 3.1      | 3.4     |
| Forward voltage (@ 350 mA, 25 °C) - amber, red-orange, red                    | V       |         | 2.17     | 2.6     |
| LED junction temperature                                                      | °C      |         |          | 150     |

ORDER CODES SUGGESTED FOR NEW DESIGNS - WHITE ( $T_j = 85^\circ\text{C}$ )

The following tables provide order codes for XLamp XB-D white LEDs. For a complete description of the order-code nomenclature, please consult the Bin and Order Formats section (page 30).

| Chromaticity                      |        | Minimum Luminous Flux (lm)<br>@ 350 mA* |                      |                       | Calculated Minimum<br>Luminous Flux (lm)** |         | Order Codes              |                           |                           |
|-----------------------------------|--------|-----------------------------------------|----------------------|-----------------------|--------------------------------------------|---------|--------------------------|---------------------------|---------------------------|
| Kit                               | CCT    | Code                                    | Flux (lm)<br>@ 85 °C | Flux (lm)<br>@ 25 °C* | 700 mA                                     | 1000 mA | No CRI Minimum           | 70 CRI Minimum            | 80 CRI Minimum            |
| ANSI Cool White (5000 K – 8300 K) |        |                                         |                      |                       |                                            |         |                          |                           |                           |
| 51                                | 6200 K | R5                                      | 139                  | 156                   | 239                                        | 308     | XBDAWT-00-0000-000000H51 | XBDAWT-00-0000-000000BH51 |                           |
|                                   |        | R4                                      | 130                  | 148                   | 224                                        | 289     | XBDAWT-00-0000-000000G51 | XBDAWT-00-0000-000000BG51 | XBDAWT-00-0000-000000HG51 |
|                                   |        | R3                                      | 122                  | 139                   | 210                                        | 271     | XBDAWT-00-0000-000000F51 | XBDAWT-00-0000-000000BF51 | XBDAWT-00-0000-000000HF51 |
|                                   |        | R2                                      | 114                  | 130                   | 196                                        | 253     |                          |                           | XBDAWT-00-0000-000000HE51 |
| 53                                | 6000 K | R5                                      | 139                  | 156                   | 239                                        | 308     | XBDAWT-00-0000-000000H53 | XBDAWT-00-0000-000000BH53 |                           |
|                                   |        | R4                                      | 130                  | 148                   | 224                                        | 289     | XBDAWT-00-0000-000000G53 | XBDAWT-00-0000-000000BG53 | XBDAWT-00-0000-000000HG53 |
|                                   |        | R3                                      | 122                  | 139                   | 210                                        | 271     | XBDAWT-00-0000-000000F53 | XBDAWT-00-0000-000000BF53 | XBDAWT-00-0000-000000HF53 |
|                                   |        | R2                                      | 114                  | 130                   | 196                                        | 253     |                          |                           | XBDAWT-00-0000-000000HE53 |
| 50                                | 6200 K | R5                                      | 139                  | 156                   | 239                                        | 308     | XBDAWT-00-0000-000000H50 | XBDAWT-00-0000-000000BH50 |                           |
|                                   |        | R4                                      | 130                  | 148                   | 224                                        | 289     | XBDAWT-00-0000-000000G50 | XBDAWT-00-0000-000000BG50 | XBDAWT-00-0000-000000HG50 |
|                                   |        | R3                                      | 122                  | 139                   | 210                                        | 271     | XBDAWT-00-0000-000000F50 | XBDAWT-00-0000-000000BF50 | XBDAWT-00-0000-000000HF50 |
|                                   |        | R2                                      | 114                  | 130                   | 196                                        | 253     |                          |                           | XBDAWT-00-0000-000000HE50 |

## Notes:

- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38.
- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and  $\pm 2$  on CRI measurements. See the Measurements section (page 32).
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.
- Typical CRI for Neutral White, 3700 K - 5000 K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.

\* Flux values @ 25 °C are calculated and are for reference only.

\*\* Calculated flux values at 700 mA and 1000 mA are for 85 °C and are for reference only.

ORDER CODES SUGGESTED FOR NEW DESIGNS - WHITE ( $T_j = 85^\circ\text{C}$ ) - CONTINUED

| Chromaticity |     | Minimum Luminous Flux (lm)<br>@ 350 mA* |                      |                       | Calculated Minimum<br>Luminous Flux (lm)** |         | Order Codes    |                |                |
|--------------|-----|-----------------------------------------|----------------------|-----------------------|--------------------------------------------|---------|----------------|----------------|----------------|
| Kit          | CCT | Code                                    | Flux (lm)<br>@ 85 °C | Flux (lm)<br>@ 25 °C* | 700 mA                                     | 1000 mA | No CRI Minimum | 70 CRI Minimum | 80 CRI Minimum |

ANSI Cool White (5000 K – 8300 K)

|    |        |    |     |     |     |     |                          |                           |                           |
|----|--------|----|-----|-----|-----|-----|--------------------------|---------------------------|---------------------------|
| E1 | 6500 K | R5 | 139 | 156 | 239 | 308 | XBDAWT-00-0000-000000HE1 | XBDAWT-00-0000-000000BHE1 |                           |
|    |        | R4 | 130 | 148 | 224 | 289 | XBDAWT-00-0000-000000GE1 | XBDAWT-00-0000-000000BGE1 | XBDAWT-00-0000-000000HGE1 |
|    |        | R3 | 122 | 139 | 210 | 271 | XBDAWT-00-0000-000000FE1 | XBDAWT-00-0000-000000BFE1 | XBDAWT-00-0000-000000HFE1 |
|    |        | R2 | 114 | 130 | 196 | 253 |                          |                           | XBDAWT-00-0000-000000HEE1 |
| E2 | 5700 K | R5 | 139 | 156 | 239 | 308 | XBDAWT-00-0000-000000HE2 | XBDAWT-00-0000-000000BHE2 |                           |
|    |        | R4 | 130 | 148 | 224 | 289 | XBDAWT-00-0000-000000GE2 | XBDAWT-00-0000-000000BGE2 | XBDAWT-00-0000-000000HGE2 |
|    |        | R3 | 122 | 139 | 210 | 271 | XBDAWT-00-0000-000000FE2 | XBDAWT-00-0000-000000BFE2 | XBDAWT-00-0000-000000HFE2 |
|    |        | R2 | 114 | 130 | 196 | 253 |                          |                           | XBDAWT-00-0000-000000HEE2 |

## Notes:

- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38 .
- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and  $\pm 2$  on CRI measurements. See the Measurements section (page 32).
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.
- Typical CRI for Neutral White, 3700 K - 5000 K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.

\* Flux values @ 25 °C are calculated and are for reference only.

\*\* Calculated flux values at 700 mA and 1000 mA are for 85 °C and are for reference only.

ORDER CODES SUGGESTED FOR NEW DESIGNS - WHITE ( $T_J = 85^\circ\text{C}$ ) - CONTINUED

| Chromaticity                         |        | Minimum Luminous Flux (lm)<br>@ 350 mA* |                      |                       | Calculated<br>Minimum<br>Luminous Flux<br>(lm)** |            | Order Codes              |                           |                           |                           |
|--------------------------------------|--------|-----------------------------------------|----------------------|-----------------------|--------------------------------------------------|------------|--------------------------|---------------------------|---------------------------|---------------------------|
| Kit                                  | CCT    | Code                                    | Flux (lm)<br>@ 85 °C | Flux (lm)<br>@ 25 °C* | 700<br>mA                                        | 1000<br>mA | No CRI Minimum           | 70 CRI Minimum            | Standard CRI              | 80 CRI Minimum            |
| ANSI Neutral White (3700 K – 5000 K) |        |                                         |                      |                       |                                                  |            |                          |                           |                           |                           |
| E3                                   | 5000 K | R5                                      | 139                  | 156                   | 239                                              | 308        | XBDAWT-00-0000-000000HE3 | XBDAWT-00-0000-000000BHE3 |                           |                           |
|                                      |        | R4                                      | 130                  | 148                   | 224                                              | 289        | XBDAWT-00-0000-000000GE3 | XBDAWT-00-0000-000000BGE3 | XBDAWT-00-0000-000000LGE3 | XBDAWT-00-0000-000000HGE3 |
|                                      |        | R3                                      | 122                  | 139                   | 210                                              | 271        | XBDAWT-00-0000-000000FE3 | XBDAWT-00-0000-000000BFE3 | XBDAWT-00-0000-000000LFE3 | XBDAWT-00-0000-000000HFE3 |
|                                      |        | R2                                      | 114                  | 130                   | 196                                              | 253        |                          |                           | XBDAWT-00-0000-000000LEE3 | XBDAWT-00-0000-000000HEE3 |
| F4                                   | 4750 K | R5                                      | 139                  | 156                   | 239                                              | 308        | XBDAWT-00-0000-000000HF4 | XBDAWT-00-0000-000000BHF4 |                           |                           |
|                                      |        | R4                                      | 130                  | 148                   | 224                                              | 289        | XBDAWT-00-0000-000000GF4 | XBDAWT-00-0000-000000BGF4 | XBDAWT-00-0000-000000LGF4 | XBDAWT-00-0000-000000HGF4 |
|                                      |        | R3                                      | 122                  | 139                   | 210                                              | 271        | XBDAWT-00-0000-000000FF4 | XBDAWT-00-0000-000000BFF4 | XBDAWT-00-0000-000000LFF4 | XBDAWT-00-0000-000000HFF4 |
|                                      |        | R2                                      | 114                  | 130                   | 196                                              | 253        |                          |                           | XBDAWT-00-0000-000000LEF4 | XBDAWT-00-0000-000000HEF4 |
| E4                                   | 4500 K | R5                                      | 139                  | 156                   | 239                                              | 308        | XBDAWT-00-0000-000000HE4 | XBDAWT-00-0000-000000BHE4 |                           |                           |
|                                      |        | R4                                      | 130                  | 148                   | 224                                              | 289        | XBDAWT-00-0000-000000GE4 | XBDAWT-00-0000-000000BGE4 | XBDAWT-00-0000-000000LGE4 | XBDAWT-00-0000-000000HGE4 |
|                                      |        | R3                                      | 122                  | 139                   | 210                                              | 271        | XBDAWT-00-0000-000000FE4 | XBDAWT-00-0000-000000BFE4 | XBDAWT-00-0000-000000LFE4 | XBDAWT-00-0000-000000HFE4 |
|                                      |        | R2                                      | 114                  | 130                   | 196                                              | 253        |                          |                           | XBDAWT-00-0000-000000LEE4 | XBDAWT-00-0000-000000HEE4 |
| F5                                   | 4250 K | R4                                      | 130                  | 148                   | 224                                              | 289        | XBDAWT-00-0000-000000GF5 | XBDAWT-00-0000-000000BGF5 | XBDAWT-00-0000-000000LGF5 | XBDAWT-00-0000-000000HGF5 |
|                                      |        | R3                                      | 122                  | 139                   | 210                                              | 271        | XBDAWT-00-0000-000000FF5 | XBDAWT-00-0000-000000BFF5 | XBDAWT-00-0000-000000LFF5 | XBDAWT-00-0000-000000HFF5 |
|                                      |        | R2                                      | 114                  | 130                   | 196                                              | 253        | XBDAWT-00-0000-000000EF5 | XBDAWT-00-0000-000000BEF5 | XBDAWT-00-0000-000000LEF5 | XBDAWT-00-0000-000000HEF5 |

## Notes:

- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38.
- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and  $\pm 2$  on CRI measurements. See the Measurements section (page 32).
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.
- Typical CRI for Neutral White, 3700 K - 5000 K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.

\* Flux values @ 25 °C are calculated and are for reference only.

\*\* Calculated flux values at 700 mA and 1000 mA are for 85 °C and are for reference only.

ORDER CODES SUGGESTED FOR NEW DESIGNS - WHITE ( $T_j = 85^\circ\text{C}$ ) - CONTINUED

| Chromaticity                         |        | Minimum Luminous Flux (lm)<br>@ 350 mA* |                      |                       | Calculated<br>Minimum<br>Luminous Flux<br>(lm)** |            | Order Codes              |                          |                          |                          |
|--------------------------------------|--------|-----------------------------------------|----------------------|-----------------------|--------------------------------------------------|------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Kit                                  | CCT    | Code                                    | Flux (lm)<br>@ 85 °C | Flux (lm)<br>@ 25 °C* | 700<br>mA                                        | 1000<br>mA | No CRI Minimum           | 70 CRI Minimum           | Standard CRI             | 80 CRI Minimum           |
| ANSI Neutral White (3700 K – 5000 K) |        |                                         |                      |                       |                                                  |            |                          |                          |                          |                          |
| E5                                   | 4000 K | R4                                      | 130                  | 148                   | 224                                              | 289        | XBDAWT-00-0000-000000GE5 | XBDAWT-00-0000-00000BGE5 | XBDAWT-00-0000-00000LGE5 | XBDAWT-00-0000-00000HGE5 |
|                                      |        | R3                                      | 122                  | 139                   | 210                                              | 271        | XBDAWT-00-0000-000000FE5 | XBDAWT-00-0000-00000BFE5 | XBDAWT-00-0000-00000LFE5 | XBDAWT-00-0000-00000HFE5 |
|                                      |        | R2                                      | 114                  | 130                   | 196                                              | 253        | XBDAWT-00-0000-000000EE5 | XBDAWT-00-0000-00000BEE5 | XBDAWT-00-0000-00000LEE5 | XBDAWT-00-0000-00000HEE5 |

## Notes:

- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38 .
- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and  $\pm 2$  on CRI measurements. See the Measurements section (page 32).
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.
- Typical CRI for Neutral White, 3700 K - 5000 K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.
- \* Flux values @ 25 °C are calculated and are for reference only.
- \*\* Calculated flux values at 700 mA and 1000 mA are for 85 °C and are for reference only.

