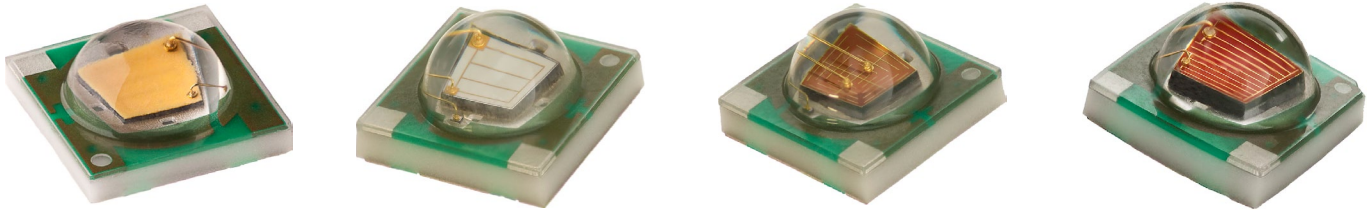


Cree® XLamp® XP-E LEDs



PRODUCT DESCRIPTION

The XLamp® XP-E LED combines the proven lighting-class performance and reliability of the XLamp XR-E LED in a package with 80% smaller footprint. The XLamp XP-E LED continues Cree's history of innovation in LEDs for lighting applications with wide viewing angle, symmetrical package, unlimited floor life and electrically neutral thermal path.

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

FEATURES

- Available in white, 80-CRI, 85-CRI and 90-CRI white, royal blue, blue, green, amber, red-orange, red, High Efficiency (HE) photo red & far red
- Maximum drive current: up to 1 A
- Low thermal resistance: as low as 8 °C/W
- Maximum junction temperature: 150 °C
- Wide viewing angle: 115°-130°
- Unlimited floor life at ≤ 30 °C/85% RH
- Reflow solderable - JEDEC J-STD-020C compatible
- Electrically neutral thermal path
- RoHS and REACH compliant
- UL® recognized component (E349212)



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CHARACTERISTICS

| Characteristics | Unit | Minimum | Typical | Maximum |
|---|---------|---------|---------|---------|
| Thermal resistance, junction to solder point - white, royal blue, blue | °C/W | | 9 | |
| Thermal resistance, junction to solder point - green | °C/W | | 15 | |
| Thermal resistance, junction to solder point - amber | °C/W | | 10 | |
| Thermal resistance, junction to solder point - red-orange, red, HE photo red, far red | °C/W | | 8 | |
| Viewing angle (FWHM) - white | degrees | | 115 | |
| Viewing angle (FWHM) - royal blue, blue, green, amber, red-orange, red, HE photo red, far red | degrees | | 130 | |
| Temperature coefficient of voltage - white | mV/°C | | -3.0 | |
| Temperature coefficient of voltage - royal blue, blue | mV/°C | | -3.3 | |
| Temperature coefficient of voltage - green | mV/°C | | -3.8 | |
| Temperature coefficient of voltage - amber | mV/°C | | -1.2 | |
| Temperature coefficient of voltage - red-orange, red | mV/°C | | -1.8 | |
| Temperature coefficient of voltage - HE photo red | mV/°C | | -1.6 | |
| Temperature coefficient of voltage - far red | mV/°C | | -1.0 | |
| ESD withstand voltage (HBM per Mil-Std-883D) - white, royal blue, blue, green | V | | | 8000 |
| ESD classification (HBM per Mil-Std-883D) - amber, red-orange, red, HE photo red, far red | | | Class 2 | |
| DC forward current - white, royal blue, blue, green, HE photo red, far red | mA | | | 1000 |
| DC forward current - amber | mA | | | 500 |
| DC forward current - red-orange, red | mA | | | 700 |
| Reverse voltage | V | | | 5 |
| Forward voltage (@ 350 mA) - white | V | | 3.05 | 3.9 |
| Forward voltage (@ 350 mA) - royal blue, blue | V | | 3.1 | 3.9 |
| Forward voltage (@ 350 mA) - green | V | | 3.3 | 3.9 |
| Forward voltage (@ 350 mA) - amber, red-orange, red, HE photo red | V | | 2.1 | 2.5 |
| Forward voltage (@ 350 mA) - far red | V | | 1.9 | 2.4 |
| Forward voltage (@ 500 mA) - amber | V | | 2.3 | |
| Forward voltage (@ 700 mA) - white | V | | 3.3 | |
| Forward voltage (@ 700 mA) - red-orange, red, HE photo red | V | | 2.3 | |
| Forward voltage (@ 700 mA) - far red | V | | 2.1 | |
| Forward voltage (@ 1000 mA) - white, royal blue, blue | V | | 3.5 | |
| Forward voltage (@ 1000 mA) - green | V | | 3.8 | |
| Forward voltage (@ 1000 mA) - HE photo red | V | | 2.5 | |
| Forward voltage (@ 1000 mA) - far red | V | | 2.25 | |
| LED junction temperature | °C | | | 150 |