ORDER CODES SUGGESTED FOR NEW DESIGNS - WHITE ( $T_j = 85^\circ\text{C}$ ) - CONTINUED

| Chromaticity                      |        | Minimum Luminous Flux (lm)<br>@ 350 mA* |                      |                       | Calculated<br>Minimum<br>Luminous Flux<br>(lm)** |            | Order Codes              |                           |                           |                           |                           |
|-----------------------------------|--------|-----------------------------------------|----------------------|-----------------------|--------------------------------------------------|------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Kit                               | CCT    | Code                                    | Flux (lm)<br>@ 85 °C | Flux (lm)<br>@ 25 °C* | 700<br>mA                                        | 1000<br>mA | No CRI Minimum           | 70 CRI Minimum            | Standard CRI              | 80 CRI Minimum            | 90 CRI Minimum            |
| ANSI Warm White (2700 K - 3750 K) |        |                                         |                      |                       |                                                  |            |                          |                           |                           |                           |                           |
| F6                                | 3750 K | R4                                      | 130                  | 148                   | 224                                              | 289        | XBDAWT-00-0000-000000GF6 | XBDAWT-00-0000-000000BGF6 |                           |                           |                           |
|                                   |        | R3                                      | 122                  | 139                   | 210                                              | 271        | XBDAWT-00-0000-000000FF6 | XBDAWT-00-0000-000000BFF6 | XBDAWT-00-0000-000000LFF6 | XBDAWT-00-0000-000000HFF6 |                           |
|                                   |        | R2                                      | 114                  | 130                   | 196                                              | 253        | XBDAWT-00-0000-000000EF6 | XBDAWT-00-0000-000000BEF6 | XBDAWT-00-0000-000000LEF6 | XBDAWT-00-0000-000000HEF6 |                           |
|                                   |        | Q5                                      | 107                  | 122                   | 184                                              | 237        | XBDAWT-00-0000-000000DF6 | XBDAWT-00-0000-000000BDF6 | XBDAWT-00-0000-000000LDF6 | XBDAWT-00-0000-000000HDF6 |                           |
| E6                                | 3500 K | R4                                      | 130                  | 148                   | 224                                              | 289        | XBDAWT-00-0000-000000GE6 | XBDAWT-00-0000-000000BGE6 |                           |                           |                           |
|                                   |        | R3                                      | 122                  | 139                   | 210                                              | 271        | XBDAWT-00-0000-000000FE6 | XBDAWT-00-0000-000000BFE6 | XBDAWT-00-0000-000000LFE6 | XBDAWT-00-0000-000000HFE6 |                           |
|                                   |        | R2                                      | 114                  | 130                   | 196                                              | 253        | XBDAWT-00-0000-000000EE6 | XBDAWT-00-0000-000000BEE6 | XBDAWT-00-0000-000000LEE6 | XBDAWT-00-0000-000000HEE6 |                           |
|                                   |        | Q5                                      | 107                  | 122                   | 184                                              | 237        | XBDAWT-00-0000-000000DE6 | XBDAWT-00-0000-000000BDE6 | XBDAWT-00-0000-000000LDE6 | XBDAWT-00-0000-000000HDE6 |                           |
| F7                                | 3250 K | R3                                      | 122                  | 139                   | 210                                              | 271        | XBDAWT-00-0000-000000FF7 | XBDAWT-00-0000-000000BFF7 | XBDAWT-00-0000-000000LFF7 | XBDAWT-00-0000-000000HFF7 |                           |
|                                   |        | R2                                      | 114                  | 130                   | 196                                              | 253        | XBDAWT-00-0000-000000EF7 | XBDAWT-00-0000-000000BEF7 | XBDAWT-00-0000-000000LEF7 | XBDAWT-00-0000-000000HEF7 |                           |
|                                   |        | Q5                                      | 107                  | 122                   | 184                                              | 237        | XBDAWT-00-0000-000000DF7 | XBDAWT-00-0000-000000BDF7 | XBDAWT-00-0000-000000LDF7 | XBDAWT-00-0000-000000HDF7 |                           |
|                                   |        | Q4                                      | 100                  | 114                   | 172                                              | 222        |                          |                           |                           |                           |                           |
|                                   |        | Q3                                      | 93.9                 | 107                   | 162                                              | 208        |                          |                           |                           |                           |                           |
|                                   |        | Q2                                      | 87.4                 | 100                   | 150                                              | 194        |                          |                           |                           |                           | XBDAWT-00-0000-000000UAF7 |
|                                   |        | P4                                      | 80.6                 | 93                    | 139                                              | 179        |                          |                           |                           |                           | XBDAWT-00-0000-000000U9F7 |

## Notes:

- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38 .
- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and  $\pm 2$  on CRI measurements. See the Measurements section (page 32).
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.
- Typical CRI for Neutral White, 3700 K - 5000 K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.
- \* Flux values @ 25 °C are calculated and are for reference only.
- \*\* Calculated flux values at 700 mA and 1000 mA are for 85 °C and are for reference only.

ORDER CODES SUGGESTED FOR NEW DESIGNS - WHITE ( $T_J = 85^\circ\text{C}$ ) - CONTINUED

| Chromaticity                      |        | Minimum Luminous Flux (lm)<br>@ 350 mA* |                      |                       | Calculated<br>Minimum<br>Luminous Flux<br>(lm)** |            | Order Codes              |                           |                           |                           |                           |
|-----------------------------------|--------|-----------------------------------------|----------------------|-----------------------|--------------------------------------------------|------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Kit                               | CCT    | Code                                    | Flux (lm)<br>@ 85 °C | Flux (lm)<br>@ 25 °C* | 700<br>mA                                        | 1000<br>mA | No CRI Minimum           | 70 CRI Minimum            | Standard CRI              | 80 CRI Minimum            | 90 CRI Minimum            |
| ANSI Warm White (2700 K - 3750 K) |        |                                         |                      |                       |                                                  |            |                          |                           |                           |                           |                           |
| E7                                | 3000 K | R3                                      | 122                  | 139                   | 210                                              | 271        | XBDAWT-00-0000-000000FE7 | XBDAWT-00-0000-000000BFE7 | XBDAWT-00-0000-000000LFE7 | XBDAWT-00-0000-000000HFE7 |                           |
|                                   |        | R2                                      | 114                  | 130                   | 196                                              | 253        | XBDAWT-00-0000-000000EE7 | XBDAWT-00-0000-000000BEE7 | XBDAWT-00-0000-000000LEE7 | XBDAWT-00-0000-000000HEE7 |                           |
|                                   |        | Q5                                      | 107                  | 122                   | 184                                              | 237        | XBDAWT-00-0000-000000DE7 | XBDAWT-00-0000-000000BDE7 | XBDAWT-00-0000-000000LDE7 | XBDAWT-00-0000-000000HDE7 |                           |
|                                   |        | Q4                                      | 100                  | 114                   | 172                                              | 222        |                          |                           |                           |                           |                           |
|                                   |        | Q3                                      | 93.9                 | 107                   | 162                                              | 208        |                          |                           |                           |                           |                           |
|                                   |        | Q2                                      | 87.4                 | 100                   | 150                                              | 194        |                          |                           |                           |                           | XBDAWT-00-0000-000000UAE7 |
|                                   |        | P4                                      | 80.6                 | 93                    | 139                                              | 179        |                          |                           |                           |                           | XBDAWT-00-0000-000000U9E7 |
| F8                                | 2850 K | R2                                      | 114                  | 130                   | 196                                              | 253        | XBDAWT-00-0000-000000EF8 | XBDAWT-00-0000-000000BEF8 | XBDAWT-00-0000-000000LEF8 | XBDAWT-00-0000-000000HEF8 |                           |
|                                   |        | Q5                                      | 107                  | 122                   | 184                                              | 237        | XBDAWT-00-0000-000000DF8 | XBDAWT-00-0000-000000BDF8 | XBDAWT-00-0000-000000LDF8 | XBDAWT-00-0000-000000HDF8 |                           |
|                                   |        | Q4                                      | 100                  | 114                   | 172                                              | 222        | XBDAWT-00-0000-000000CF8 | XBDAWT-00-0000-000000BCF8 | XBDAWT-00-0000-000000LCF8 | XBDAWT-00-0000-000000HCF8 |                           |
|                                   |        | Q3                                      | 93.9                 | 107                   | 162                                              | 208        |                          |                           |                           |                           |                           |
|                                   |        | Q2                                      | 87.4                 | 100                   | 150                                              | 194        |                          |                           |                           |                           | XBDAWT-00-0000-000000UAF8 |
|                                   |        | P4                                      | 80.6                 | 93                    | 139                                              | 179        |                          |                           |                           |                           | XBDAWT-00-0000-000000U9F8 |
|                                   |        |                                         |                      |                       |                                                  |            |                          |                           |                           |                           |                           |
| E8                                | 2700 K | R2                                      | 114                  | 130                   | 196                                              | 253        | XBDAWT-00-0000-000000EE8 | XBDAWT-00-0000-000000BEE8 | XBDAWT-00-0000-000000LEE8 | BDAAWT-00-0000-000000HEE8 |                           |
|                                   |        | Q5                                      | 107                  | 122                   | 184                                              | 237        | XBDAWT-00-0000-000000DE8 | XBDAWT-00-0000-000000BDE8 | XBDAWT-00-0000-000000LDE8 | XBDAWT-00-0000-000000HDE8 |                           |
|                                   |        | Q4                                      | 100                  | 114                   | 172                                              | 222        | XBDAWT-00-0000-000000CE8 | XBDAWT-00-0000-000000BCE8 | XBDAWT-00-0000-000000LCE8 | XBDAWT-00-0000-000000HCE8 |                           |
|                                   |        | Q3                                      | 93.9                 | 107                   | 162                                              | 208        |                          |                           |                           |                           |                           |
|                                   |        | Q2                                      | 87.4                 | 100                   | 150                                              | 194        |                          |                           |                           |                           | XBDAWT-00-0000-000000UAE8 |
|                                   |        | P4                                      | 80.6                 | 93                    | 139                                              | 179        |                          |                           |                           |                           | XBDAWT-00-0000-000000U9E8 |
|                                   |        |                                         |                      |                       |                                                  |            |                          |                           |                           |                           |                           |

## Notes:

- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38 .
- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and  $\pm 2$  on CRI measurements. See the Measurements section (page 32).
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.
- Typical CRI for Neutral White, 3700 K - 5000 K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.

\* Flux values @ 25 °C are calculated and are for reference only.

\*\* Calculated flux values at 700 mA and 1000 mA are for 85 °C and are for reference only.

ORDER CODES SUGGESTED FOR NEW DESIGNS - COLOR ( $T_J = 25^\circ\text{C}$ )

The following tables provide order codes for XLamp XB-D color LEDs. For a complete description of the order-code nomenclature, please consult the Bin and Order Formats section (page 30).

| Royal Blue |                          | Minimum Radiant Flux (mW) @ 350 mA |           | Order Codes              |
|------------|--------------------------|------------------------------------|-----------|--------------------------|
| Kit        | Dominant Wavelength (nm) | Code                               | Flux (mW) |                          |
| 01         | 450 - 465                | 38                                 | 650       | XBDROY-00-0000-000000S01 |
|            |                          | 37                                 | 625       | XBDROY-00-0000-000000R01 |
|            |                          | 36                                 | 600       | XBDROY-00-0000-000000Q01 |
|            |                          | 35                                 | 575       | XBDROY-00-0000-000000P01 |
|            |                          | 34                                 | 550       | XBDROY-00-0000-000000N01 |
| 02         | 450 - 460                | 38                                 | 650       | XBDROY-00-0000-000000S02 |
|            |                          | 37                                 | 625       | XBDROY-00-0000-000000R02 |
|            |                          | 36                                 | 600       | XBDROY-00-0000-000000Q02 |
|            |                          | 35                                 | 575       | XBDROY-00-0000-000000P02 |
|            |                          | 34                                 | 550       | XBDROY-00-0000-000000N02 |
| 03         | 455 - 465                | 37                                 | 625       | XBDROY-00-0000-000000R03 |
|            |                          | 36                                 | 600       | XBDROY-00-0000-000000Q03 |
|            |                          | 35                                 | 575       | XBDROY-00-0000-000000P03 |
|            |                          | 34                                 | 550       | XBDROY-00-0000-000000N03 |
| 04         | 450 - 455                | 38                                 | 650       | XBDROY-00-0000-000000S04 |
|            |                          | 37                                 | 625       | XBDROY-00-0000-000000R04 |
|            |                          | 36                                 | 600       | XBDROY-00-0000-000000Q04 |
|            |                          | 35                                 | 575       | XBDROY-00-0000-000000P04 |
| 05         | 455 - 460                | 37                                 | 625       | XBDROY-00-0000-000000R05 |
|            |                          | 36                                 | 600       | XBDROY-00-0000-000000Q05 |
|            |                          | 35                                 | 575       | XBDROY-00-0000-000000P05 |
|            |                          | 34                                 | 550       | XBDROY-00-0000-000000N05 |
| 06         | 460 - 465                | 37                                 | 625       | XBDROY-00-0000-000000R06 |
|            |                          | 36                                 | 600       | XBDROY-00-0000-000000Q06 |
|            |                          | 35                                 | 575       | XBDROY-00-0000-000000P06 |
| 07         | 452.5 - 457.5            | 38                                 | 650       | XBDROY-00-0000-000000S07 |
|            |                          | 37                                 | 625       | XBDROY-00-0000-000000R07 |
|            |                          | 36                                 | 600       | XBDROY-00-0000-000000Q07 |
| 08         | 457.5 - 462.5            | 37                                 | 625       | XBDROY-00-0000-000000R08 |
|            |                          | 36                                 | 600       | XBDROY-00-0000-000000Q08 |
|            |                          | 35                                 | 575       | XBDROY-00-0000-000000P08 |

## Notes:

- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38.
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.

ORDER CODES SUGGESTED FOR NEW DESIGNS - COLOR ( $T_j = 25\text{ }^{\circ}\text{C}$ ) - CONTINUED

| Royal Blue |                          | Minimum Radiant Flux (mW) @ 350 mA |           | Order Codes              |
|------------|--------------------------|------------------------------------|-----------|--------------------------|
| Kit        | Dominant Wavelength (nm) | Code                               | Flux (mW) |                          |
| 09         | 452.5 - 462.5            | 38                                 | 650       | XBDROY-00-0000-000000S09 |
|            |                          | 37                                 | 625       | XBDROY-00-0000-000000R09 |
|            |                          | 36                                 | 600       | XBDROY-00-0000-000000Q09 |

| Blue |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes              |
|------|--------------------------|-------------------------------------|-----------|--------------------------|
| Kit  | Dominant Wavelength (nm) | Code                                | Flux (lm) |                          |
| 01   | 465 - 485                | N2                                  | 51.7      | XBDBLU-00-0000-000000401 |
|      |                          | M3                                  | 45.7      | XBDBLU-00-0000-000000301 |
|      |                          | M2                                  | 39.8      | XBDBLU-00-0000-000000201 |
|      |                          | K3                                  | 35.2      | XBDBLU-00-0000-000000Z01 |
| 02   | 465 - 480                | N2                                  | 51.7      | XBDBLU-00-0000-000000402 |
|      |                          | M3                                  | 45.7      | XBDBLU-00-0000-000000302 |
|      |                          | M2                                  | 39.8      | XBDBLU-00-0000-000000202 |
|      |                          | K3                                  | 35.2      | XBDBLU-00-0000-000000Z02 |
| 05   | 470 - 480                | N2                                  | 51.7      | XBDBLU-00-0000-000000405 |
|      |                          | M3                                  | 45.7      | XBDBLU-00-0000-000000305 |
|      |                          | M2                                  | 39.8      | XBDBLU-00-0000-000000205 |
|      |                          | K3                                  | 35.2      | XBDBLU-00-0000-000000Z05 |

| Green |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes              |
|-------|--------------------------|-------------------------------------|-----------|--------------------------|
| Kit   | Dominant Wavelength (nm) | Code                                | Flux (lm) |                          |
| 01    | 520 - 535                | R5                                  | 139       | XBDGRN-00-0000-000000H01 |
|       |                          | R4                                  | 130       | XBDGRN-00-0000-000000G01 |
|       |                          | R3                                  | 120       | XBDGRN-00-0000-000000F01 |
|       |                          | R2                                  | 114       | XBDGRN-00-0000-000000E01 |
|       |                          | Q5                                  | 107       | XBDGRN-00-0000-000000D01 |
| 02    | 520 - 530                | R5                                  | 139       | XBDGRN-00-0000-000000H02 |
|       |                          | R4                                  | 130       | XBDGRN-00-0000-000000G02 |
|       |                          | R3                                  | 120       | XBDGRN-00-0000-000000F02 |
|       |                          | R2                                  | 114       | XBDGRN-00-0000-000000E02 |
|       |                          | Q5                                  | 107       | XBDGRN-00-0000-000000D02 |

## Notes:

- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38.
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.

ORDER CODES SUGGESTED FOR NEW DESIGNS - COLOR ( $T_j = 25\text{ }^{\circ}\text{C}$ ) - CONTINUED

| Green |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes              |
|-------|--------------------------|-------------------------------------|-----------|--------------------------|
| Kit   | Dominant Wavelength (nm) | Code                                | Flux (lm) |                          |
| 03    | 525 - 535                | R5                                  | 139       | XBDGRN-00-0000-000000H03 |
|       |                          | R4                                  | 130       | XBDGRN-00-0000-000000G03 |
|       |                          | R3                                  | 120       | XBDGRN-00-0000-000000F03 |
|       |                          | R2                                  | 114       | XBDGRN-00-0000-000000E03 |
|       |                          | Q5                                  | 107       | XBDGRN-00-0000-000000D03 |

| PC Amber |           | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes              |
|----------|-----------|-------------------------------------|-----------|--------------------------|
| Kit      | Color Bin | Group                               | Flux (lm) |                          |
| 01       | Y2        | Q4                                  | 100       | XBDBPA-00-0000-000000C01 |
|          |           | Q3                                  | 93.9      | XBDBPA-00-0000-000000B01 |
|          |           | Q2                                  | 87.4      | XBDBPA-00-0000-000000A01 |

| Amber |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes              |
|-------|--------------------------|-------------------------------------|-----------|--------------------------|
| Kit   | Dominant Wavelength (nm) | Code                                | Flux (lm) |                          |
| 01    | 585 - 595                | Q2                                  | 87.4      | XBDAMB-00-0000-000000A01 |
|       |                          | P4                                  | 80.6      | XBDAMB-00-0000-000000901 |
|       |                          | P3                                  | 73.9      | XBDAMB-00-0000-000000801 |
|       |                          | P2                                  | 67.2      | XBDAMB-00-0000-000000701 |
| 03    | 590 - 595                | Q2                                  | 87.4      | XBDAMB-00-0000-000000A03 |
|       |                          | P4                                  | 80.6      | XBDAMB-00-0000-000000903 |
|       |                          | P3                                  | 73.9      | XBDAMB-00-0000-000000803 |
|       |                          | P2                                  | 67.2      | XBDAMB-00-0000-000000703 |

## Notes:

- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38.
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.

ORDER CODES SUGGESTED FOR NEW DESIGNS - COLOR ( $T_j = 25\text{ }^{\circ}\text{C}$ ) - CONTINUED

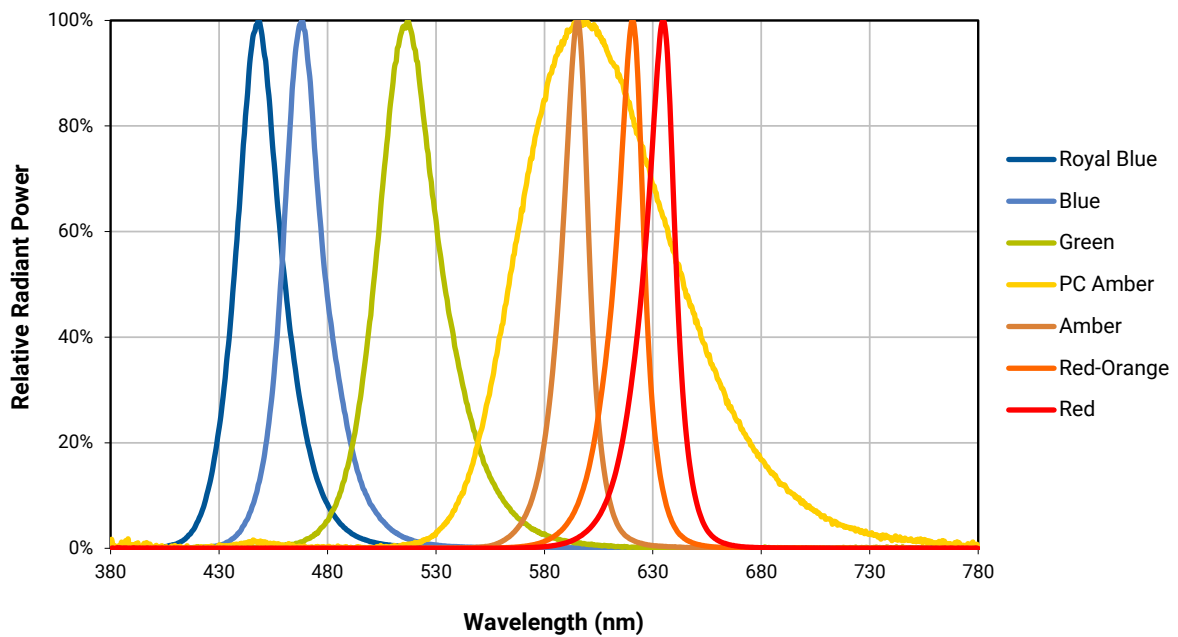
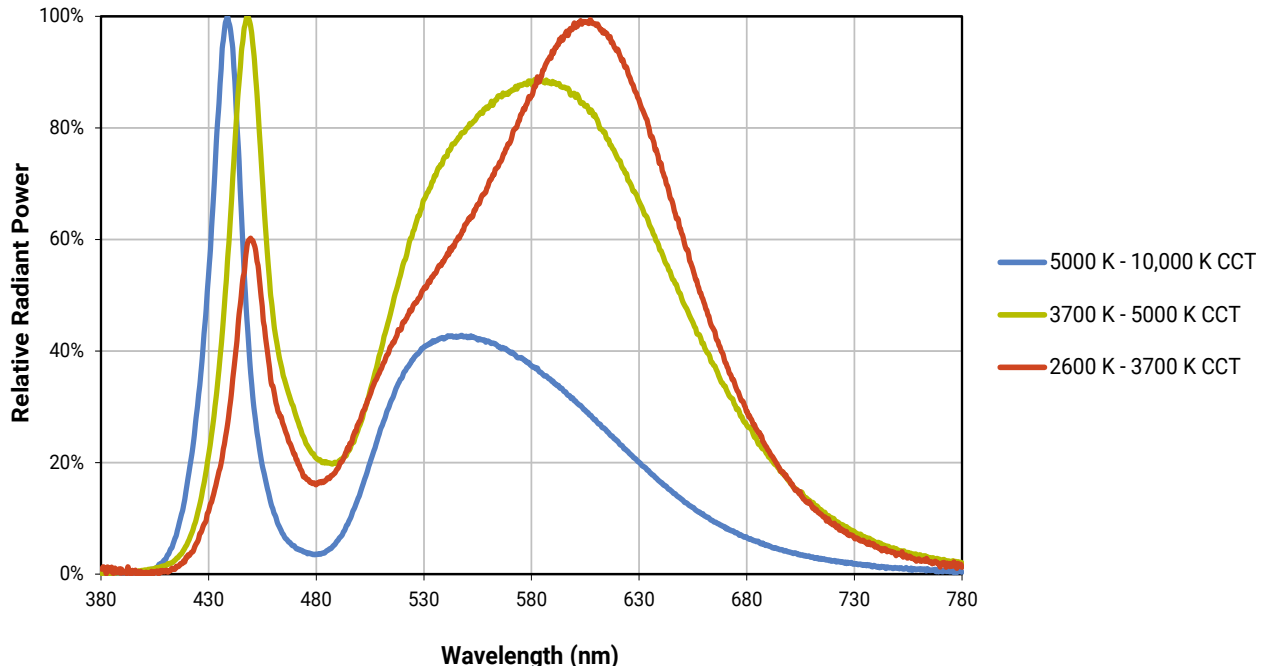
| Red-Orange |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes              |
|------------|--------------------------|-------------------------------------|-----------|--------------------------|
| Kit        | Dominant Wavelength (nm) | Code                                | Flux (lm) |                          |
| 01         | 610 - 620                | R2                                  | 114       | XBDRDO-00-0000-000000E01 |
|            |                          | Q5                                  | 107       | XBDRDO-00-0000-000000D01 |
|            |                          | Q4                                  | 100       | XBDRDO-00-0000-000000C01 |
|            |                          | Q3                                  | 93.9      | XBDRDO-00-0000-000000B01 |
|            |                          | Q2                                  | 87.4      | XBDRDO-00-0000-000000A01 |
| 02         | 610 - 615                | R2                                  | 114       | XBDRDO-00-0000-000000E02 |
|            |                          | Q5                                  | 107       | XBDRDO-00-0000-000000D02 |
|            |                          | Q4                                  | 100       | XBDRDO-00-0000-000000C02 |
|            |                          | Q3                                  | 93.9      | XBDRDO-00-0000-000000B02 |
|            |                          | Q2                                  | 87.4      | XBDRDO-00-0000-000000A02 |
| 03         | 615 - 620                | Q4                                  | 100       | XBDRDO-00-0000-000000C03 |
|            |                          | Q3                                  | 93.9      | XBDRDO-00-0000-000000B03 |
|            |                          | Q2                                  | 87.4      | XBDRDO-00-0000-000000A03 |

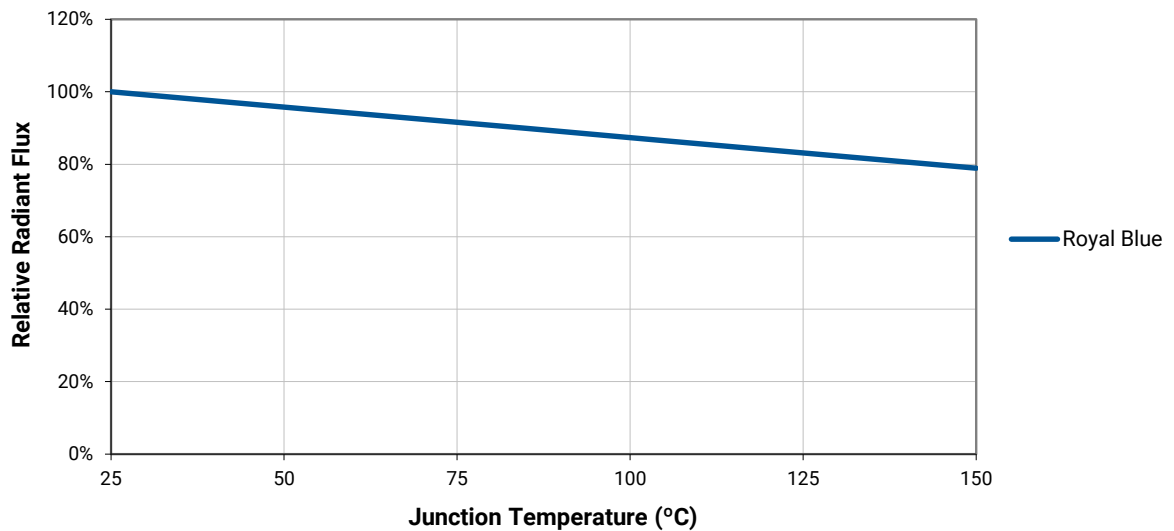
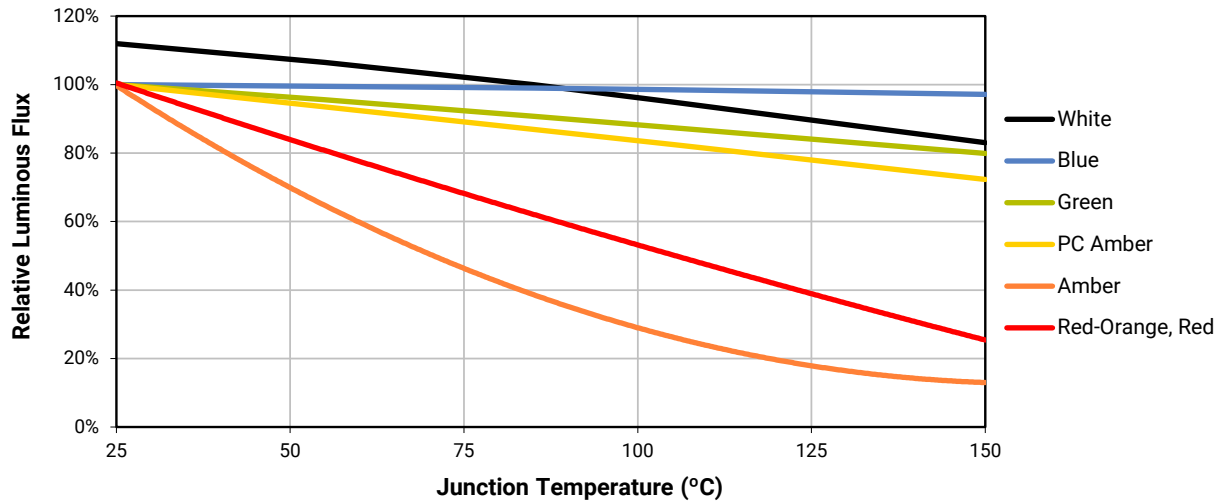
| Red |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes             |
|-----|--------------------------|-------------------------------------|-----------|-------------------------|
| Kit | Dominant Wavelength (nm) | Code                                | Flux (lm) |                         |
| 01  | 620 - 630                | P4                                  | 80.6      | XBDRD-00-0000-000000901 |
|     |                          | P3                                  | 73.9      | XBDRD-00-0000-000000801 |
|     |                          | P2                                  | 67.2      | XBDRD-00-0000-000000701 |
| 02  | 620 - 625                | P4                                  | 80.6      | XBDRD-00-0000-000000902 |
|     |                          | P3                                  | 73.9      | XBDRD-00-0000-000000802 |
|     |                          | P2                                  | 67.2      | XBDRD-00-0000-000000702 |

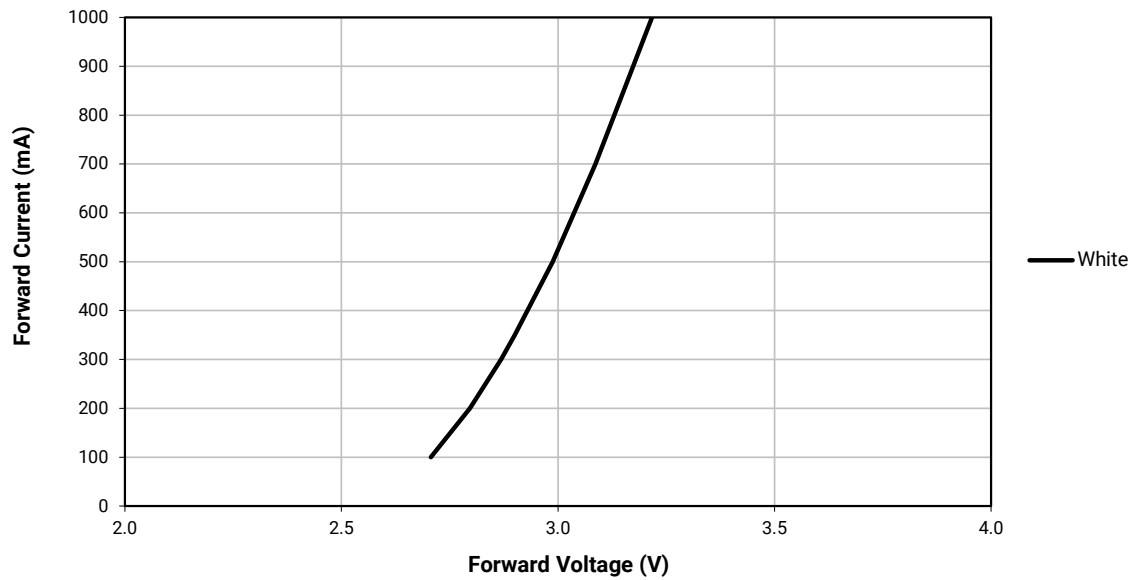
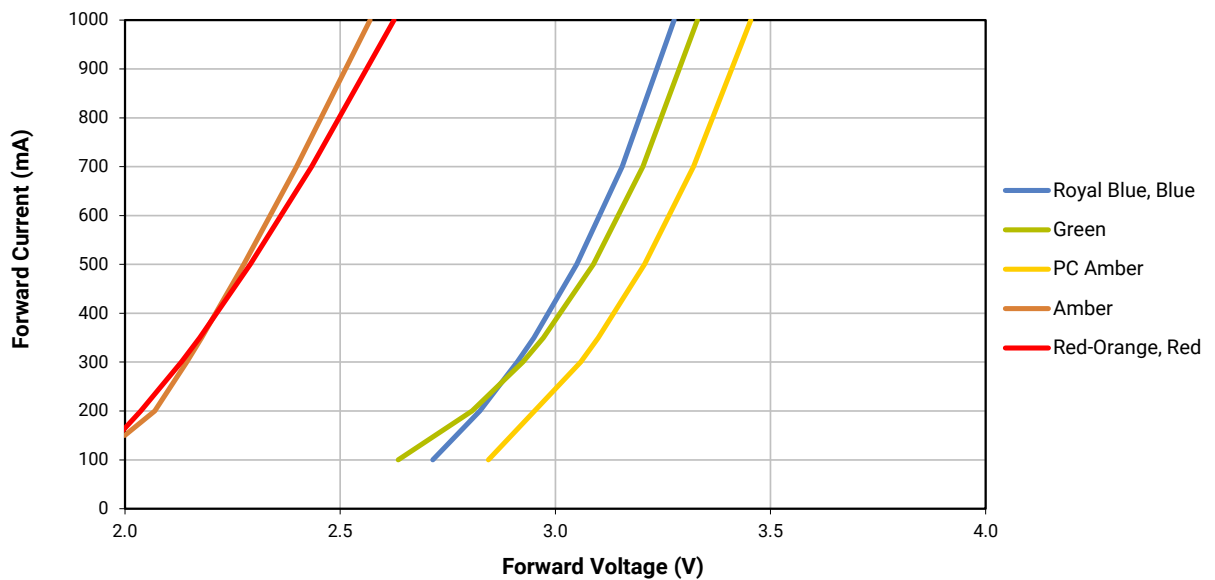
## Notes:

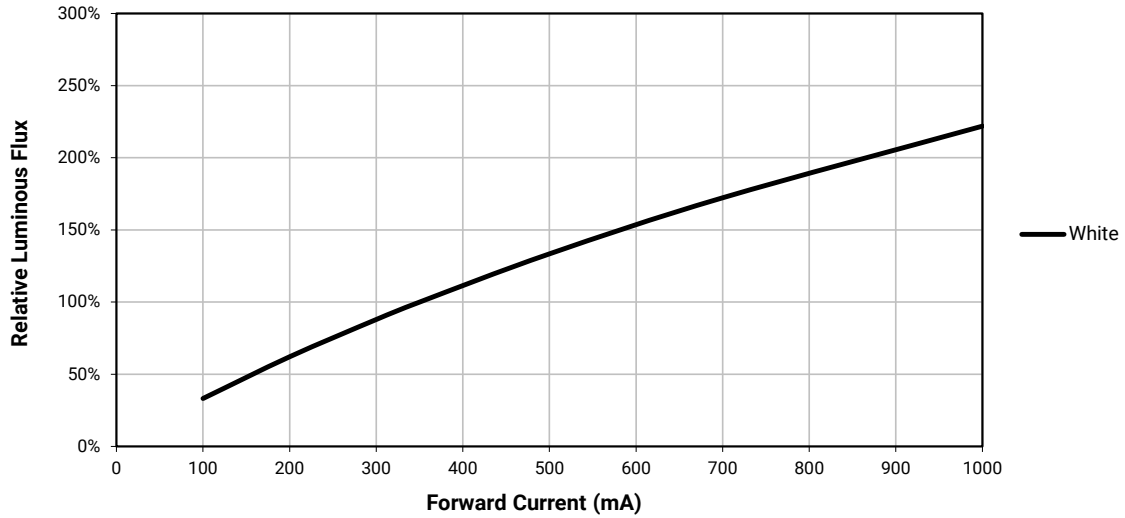
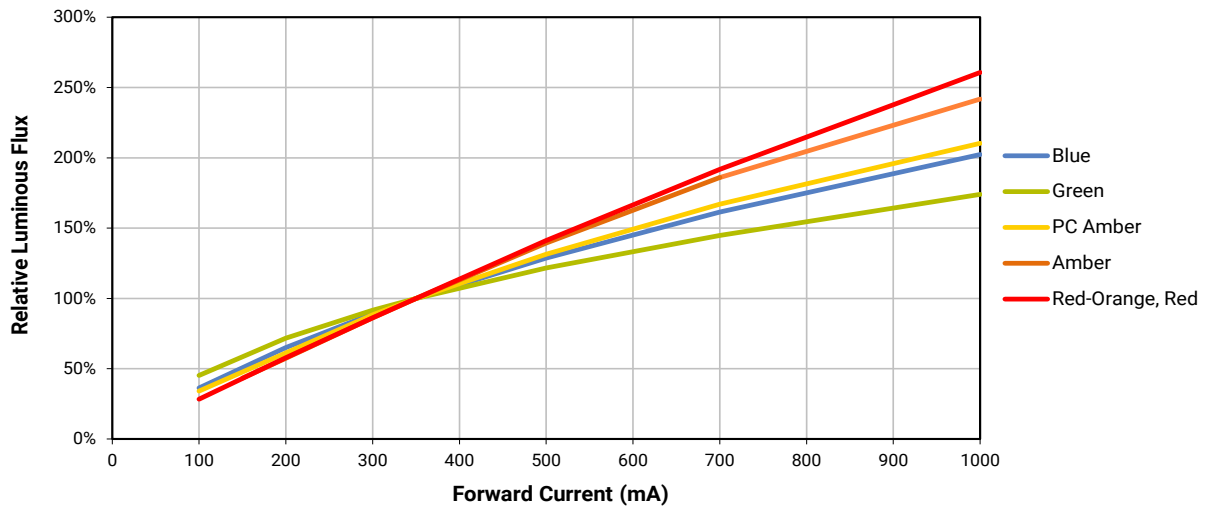
- For additional order codes NOT recommended for new designs please see the Appendix section starting on page 38.
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.

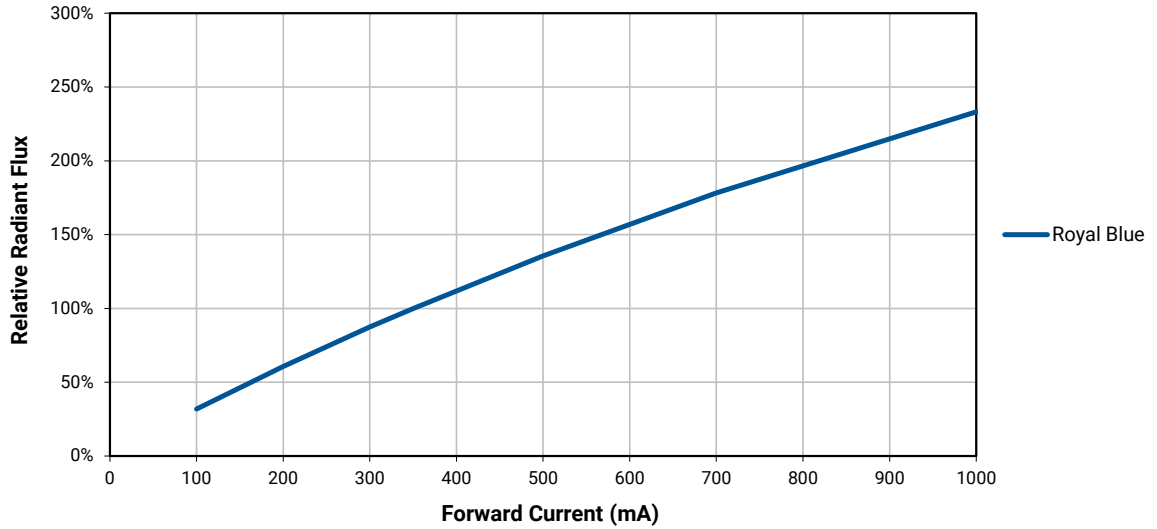
## RELATIVE SPECTRAL POWER DISTRIBUTION



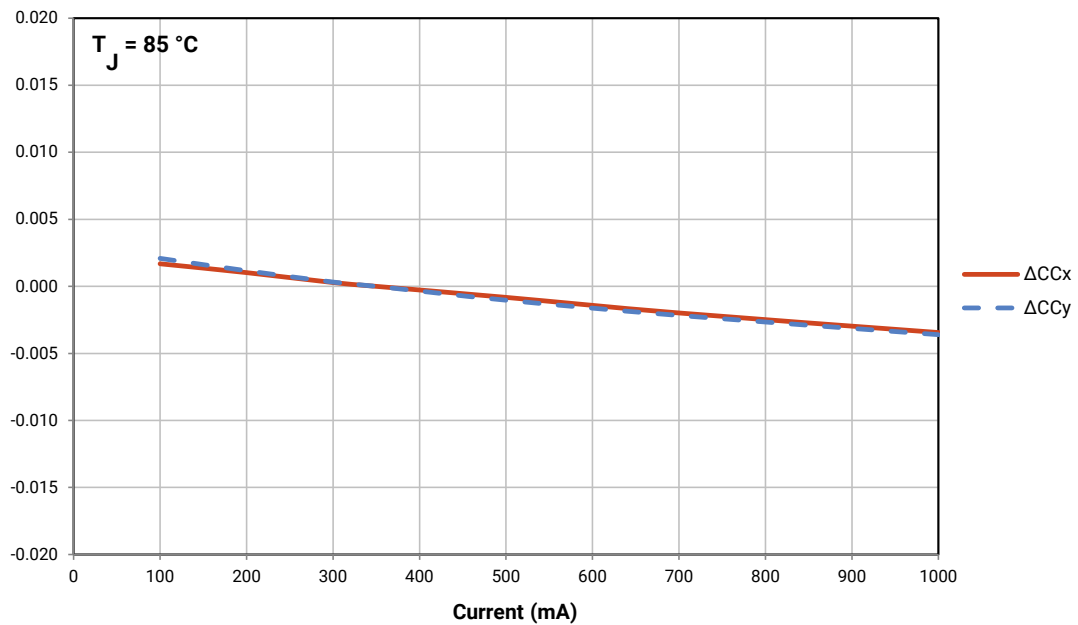
RELATIVE FLUX VS. JUNCTION TEMPERATURE ( $I_F = 350$  mA)

ELECTRICAL CHARACTERISTICS - WHITE ( $T_J = 85^\circ\text{C}$ )ELECTRICAL CHARACTERISTICS - COLOR ( $T_J = 25^\circ\text{C}$ )

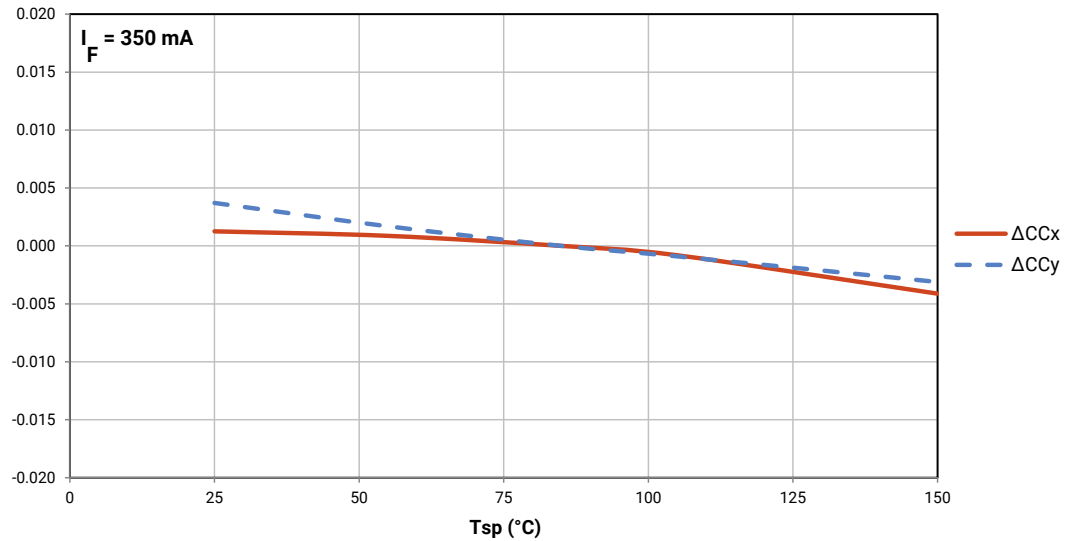
RELATIVE FLUX VS. CURRENT - WHITE ( $T_j = 85^\circ\text{C}$ )RELATIVE FLUX VS. CURRENT - COLOR ( $T_j = 25^\circ\text{C}$ )

RELATIVE FLUX VS. CURRENT -COLOR ( $T_J = 25\text{ }^{\circ}\text{C}$ ) - CONTINUED

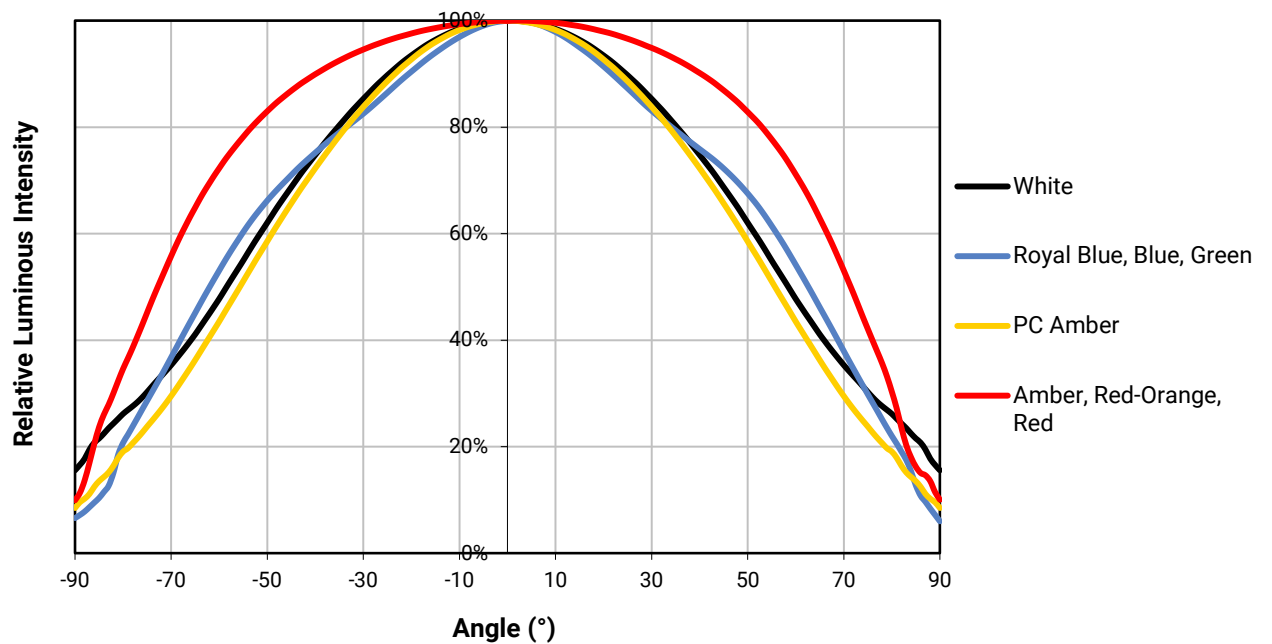
## RELATIVE CHROMATICITY VS. CURRENT (WARM WHITE)