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

The following table provides order codes for XLamp XP-E white LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 38).

| Minimum Luminous Flux (lm) @ 350 mA | | Chromaticity Regions | Order Codes |
|-------------------------------------|-----------|--|----------------------|
| Group | Flux (lm) | | |
| Q4 | 100 | WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP | XPEWHT-L1-0000-00C01 |
| | | WC, WD, WF, WG | XPEWHT-L1-0000-00C02 |
| | | WC, WD, WF, WG, WH, WJ, WN, WP | XPEWHT-L1-0000-00C03 |
| Q5 | 107 | WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP | XPEWHT-L1-0000-00D01 |
| | | WC, WD, WF, WG | XPEWHT-L1-0000-00D02 |
| | | WC, WD, WF, WG, WH, WJ, WN, WP | XPEWHT-L1-0000-00D03 |
| R2 | 114 | WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP | XPEWHT-L1-0000-00E01 |
| | | WC, WD, WF, WG | XPEWHT-L1-0000-00E02 |
| | | WC, WD, WF, WG, WH, WJ, WN, WP | XPEWHT-L1-0000-00E03 |
| R3 | 122 | WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP | XPEWHT-L1-0000-00F01 |
| | | WC, WD, WF, WG | XPEWHT-L1-0000-00F02 |
| | | WC, WD, WF, WG, WH, WJ, WN, WP | XPEWHT-L1-0000-00F03 |

Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ± 2 on CRI measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.

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

The following tables provide order codes for XLamp XP-E white LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 38). For definitions of the chromaticity kits, please see the Cree's Standard Chromaticity Kits section (page 37).

| Chromaticity | | Minimum Luminous Flux (lm) @ 350 mA | | Order Codes |
|--------------|--------|-------------------------------------|-----------|----------------------|
| Kit | CCT | Code | Flux (lm) | 70 CRI Typical |
| 51 | 6200 K | R3 | 122 | XPEWHT-L1-0000-00F51 |
| | | R2 | 114 | XPEWHT-L1-0000-00E51 |
| | | Q5 | 107 | XPEWHT-L1-0000-00D51 |
| | | Q4 | 100 | XPEWHT-L1-0000-00C51 |
| 53 | 6000 K | R3 | 122 | XPEWHT-L1-0000-00F53 |
| | | R2 | 114 | XPEWHT-L1-0000-00E53 |
| | | Q5 | 107 | XPEWHT-L1-0000-00D53 |
| | | Q4 | 100 | XPEWHT-L1-0000-00C53 |
| 50 | 6200 K | R3 | 122 | XPEWHT-L1-0000-00F50 |
| | | R2 | 114 | XPEWHT-L1-0000-00E50 |
| | | Q5 | 107 | XPEWHT-L1-0000-00D50 |
| | | Q4 | 100 | XPEWHT-L1-0000-00C50 |
| E1 | 6500 K | R3 | 122 | XPEWHT-L1-0000-00FE1 |
| | | R2 | 114 | XPEWHT-L1-0000-00EE1 |
| | | Q5 | 107 | XPEWHT-L1-0000-00DE1 |
| | | Q4 | 100 | XPEWHT-L1-0000-00CE1 |
| E2 | 5700 K | R3 | 122 | XPEWHT-L1-0000-00FE2 |
| | | R2 | 114 | XPEWHT-L1-0000-00EE2 |
| | | Q5 | 107 | XPEWHT-L1-0000-00DE2 |
| | | Q4 | 100 | XPEWHT-L1-0000-00CE2 |

Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ± 2 on CRI measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.