## RELATIVE CHROMATICITY VS. TEMPERATURE (WARM WHITE)

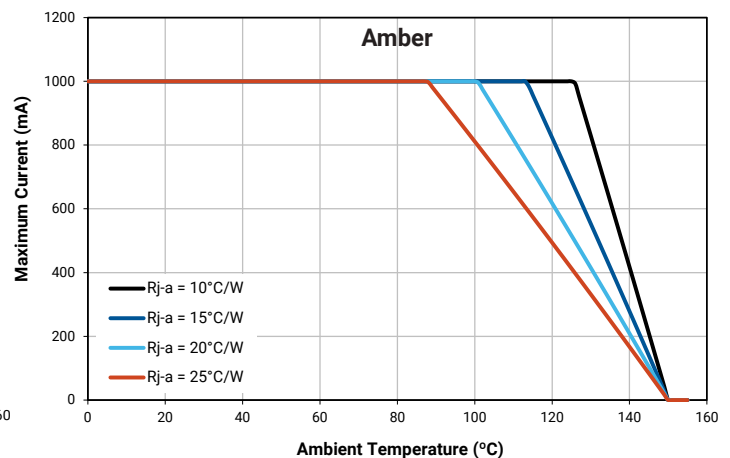
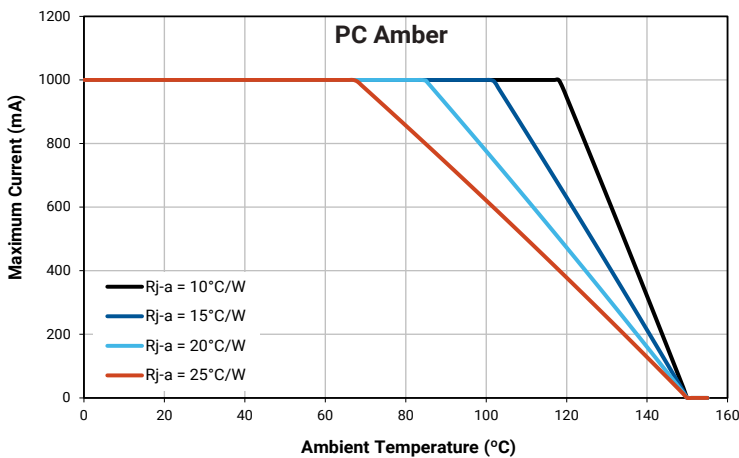
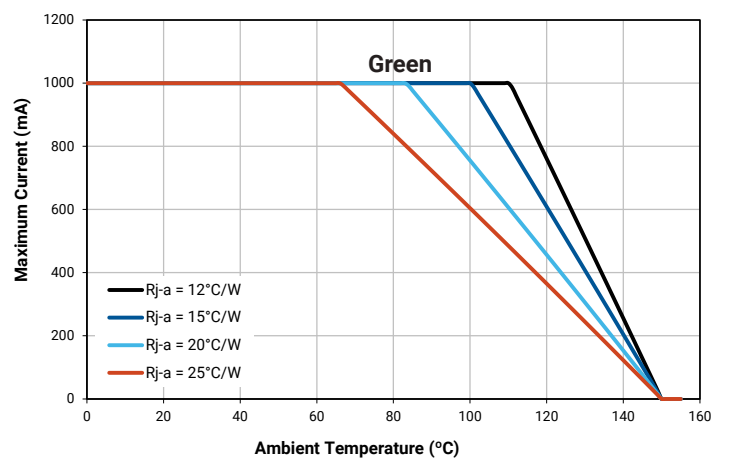
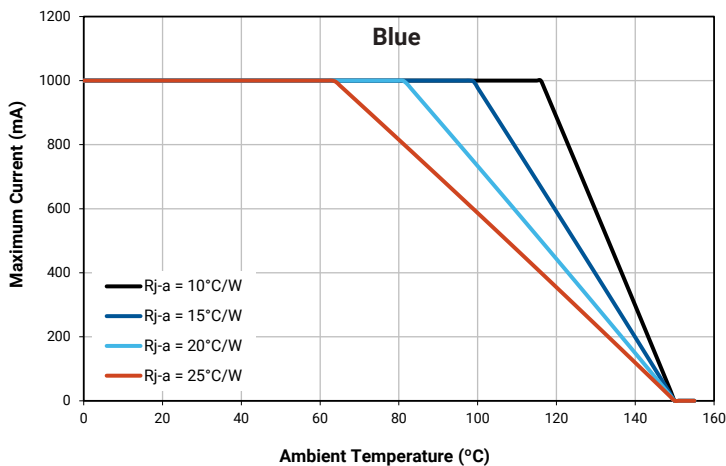
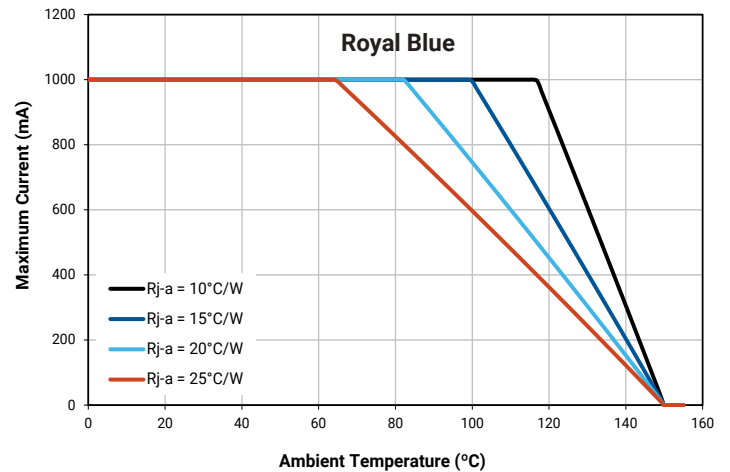
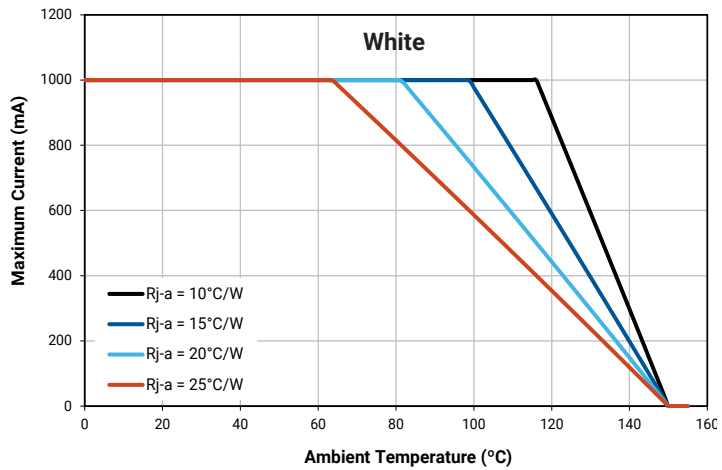


## TYPICAL SPATIAL DISTRIBUTION

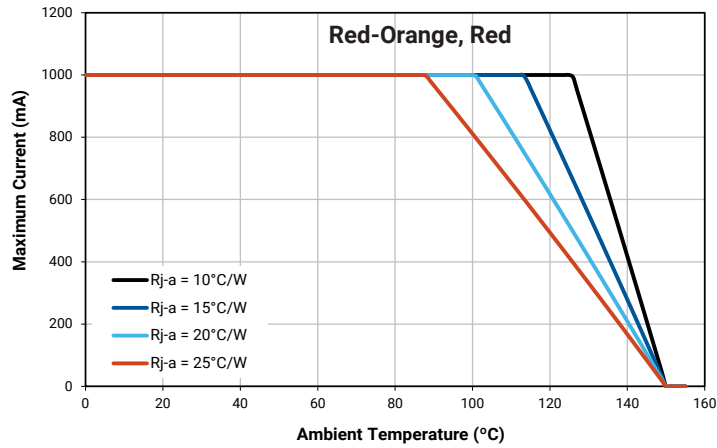


## THERMAL DESIGN

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.



## THERMAL DESIGN - CONTINUED



## PERFORMANCE GROUPS – LUMINOUS FLUX

XLamp XB-D LEDs, except royal blue, are tested for luminous flux and placed into one of the following luminous-flux groups. These groups, appended with a 0, are used in the Bin Code “Luminous or radiant flux group.”

| Group Code | Minimum Luminous Flux (lm)<br>@ 350 mA | Maximum Luminous Flux (lm)<br>@ 350 mA |
|------------|----------------------------------------|----------------------------------------|
| 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                                     |
| N4         | 62                                     | 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                                    |
| R3         | 122                                    | 130                                    |
| R4         | 130                                    | 139                                    |
| R5         | 139                                    | 148                                    |
| S2         | 143                                    | 156                                    |
| S3         | 156                                    | 164                                    |

## PERFORMANCE GROUPS – RADIANT FLUX

Royal blue XLamp XB-D LEDs are tested for radiant flux and sorted into one of the following radiant-flux bins.

| Group | Minimum Radiant Flux (mW)<br>@ 350 mA | Maximum Radiant Flux (mW)<br>@ 350 mA |
|-------|---------------------------------------|---------------------------------------|
| 34    | 550                                   | 575                                   |
| 35    | 575                                   | 600                                   |
| 36    | 600                                   | 625                                   |
| 37    | 625                                   | 650                                   |
| 38    | 650                                   | 675                                   |
| 39    | 675                                   | 700                                   |
| 40    | 700                                   | 725                                   |

## PERFORMANCE GROUPS – DOMINANT WAVELENGTH

Color XLamp XB-D 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 | D36       | 450                          | 452.5                        |
|            | D37       | 452.5                        | 455                          |
|            | D46       | 455                          | 457.5                        |
|            | D47       | 457.5                        | 460                          |
|            | D56       | 460                          | 462.5                        |
|            | D57       | 462.5                        | 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, red and royal blue XLamp XB-D LEDs are tested for forward voltage and sorted into one of the forward voltage bins defined below.

| Forward Voltage Group | Minimum Forward Voltage (V)<br>@ 350 mA | Maximum Forward Voltage (V)<br>@ 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                                     |

## 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 |

## PERFORMANCE GROUPS – CHROMATICITY (CONTINUED)

| Region | x      | y      | Region | x      | y      | Region | x      | y      | Region | x      | y      |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 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 |
| 4R     | 0.3512 | 0.3465 | 4S     | 0.3571 | 0.3907 | 4T     | 0.3668 | 0.3957 | 4U     | 0.3590 | 0.3521 |
|        | 0.3590 | 0.3521 |        | 0.3668 | 0.3957 |        | 0.3771 | 0.4034 |        | 0.3670 | 0.3578 |
|        | 0.3567 | 0.3389 |        | 0.3641 | 0.3804 |        | 0.3736 | 0.3874 |        | 0.3640 | 0.3440 |
|        | 0.3495 | 0.3339 |        | 0.3548 | 0.3736 |        | 0.3641 | 0.3804 |        | 0.3567 | 0.3389 |
| 5A1    | 0.3670 | 0.3578 | 5A2    | 0.3686 | 0.3649 | 5A3    | 0.3744 | 0.3685 | 5A4    | 0.3726 | 0.3612 |
|        | 0.3686 | 0.3649 |        | 0.3702 | 0.3722 |        | 0.3763 | 0.3760 |        | 0.3744 | 0.3685 |
|        | 0.3744 | 0.3685 |        | 0.3763 | 0.3760 |        | 0.3825 | 0.3798 |        | 0.3804 | 0.3721 |
|        | 0.3726 | 0.3612 |        | 0.3744 | 0.3685 |        | 0.3804 | 0.3721 |        | 0.3783 | 0.3646 |
| 5B1    | 0.3702 | 0.3722 | 5B2    | 0.3719 | 0.3797 | 5B3    | 0.3782 | 0.3837 | 5B4    | 0.3763 | 0.3760 |
|        | 0.3719 | 0.3797 |        | 0.3736 | 0.3874 |        | 0.3802 | 0.3916 |        | 0.3782 | 0.3837 |
|        | 0.3782 | 0.3837 |        | 0.3802 | 0.3916 |        | 0.3869 | 0.3958 |        | 0.3847 | 0.3877 |
|        | 0.3763 | 0.3760 |        | 0.3782 | 0.3837 |        | 0.3847 | 0.3877 |        | 0.3825 | 0.3798 |
| 5C1    | 0.3825 | 0.3798 | 5C2    | 0.3847 | 0.3877 | 5C3    | 0.3912 | 0.3917 | 5C4    | 0.3887 | 0.3836 |
|        | 0.3847 | 0.3877 |        | 0.3869 | 0.3958 |        | 0.3937 | 0.4001 |        | 0.3912 | 0.3917 |
|        | 0.3912 | 0.3917 |        | 0.3937 | 0.4001 |        | 0.4006 | 0.4044 |        | 0.3978 | 0.3958 |
|        | 0.3887 | 0.3836 |        | 0.3912 | 0.3917 |        | 0.3978 | 0.3958 |        | 0.3950 | 0.3875 |
| 5D1    | 0.3783 | 0.3646 | 5D2    | 0.3804 | 0.3721 | 5D3    | 0.3863 | 0.3758 | 5D4    | 0.3840 | 0.3681 |
|        | 0.3804 | 0.3721 |        | 0.3825 | 0.3798 |        | 0.3887 | 0.3836 |        | 0.3863 | 0.3758 |
|        | 0.3863 | 0.3758 |        | 0.3887 | 0.3836 |        | 0.3950 | 0.3875 |        | 0.3924 | 0.3794 |
|        | 0.3840 | 0.3681 |        | 0.3863 | 0.3758 |        | 0.3924 | 0.3794 |        | 0.3898 | 0.3716 |
| 5R     | 0.3670 | 0.3578 | 5S     | 0.3771 | 0.4034 | 5T     | 0.3916 | 0.4127 | 5U     | 0.3783 | 0.3646 |
|        | 0.3783 | 0.3646 |        | 0.3916 | 0.4127 |        | 0.4064 | 0.4221 |        | 0.3898 | 0.3716 |
|        | 0.3743 | 0.3502 |        | 0.3869 | 0.3958 |        | 0.4006 | 0.4044 |        | 0.3848 | 0.3565 |
|        | 0.3640 | 0.3440 |        | 0.3736 | 0.3874 |        | 0.3869 | 0.3958 |        | 0.3743 | 0.3502 |
| 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 |

## PERFORMANCE GROUPS – CHROMATICITY (CONTINUED)

| Region | x      | y      | Region | x      | y      | Region | x      | y      | Region | x      | y      |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 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 |
| 6R     | 0.3889 | 0.3690 | 6S     | 0.4054 | 0.4191 | 6T     | 0.4217 | 0.4273 | 6U     | 0.4017 | 0.3751 |
|        | 0.4017 | 0.3751 |        | 0.4217 | 0.4273 |        | 0.4382 | 0.4356 |        | 0.4147 | 0.3814 |
|        | 0.3957 | 0.3596 |        | 0.4146 | 0.4089 |        | 0.4299 | 0.4165 |        | 0.4077 | 0.3652 |
|        | 0.3840 | 0.3540 |        | 0.3996 | 0.4015 |        | 0.4146 | 0.4089 |        | 0.3957 | 0.3596 |
| 7A     | 0.4221 | 0.3985 | 7B     | 0.4299 | 0.4165 | 7C     | 0.4430 | 0.4212 | 7D     | 0.4342 | 0.4028 |
|        | 0.4342 | 0.4028 |        | 0.4430 | 0.4212 |        | 0.4562 | 0.426  |        | 0.4465 | 0.4071 |
|        | 0.4260 | 0.3853 |        | 0.4342 | 0.4028 |        | 0.4465 | 0.4071 |        | 0.4373 | 0.3893 |
|        | 0.4147 | 0.3814 |        | 0.4221 | 0.3985 |        | 0.4342 | 0.4028 |        | 0.4260 | 0.3853 |
| 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 |
| 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 |
| 8A     | 0.4465 | 0.4071 | 8B     | 0.4562 | 0.4260 | 8C     | 0.4687 | 0.4289 | 8D     | 0.4582 | 0.4099 |
|        | 0.4582 | 0.4099 |        | 0.4687 | 0.4289 |        | 0.4813 | 0.4319 |        | 0.4700 | 0.4126 |
|        | 0.4483 | 0.3918 |        | 0.4582 | 0.4099 |        | 0.4700 | 0.4126 |        | 0.4593 | 0.3944 |
|        | 0.4373 | 0.3893 |        | 0.4465 | 0.4071 |        | 0.4582 | 0.4099 |        | 0.4483 | 0.3918 |

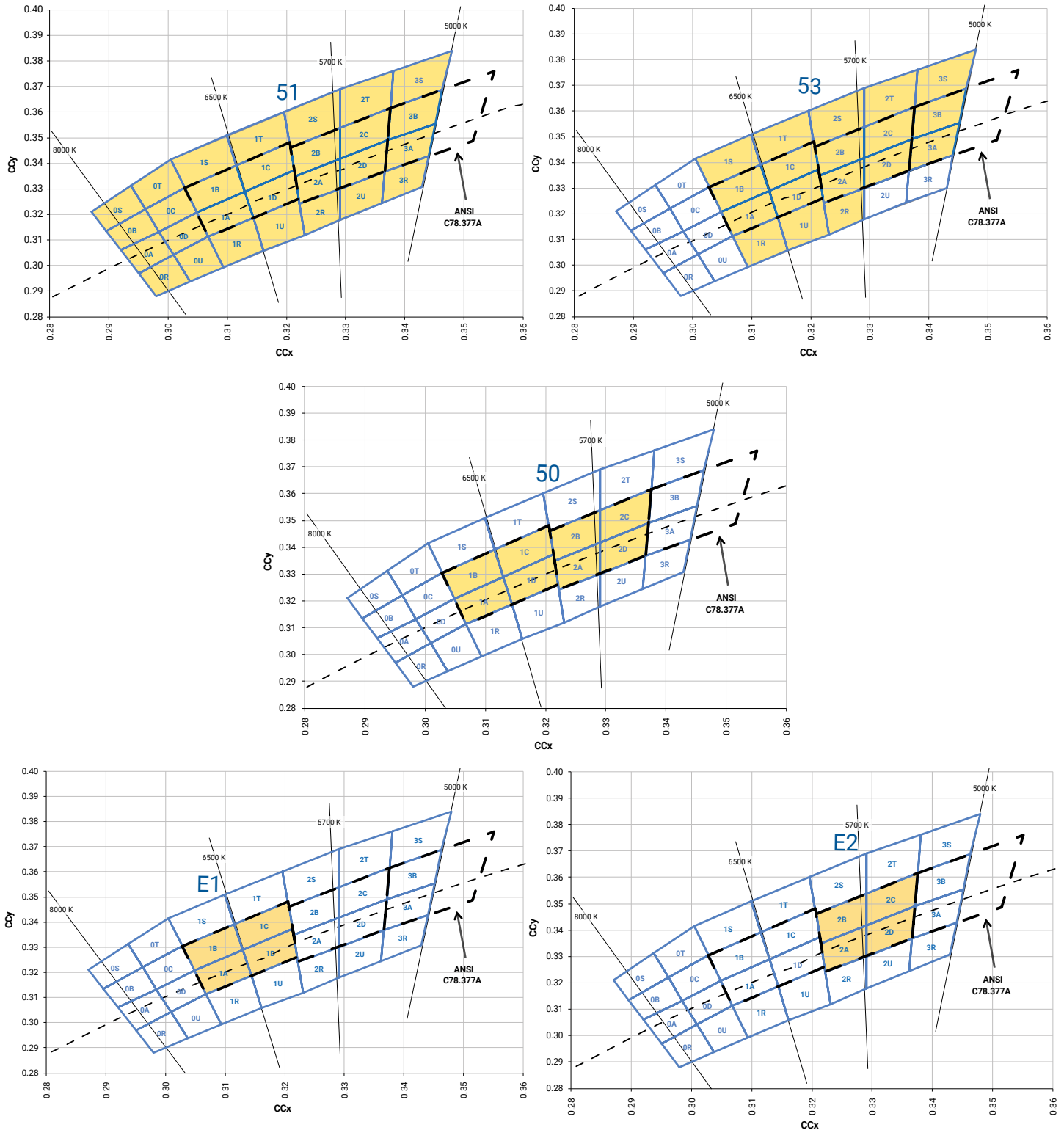
## PERFORMANCE GROUPS – CHROMATICITY (CONTINUED)

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

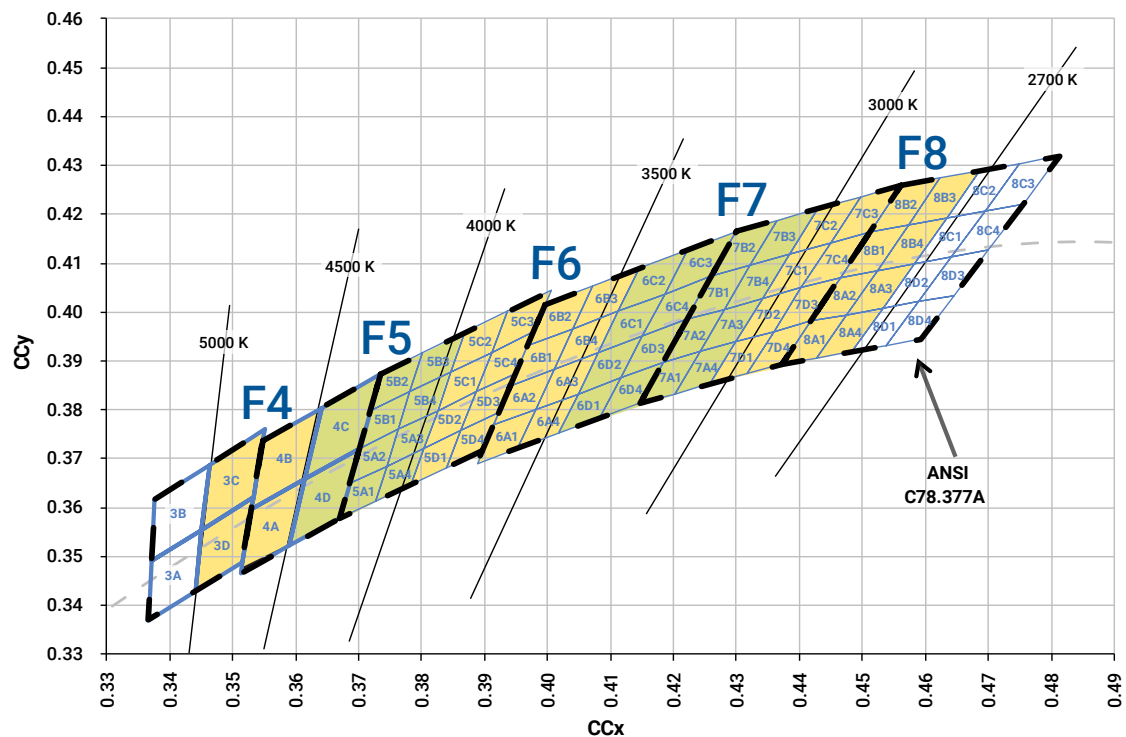
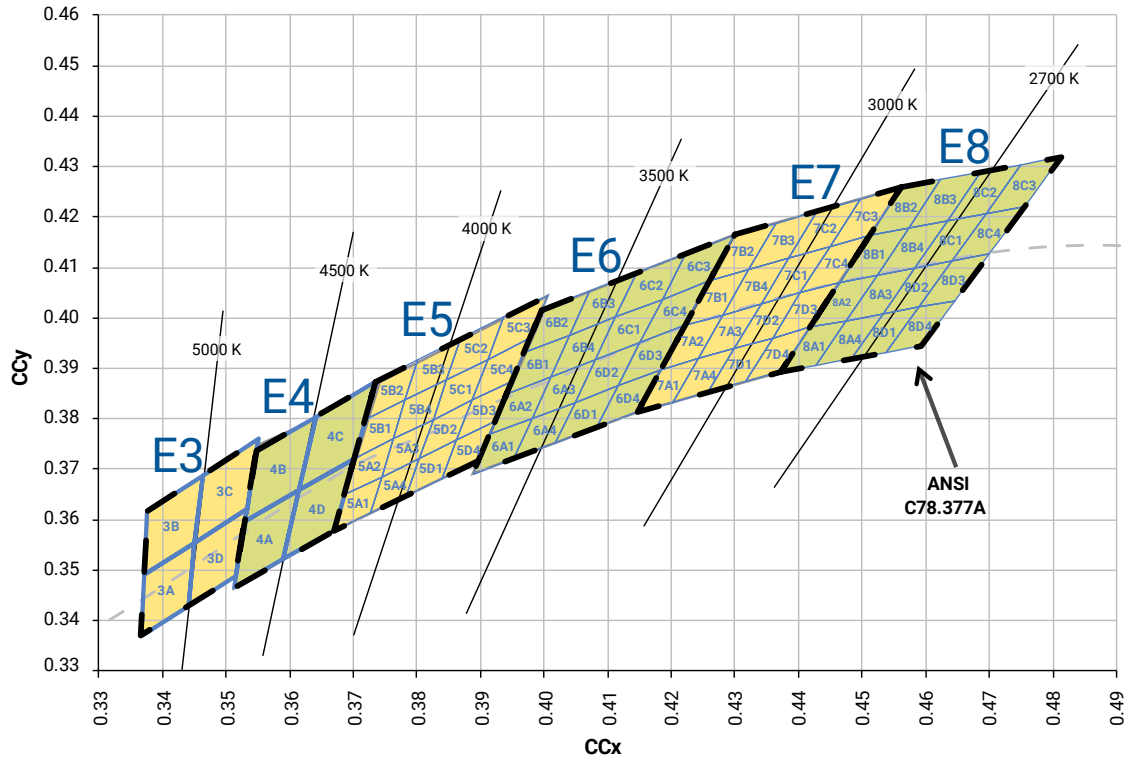
XLamp XB-D PC amber LEDs are placed into the region defined by the following bounding coordinates.

| Region | x      | y      |
|--------|--------|--------|
| Y2     | 0.5469 | 0.4249 |
|        | 0.5700 | 0.4100 |
|        | 0.5900 | 0.4100 |
|        | 0.5610 | 0.4390 |

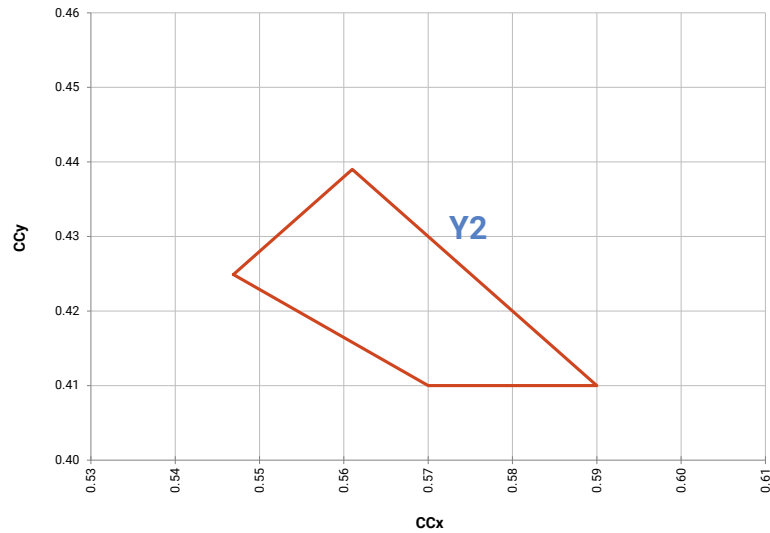
## STANDARD COOL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS



## STANDARD WARM AND NEUTRAL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS



## CREE LED'S PC AMBER KIT PLOTTED ON THE 1931 CIE CURVE



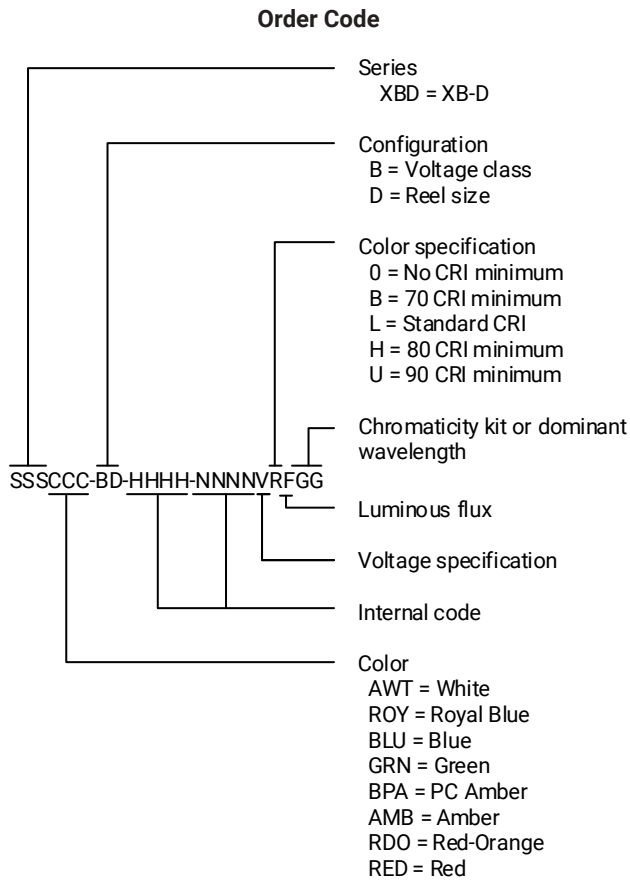
## CREE LED'S STANDARD CHROMATICITY KITS

The following table provides the chromaticity bins associated with chromaticity kits, which are specified as part of the order code.

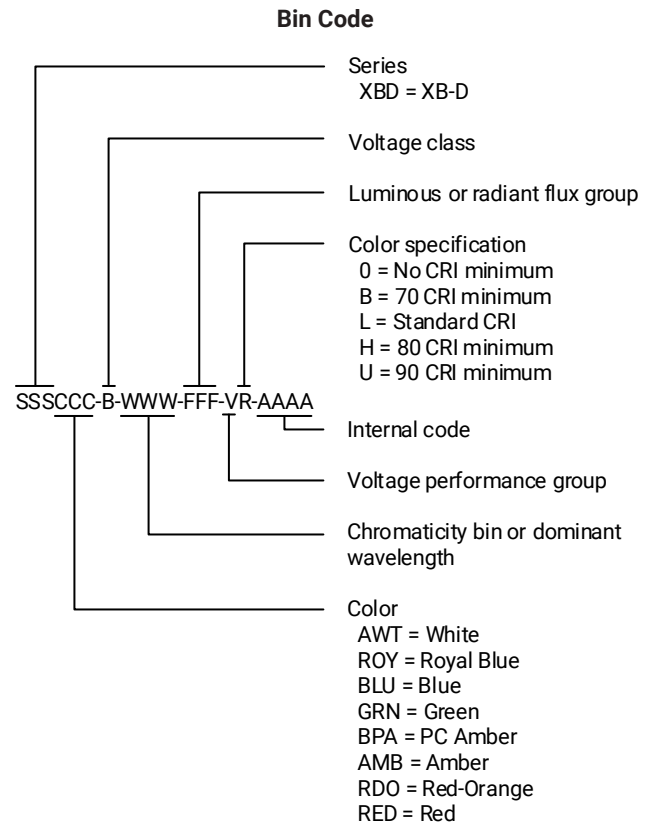
| Color         | Kit | Chromaticity Bins                                                                                              |
|---------------|-----|----------------------------------------------------------------------------------------------------------------|
| Cool White    | 51  | 0A, 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 |
|               | 53  | 1A, 1B, 1C, 1D, 1R, 1S, 1T, 1U, 2A, 2B, 2C, 2D, 2R, 2S, 2T, 3A, 3B, 3S                                         |
|               | 50  | 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D                                                                                 |
|               | E1  | 1A, 1B, 1C, 1D                                                                                                 |
|               | E2  | 2A, 2B, 2C, 2D                                                                                                 |
| Neutral White | E3  | 3A, 3B, 3C, 3D                                                                                                 |
|               | F4  | 3C, 3D, 4A, 4B                                                                                                 |
|               | E4  | 4A, 4B, 4C, 4D                                                                                                 |
|               | F5  | 4C, 4D, 5A1, 5A2, 5A3, 5A4, 5B1, 5B2, 5B3, 5B4                                                                 |
|               | E5  | 5A1, 5A2, 5A3, 5A4, 5B1, 5B2, 5B3, 5B4, 5C1, 5C2, 5C3, 5C4, 5D1, 5D2, 5D3, 5D4                                 |
| Warm White    | F6  | 5C1, 5C2, 5C3, 5C4, 5D1, 5D2, 5D3, 5D4, 6A1, 6A2, 6A3, 6A4, 6B1, 6B2, 6B3, 6B4                                 |
|               | E6  | 6A1, 6A2, 6A3, 6A4, 6B1, 6B2, 6B3, 6B4, 6C1, 6C2, 6C3, 6C4, 6D1, 6D2, 6D3, 6D4                                 |
|               | F7  | 6C1, 6C2, 6C3, 6C4, 6D1, 6D2, 6D3, 6D4, 7A1, 7A2, 7A3, 7A4, 7B1, 7B2, 7B3, 7B4                                 |
|               | E7  | 7A1, 7A2, 7A3, 7A4, 7B1, 7B2, 7B3, 7B4, 7C1, 7C2, 7C3, 7C4, 7D1, 7D2, 7D3, 7D4                                 |
|               | F8  | 7C1, 7C2, 7C3, 7C4, 7D1, 7D2, 7D3, 7D4, 8A1, 8A2, 8A3, 8A4, 8B1, 8B2, 8B3, 8B4                                 |
|               | E8  | 8A1, 8A2, 8A3, 8A4, 8B1, 8B2, 8B3, 8B4, 8C1, 8C2, 8C3, 8C4, 8D1, 8D2, 8D3, 8D4                                 |

## BIN AND ORDER CODE FORMATS

Bin codes and order codes for XB-D LEDs are configured in the following manner:



Example Order Code: XBDAWT-00-0000-0000HAE7

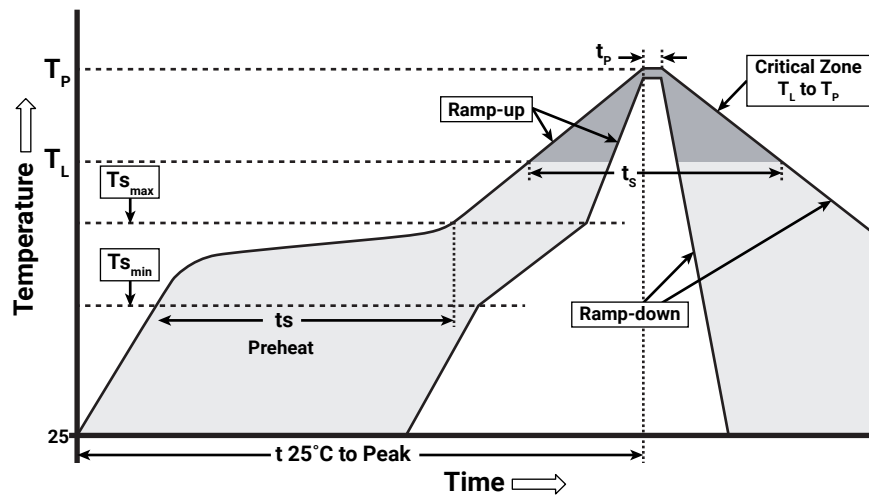


Example Bin Code: XBDAWT-0-7A3-Q20-0H-0001

## REFLOW SOLDERING CHARACTERISTICS

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

Note that this general guideline may not apply to all PCB designs and configurations of reflow soldering equipment.



IPC/JEDEC J-STD-020C

| Profile Feature                                       | Lead-Free Solder |
|-------------------------------------------------------|------------------|
| Average Ramp-Up Rate ( $T_{s_{max}}$ 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

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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 LED's control and are not intended or provided as operational specifications for the products. Calculated values are provided for informational purposes only and are not intended or provided as specifications.

### Pre-Release Qualification Testing

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

### Lumen Maintenance

Cree LED now uses standardized IES LM-80-08 and TM-21-11 methods for collecting long-term data and extrapolating LED lumen maintenance. For information on the specific LM-80 data sets available for this LED, refer to the public [LM-80 results document](#).

Please read the [Long-Term Lumen Maintenance application note](#) for more details on Cree LED's lumen maintenance testing and forecasting. Please read the [Thermal Management application note](#) for details on how thermal design, ambient temperature, and drive current affect the LED junction temperature.

### Moisture Sensitivity

Cree LED recommends keeping XLamp 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 XB-D 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 storage condition, Cree LED 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 LED representative or from the [Product Ecology](#) section of the Cree LED website.

### REACH Compliance

REACH substances of very high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, please contact a Cree LED representative to insure you get the most up-to-date REACH SVHC Declaration. REACH banned substance information (REACH Article 67) is also available upon request.

## 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.

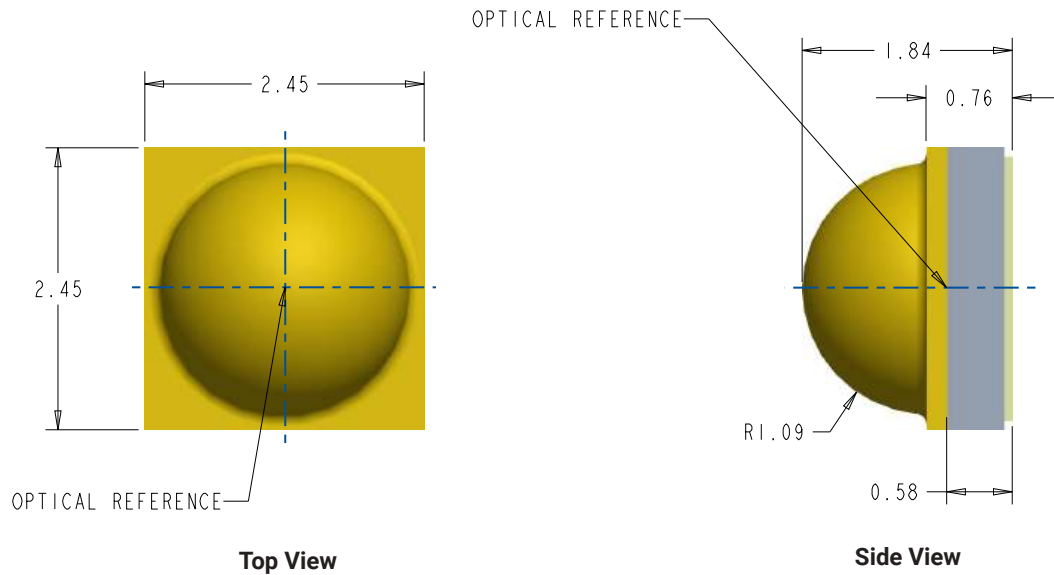
### **Vision Advisory**

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](#).

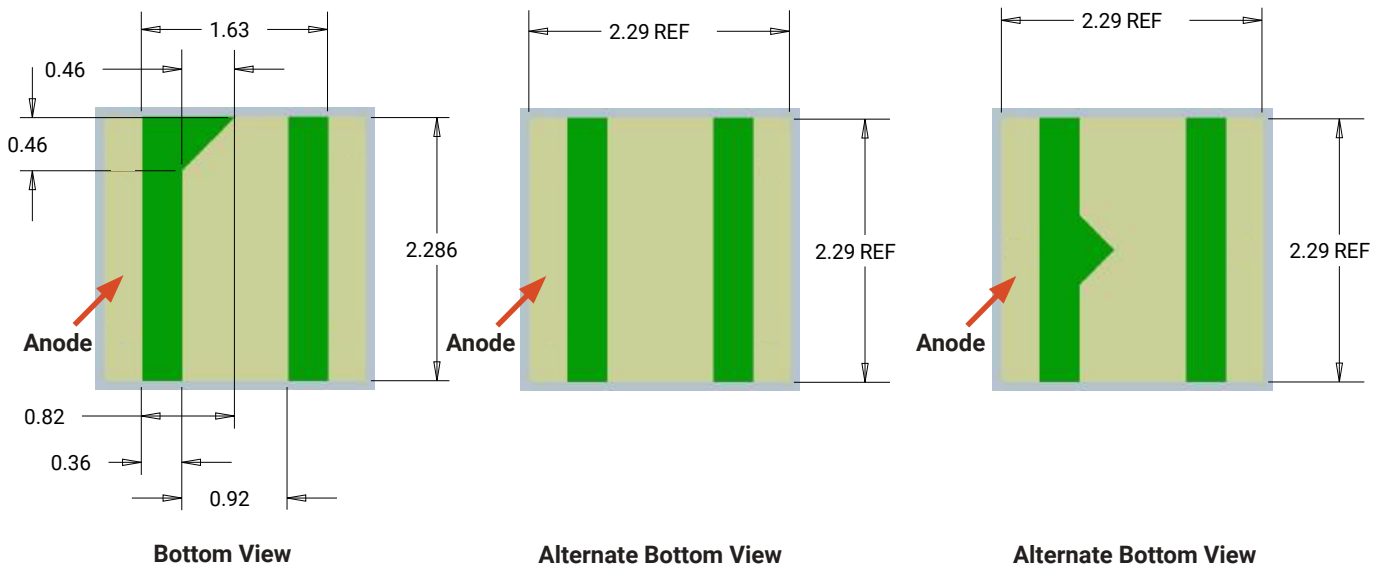
## MECHANICAL DIMENSIONS

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

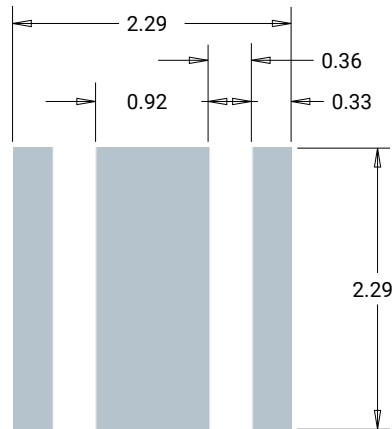
All measurements are  $\pm 0.13$  mm, unless otherwise indicated.



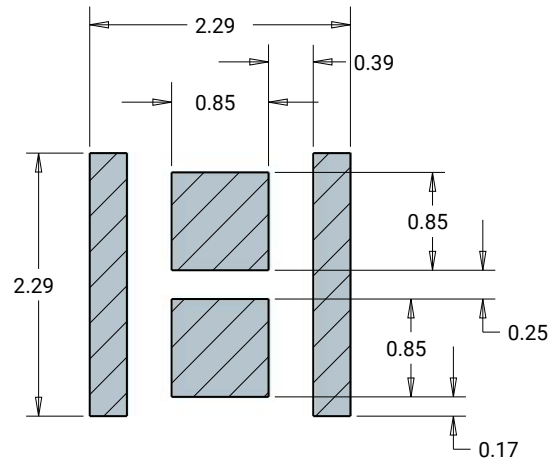
\* The height of XB-D white LEDs is  $1.97 \pm 0.16$  mm for LEDs in the E6-E8, F6-F8, and Z6-Z8 chromaticity regions.



## MECHANICAL DIMENSIONS - CONTINUED



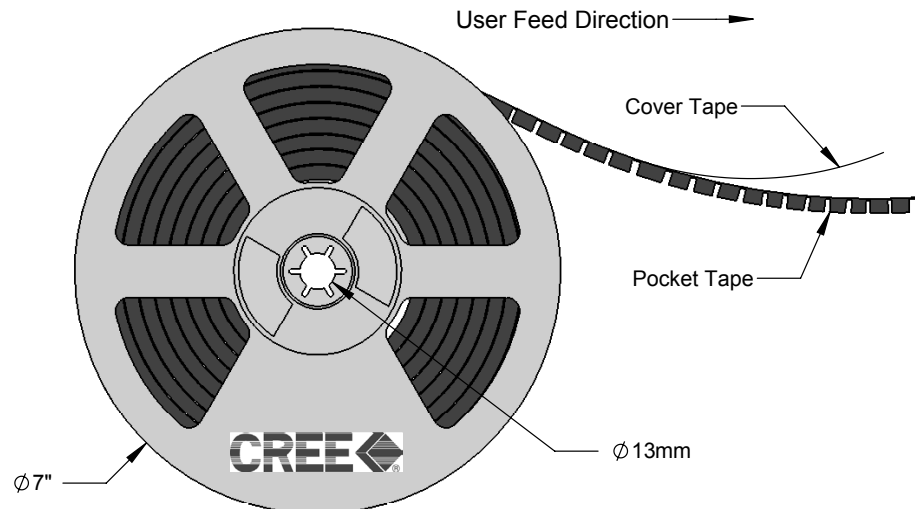
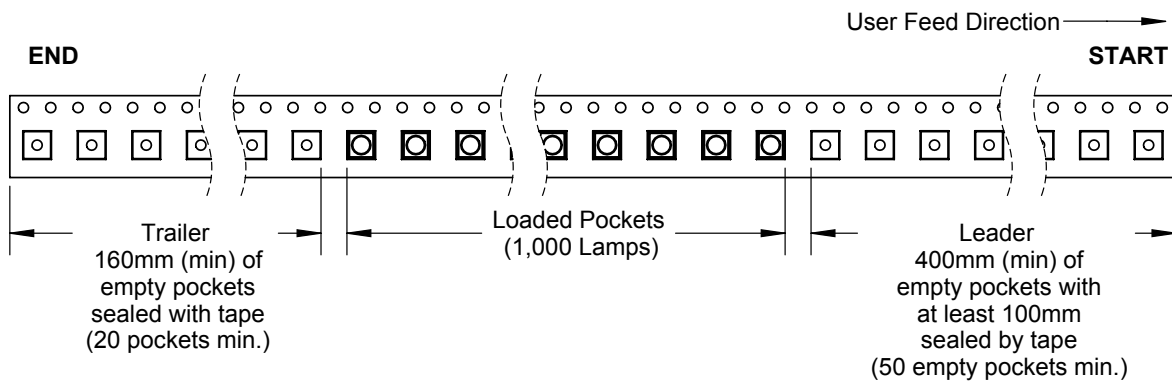
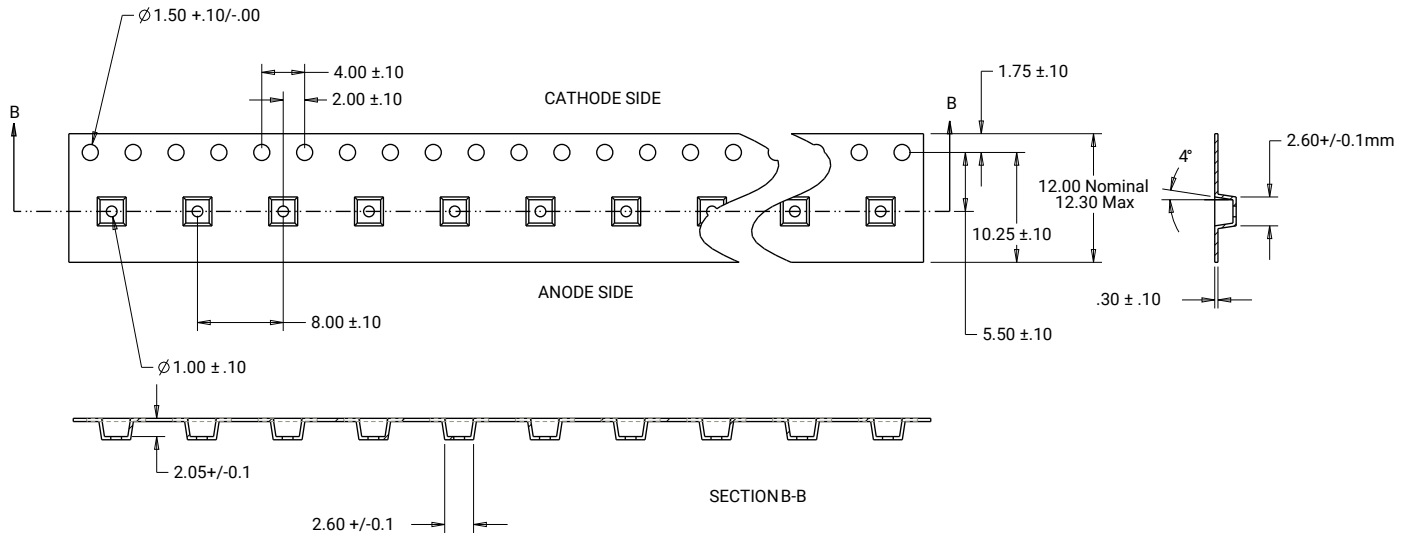
Recommended PCB Solder Pad

Recommended Stencil Pattern  
(Hatched Area is Opening)

## TAPE AND REEL

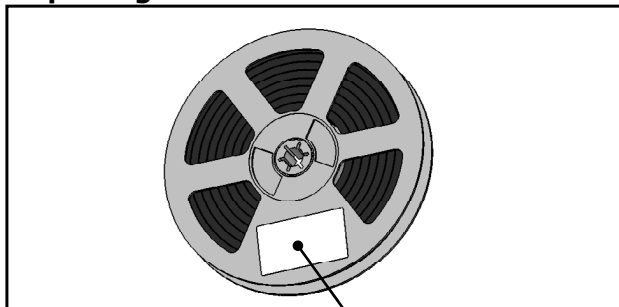
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

Except as noted, all dimensions in mm.



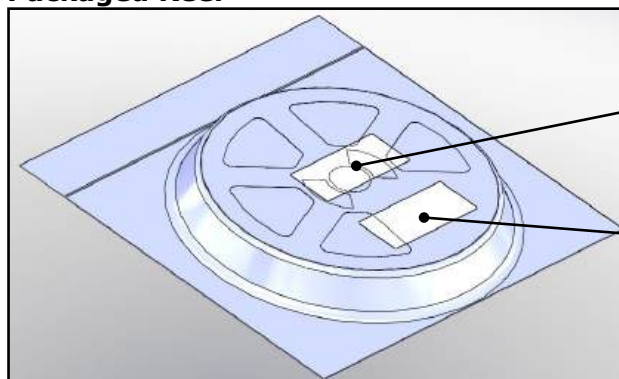
## PACKAGING

## Unpackaged Reel



Label with Cree Bin Code,  
Quantity, Reel ID

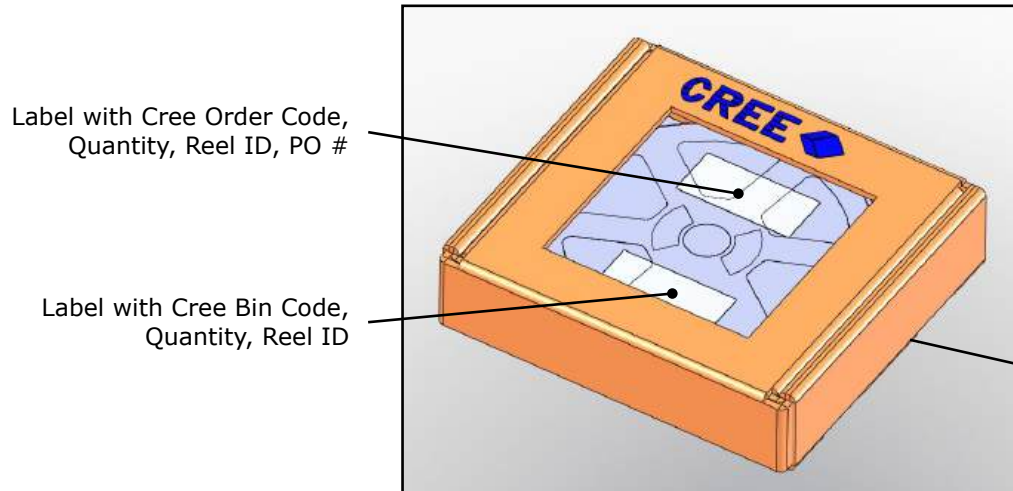
## Packaged Reel



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)

## APPENDIX - ORDER CODES NOT FOR NEW DESIGNS

The following order codes are active and valid order codes, but higher performance options are also available. Please see page 4 - page 9 for order codes of XLamp XB-D white LEDs that could serve as alternatives for the order codes set forth below.

## XB-D ANSI Cool White

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |                   | Order Codes              |                           |                |
|--------------|--------|-------------------------------------|-------------------|--------------------------|---------------------------|----------------|
| Kit          | CCT    | Code                                | Flux (lm) @ 85 °C | No CRI Minimum           | 70 CRI Minimum            | 80 CRI Minimum |
| 51           | 6200 K | R2                                  | 114               | XBDAWT-00-0000-000000E51 | XBDAWT-00-0000-000000BE51 |                |
| 53           | 6000 K | R2                                  | 114               | XBDAWT-00-0000-000000E53 | XBDAWT-00-0000-000000BE53 |                |
| 50           | 6200 K | R2                                  | 114               | XBDAWT-00-0000-000000E50 | XBDAWT-00-0000-000000BE50 |                |
| E1           | 6500 K | R2                                  | 114               | XBDAWT-00-0000-000000EE1 | XBDAWT-00-0000-000000BEE1 |                |
| E2           | 5700 K | R2                                  | 114               | XBDAWT-00-0000-000000EE2 | XBDAWT-00-0000-000000BEE2 |                |

## XB-D ANSI Neutral White

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |                   | Order Codes              |                           |                           |                           |
|--------------|--------|-------------------------------------|-------------------|--------------------------|---------------------------|---------------------------|---------------------------|
| Kit          | CCT    | Code                                | Flux (lm) @ 85 °C | No CRI Minimum           | 70 CRI Minimum            | Standard CRI              | 80 CRI Minimum            |
| E3           | 5000 K | R2                                  | 114               | XBDAWT-00-0000-000000EE3 | XBDAWT-00-0000-000000BEE3 |                           |                           |
|              |        | Q5                                  | 107               |                          |                           | XBDAWT-00-0000-000000LDE3 |                           |
|              |        | Q4                                  | 100               |                          |                           | XBDAWT-00-0000-000000LCE3 |                           |
| F4           | 4750 K | Q5                                  | 107               |                          |                           | XBDAWT-00-0000-000000LDF4 | XBDAWT-00-0000-000000HDF4 |
|              |        | Q4                                  | 100               |                          |                           | XBDAWT-00-0000-000000LCF4 |                           |
| E4           | 4500 K | Q5                                  | 107               |                          |                           | XBDAWT-00-0000-000000LDE4 | XBDAWT-00-0000-000000HDE4 |
|              |        | Q4                                  | 100               |                          |                           | XBDAWT-00-0000-000000LCE4 |                           |

## Notes:

- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and  $\pm 2$  on CRI measurements. See the Measurements section (page 32).
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.
- Typical CRI for Neutral White, 3700 K - 5000 K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.

## APPENDIX - ORDER CODES NOT FOR NEW DESIGNS - CONTINUED

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |                   | Order Codes    |                |                          |                          |
|--------------|--------|-------------------------------------|-------------------|----------------|----------------|--------------------------|--------------------------|
| Kit          | CCT    | Code                                | Flux (lm) @ 85 °C | No CRI Minimum | 70 CRI Minimum | Standard CRI             | 80 CRI Minimum           |
| F5           | 4250 K | Q5                                  | 107               |                |                | XBDAWT-00-0000-00000LDF5 | XBDAWT-00-0000-00000HDF5 |
|              |        | Q4                                  | 100               |                |                | XBDAWT-00-0000-00000LCF5 |                          |
|              |        | Q3                                  | 93.9              |                |                | XBDAWT-00-0000-00000LBF5 |                          |
| E5           | 4000 K | Q5                                  | 107               |                |                | XBDAWT-00-0000-00000LDE5 | XBDAWT-00-0000-00000HDE5 |
|              |        | Q4                                  | 100               |                |                | XBDAWT-00-0000-00000LCE5 |                          |
|              |        | Q3                                  | 93.9              |                |                | XBDAWT-00-0000-00000LBE5 |                          |

## XB-D ANSI Warm White

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |                   | Order Codes    |                |                          |                |                |
|--------------|--------|-------------------------------------|-------------------|----------------|----------------|--------------------------|----------------|----------------|
| Kit          | CCT    | Code                                | Flux (lm) @ 85 °C | No CRI Minimum | 70 CRI Minimum | Standard CRI             | 80 CRI Minimum | 90 CRI Minimum |
| F6           | 3750 K | Q4                                  | 100               |                |                | XBDAWT-00-0000-00000LCF6 |                |                |
|              |        | Q3                                  | 93.9              |                |                | XBDAWT-00-0000-00000LBF6 |                |                |
| E6           | 3500 K | Q4                                  | 100               |                |                | XBDAWT-00-0000-00000LCE6 |                |                |
|              |        | Q3                                  | 93.9              |                |                | XBDAWT-00-0000-00000LBE6 |                |                |
| F7           | 3250 K | Q4                                  | 100               |                |                | XBDAWT-00-0000-00000LCF7 |                |                |
|              |        | Q3                                  | 93.9              |                |                | XBDAWT-00-0000-00000LBF7 |                |                |
|              |        | Q2                                  | 87.4              |                |                | XBDAWT-00-0000-00000LAF7 |                |                |
| E7           | 3000 K | Q4                                  | 100               |                |                | XBDAWT-00-0000-00000LCE7 |                |                |
|              |        | Q3                                  | 93.9              |                |                | XBDAWT-00-0000-00000LBE7 |                |                |
|              |        | Q2                                  | 87.4              |                |                | XBDAWT-00-0000-00000LAE7 |                |                |

## Notes:

- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and  $\pm 2$  on CRI measurements. See the Measurements section (page 32).
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.
- Typical CRI for Neutral White, 3700 K - 5000 K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.

## APPENDIX - ORDER CODES NOT FOR NEW DESIGNS - CONTINUED

| Chromaticity |        | Minimum Luminous Flux (lm) @ 350 mA |                   | Order Codes    |                |                          |                |                |
|--------------|--------|-------------------------------------|-------------------|----------------|----------------|--------------------------|----------------|----------------|
| Kit          | CCT    | Code                                | Flux (lm) @ 85 °C | No CRI Minimum | 70 CRI Minimum | Standard CRI             | 80 CRI Minimum | 90 CRI Minimum |
| F8           | 2850 K | Q4                                  | 100               |                |                | XBDAWT-00-0000-00000LBF8 |                |                |
|              |        | Q3                                  | 93.9              |                |                | XBDAWT-00-0000-00000LAF8 |                |                |
|              |        | Q2                                  | 87.4              |                |                | XBDAWT-00-0000-00000L9F8 |                |                |
| E8           | 2700 K | Q3                                  | 93.9              |                |                | XBDAWT-00-0000-00000LBE8 |                |                |
|              |        | Q2                                  | 87.4              |                |                | XBDAWT-00-0000-00000LAE8 |                |                |
|              |        | P4                                  | 80.6              |                |                | XBDAWT-00-0000-00000L9E8 |                |                |

## Notes:

- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and  $\pm 2$  on CRI measurements. See the Measurements section (page 32).
- XLamp XB-D LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.
- Typical CRI for Neutral White, 3700 K - 5000 K CCT is 75.
- Typical CRI for Warm White, 2600 K - 3700 K CCT is 80.
- Minimum CRI for 70 CRI Minimum Cool White is 70.
- Minimum CRI for 80 CRI Minimum White is 80.

## APPENDIX - ORDER CODES NOT FOR NEW DESIGNS - CONTINUED

The following order codes are active and valid order codes, but higher performance options are also available. Please see page 10 - page 13 for order codes of XLamp XB-D color LEDs that could serve as alternatives for the order codes set forth below.

Color,  $T_J = 25^\circ\text{C}$

| Blue |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes              |
|------|--------------------------|-------------------------------------|-----------|--------------------------|
| Kit  | Dominant Wavelength (nm) | Code                                | Flux (lm) |                          |
| 01   | 465 - 485                | K2                                  | 30.6      | XBDBLU-00-0000-000000Y01 |
| 02   | 465 - 480                | K2                                  | 30.6      | XBDBLU-00-0000-000000Y02 |
| 05   | 470 - 480                | K2                                  | 30.6      | XBDBLU-00-0000-000000Y05 |

| Green |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes              |
|-------|--------------------------|-------------------------------------|-----------|--------------------------|
| Kit   | Dominant Wavelength (nm) | Code                                | Flux (lm) |                          |
| 01    | 520 - 535                | Q4                                  | 100       | XBDGRN-00-0000-000000C01 |
|       |                          | Q3                                  | 93.9      | XBDGRN-00-0000-000000B01 |
|       |                          | Q2                                  | 87.4      | XBDGRN-00-0000-000000A01 |
| 02    | 520 - 530                | Q4                                  | 100       | XBDGRN-00-0000-000000C02 |
|       |                          | Q3                                  | 93.9      | XBDGRN-00-0000-000000B02 |
|       |                          | Q2                                  | 87.4      | XBDGRN-00-0000-000000A02 |
| 03    | 525 - 535                | Q4                                  | 100       | XBDGRN-00-0000-000000C03 |
|       |                          | Q3                                  | 93.9      | XBDGRN-00-0000-000000B03 |
|       |                          | Q2                                  | 87.4      | XBDGRN-00-0000-000000A03 |

| Amber |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes              |
|-------|--------------------------|-------------------------------------|-----------|--------------------------|
| Kit   | Dominant Wavelength (nm) | Code                                | Flux (lm) |                          |
| 01    | 585 - 595                | N4                                  | 62        | XBDAMB-00-0000-000000601 |
|       |                          | N3                                  | 56.8      | XBDAMB-00-0000-000000501 |
| 03    | 590 - 595                | N4                                  | 62        | XBDAMB-00-0000-000000603 |
|       |                          | N3                                  | 56.8      | XBDAMB-00-0000-000000503 |

## Notes:

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

## APPENDIX - ORDER CODES NOT FOR NEW DESIGNS - CONTINUED

| Red-Orange |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes                     |
|------------|--------------------------|-------------------------------------|-----------|---------------------------------|
| Kit        | Dominant Wavelength (nm) | Code                                | Flux (lm) |                                 |
| 01         | 610 - 620                | P4                                  | 80.6      | <i>XBDRDO-00-0000-000000901</i> |
|            |                          | P3                                  | 73.9      | <i>XBDRDO-00-0000-000000801</i> |
| 02         | 610 - 615                | P4                                  | 80.6      | <i>XBDRDO-00-0000-000000902</i> |
|            |                          | P3                                  | 73.9      | <i>XBDRDO-00-0000-000000802</i> |
| 03         | 615 - 620                | P4                                  | 80.6      | <i>XBDRDO-00-0000-000000903</i> |
|            |                          | P3                                  | 73.9      | <i>XBDRDO-00-0000-000000803</i> |

| Red |                          | Minimum Luminous Flux (lm) @ 350 mA |           | Order Codes                     |
|-----|--------------------------|-------------------------------------|-----------|---------------------------------|
| Kit | Dominant Wavelength (nm) | Code                                | Flux (lm) |                                 |
| 01  | 620 - 630                | N4                                  | 62        | <i>XBDRED-00-0000-000000601</i> |
|     |                          | N3                                  | 56.8      | <i>XBDRED-00-0000-000000501</i> |
|     |                          | N2                                  | 51.7      | <i>XBDRED-00-0000-000000401</i> |
| 02  | 620 - 625                | N4                                  | 62        | <i>XBDRED-00-0000-000000602</i> |
|     |                          | N3                                  | 56.8      | <i>XBDRED-00-0000-000000502</i> |
|     |                          | N2                                  | 51.7      | <i>XBDRED-00-0000-000000402</i> |

## Notes:

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