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

| Chromaticity | | Minimum Luminous Flux (lm) @ 350 mA | | Order Codes | |
|--------------|--------|-------------------------------------|-----------|----------------------|----------------------|
| Kit | CCT | Code | Flux (lm) | 75 CRI Typical | 80 CRI Minimum |
| E3 | 5000 K | Q5 | 107 | XPEWHT-L1-0000-00DE3 | |
| | | Q4 | 100 | XPEWHT-L1-0000-00CE3 | |
| | | Q3 | 93.9 | XPEWHT-L1-0000-00BE3 | |
| F4 | 4750 K | Q5 | 107 | XPEWHT-L1-0000-00DF4 | |
| | | Q4 | 100 | XPEWHT-L1-0000-00CF4 | |
| | | Q3 | 93.9 | XPEWHT-L1-0000-00BF4 | |
| E4 | 4500 K | Q5 | 107 | XPEWHT-L1-0000-00DE4 | |
| | | Q4 | 100 | XPEWHT-L1-0000-00CE4 | |
| | | Q3 | 93.9 | XPEWHT-L1-0000-00BE4 | |
| F5 | 4250 K | Q5 | 107 | XPEWHT-L1-0000-00DF5 | |
| | | Q4 | 100 | XPEWHT-L1-0000-00CF5 | |
| | | Q3 | 93.9 | XPEWHT-L1-0000-00BF5 | |
| | | Q2 | 87.4 | XPEWHT-L1-0000-00AF5 | |
| E5 | 4000 K | Q5 | 107 | XPEWHT-L1-0000-00DE5 | |
| | | Q4 | 100 | XPEWHT-L1-0000-00CE5 | XPEWHT-H1-0000-00CE5 |
| | | Q3 | 93.9 | XPEWHT-L1-0000-00BE5 | XPEWHT-H1-0000-00BE5 |
| | | Q2 | 87.4 | XPEWHT-L1-0000-00AE5 | XPEWHT-H1-0000-00AE5 |
| Z5 | 4000 K | Q4 | 100 | XPEWHT-L1-0000-00CZ5 | |
| | | Q3 | 93.9 | XPEWHT-L1-0000-00BZ5 | XPEWHT-H1-0000-00BZ5 |
| | | Q2 | 87.4 | XPEWHT-L1-0000-00AZ5 | XPEWHT-H1-0000-00AZ5 |

Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ± 2 on CRI measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.

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

| Chromaticity | | Minimum Luminous Flux (lm) @ 350 mA | | Order Codes | | | |
|--------------|--------|-------------------------------------|-----------|----------------------|----------------------|----------------------|----------------------|
| Kit | CCT | Code | Flux (lm) | 80 CRI Typical | 80 CRI Minimum | 85 CRI Minimum | 90 CRI Minimum |
| F6 | 3750 K | Q4 | 100 | XPEWHT-L1-0000-00CF6 | | | |
| | | Q3 | 93.9 | XPEWHT-L1-0000-00BF6 | XPEWHT-H1-0000-00BF6 | | |
| | | Q2 | 87.4 | XPEWHT-L1-0000-00AF6 | XPEWHT-H1-0000-00AF6 | | |
| | | P4 | 80.6 | XPEWHT-L1-0000-009F6 | XPEWHT-H1-0000-009F6 | | |
| E6 | 3500 K | Q4 | 100 | XPEWHT-L1-0000-00CE6 | | | |
| | | Q3 | 93.9 | XPEWHT-L1-0000-00BE6 | XPEWHT-H1-0000-00BE6 | | |
| | | Q2 | 87.4 | XPEWHT-L1-0000-00AE6 | XPEWHT-H1-0000-00AE6 | | |
| | | P4 | 80.6 | XPEWHT-L1-0000-009E6 | XPEWHT-H1-0000-009E6 | | |
| Z6 | 3500 K | Q3 | 93.9 | XPEWHT-L1-0000-00BZ6 | | | |
| | | Q2 | 87.4 | XPEWHT-L1-0000-00AZ6 | XPEWHT-H1-0000-00AZ6 | | |
| | | P4 | 80.6 | XPEWHT-L1-0000-009Z6 | XPEWHT-H1-0000-009Z6 | | |
| F7 | 3250 K | Q3 | 93.9 | XPEWHT-L1-0000-00BF7 | | | |
| | | Q2 | 87.4 | XPEWHT-L1-0000-00AF7 | XPEWHT-H1-0000-00AF7 | | |
| | | P4 | 80.6 | XPEWHT-L1-0000-009F7 | XPEWHT-H1-0000-009F7 | | |
| E7 | 3000 K | Q3 | 93.9 | XPEWHT-L1-0000-00BE7 | | | |
| | | Q2 | 87.4 | XPEWHT-L1-0000-00AE7 | XPEWHT-H1-0000-00AE7 | | |
| | | P4 | 80.6 | XPEWHT-L1-0000-009E7 | XPEWHT-H1-0000-009E7 | XPEWHT-P1-0000-009E7 | |
| | | P3 | 73.9 | | | XPEWHT-P1-0000-008E7 | XPEWHT-U1-0000-008E7 |
| | | P2 | 67.2 | | | XPEWHT-P1-0000-007E7 | XPEWHT-U1-0000-007E7 |
| | | N4 | 62 | | | XPEWHT-P1-0000-006E7 | XPEWHT-U1-0000-006E7 |
| Z7 | 3000 K | Q2 | 87.4 | XPEWHT-L1-0000-00AZ7 | XPEWHT-H1-0000-00AZ7 | | |
| | | P4 | 80.6 | XPEWHT-L1-0000-009Z7 | XPEWHT-H1-0000-009Z7 | | |
| | | P3 | 73.9 | | | XPEWHT-P1-0000-008Z7 | |
| | | P2 | 67.2 | | | XPEWHT-P1-0000-007Z7 | XPEWHT-U1-0000-007Z7 |
| | | N4 | 62 | | | XPEWHT-P1-0000-006Z7 | XPEWHT-U1-0000-006Z7 |
| F8 | 2850 K | Q2 | 87.4 | XPEWHT-L1-0000-00AF8 | | | |
| | | P4 | 80.6 | XPEWHT-L1-0000-009F8 | XPEWHT-H1-0000-009F8 | | |
| | | P3 | 73.9 | XPEWHT-L1-0000-008F8 | XPEWHT-H1-0000-008F8 | XPEWHT-P1-0000-008F8 | |
| | | P2 | 67.2 | | | XPEWHT-P1-0000-007F8 | XPEWHT-U1-0000-007F8 |
| | | N4 | 62 | | | XPEWHT-P1-0000-006F8 | XPEWHT-U1-0000-006F8 |
| | | N3 | 56.8 | | | XPEWHT-P1-0000-005F8 | XPEWHT-U1-0000-005F8 |

Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ± 2 on CRI measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.

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

| Chromaticity | | Minimum Luminous Flux (lm) @ 350 mA | | Order Codes | | | |
|--------------|--------|-------------------------------------|-----------|----------------------|----------------------|----------------------|----------------------|
| Kit | CCT | Code | Flux (lm) | 80 CRI Typical | 80 CRI Minimum | 85 CRI Minimum | 90 CRI Minimum |
| E8 | 2700 K | Q2 | 87.4 | XPEWHT-L1-0000-00AE8 | | | |
| | | P4 | 80.6 | XPEWHT-L1-0000-009E8 | XPEWHT-H1-0000-009E8 | | |
| | | P3 | 73.9 | XPEWHT-L1-0000-008E8 | XPEWHT-H1-0000-008E8 | XPEWHT-P1-0000-008E8 | |
| | | P2 | 67.2 | | | XPEWHT-P1-0000-007E8 | XPEWHT-U1-0000-007E8 |
| | | N4 | 62 | | | XPEWHT-P1-0000-006E8 | XPEWHT-U1-0000-006E8 |
| | | N3 | 56.8 | | | XPEWHT-P1-0000-005E8 | XPEWHT-U1-0000-005E8 |
| Z8 | 2700 K | P4 | 80.6 | XPEWHT-L1-0000-009Z8 | XPEWHT-H1-0000-009Z8 | | |
| | | P3 | 73.9 | XPEWHT-L1-0000-008Z8 | XPEWHT-H1-0000-008Z8 | | |
| | | P2 | 67.2 | | | XPEWHT-P1-0000-007Z8 | |
| | | N4 | 62 | | | XPEWHT-P1-0000-006Z8 | XPEWHT-U1-0000-006Z8 |
| | | N3 | 56.8 | | | XPEWHT-P1-0000-005Z8 | XPEWHT-U1-0000-005Z8 |

Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ± 2 on CRI measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.

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

The following tables provide order codes for XLamp XP-E color LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 38).

| Color | Minimum Radiant Flux (mW) @ 350 mA | | Calculated Minimum PPF ($\mu\text{mol/s}$) | Dominant Wavelength (nm) | | | | Order Codes |
|------------|------------------------------------|-----------|--|--------------------------|----------|---------|----------|----------------------|
| | Group | Flux (mW) | | Minimum | | Maximum | | |
| | | | | Group | DWL (nm) | Group | DWL (nm) | |
| Royal Blue | 14 | 350 | 1.33 | D3 | 450 | D5 | 465 | XPEROY-L1-0000-00901 |
| | | | | D3 | 450 | D4 | 460 | XPEROY-L1-0000-00902 |
| | | | | D4 | 455 | D5 | 465 | XPEROY-L1-0000-00903 |
| | 15 | 425 | 1.61 | D3 | 450 | D5 | 465 | XPEROY-L1-0000-00A01 |
| | | | | D3 | 450 | D4 | 460 | XPEROY-L1-0000-00A02 |
| | | | | D4 | 455 | D5 | 465 | XPEROY-L1-0000-00A03 |
| | 16 | 500 | 1.90 | D3 | 450 | D5 | 465 | XPEROY-L1-0000-00B01 |
| | | | | D3 | 450 | D4 | 460 | XPEROY-L1-0000-00B02 |

| Color | Minimum Luminous Flux (lm) @ 350 mA | | Dominant Wavelength (nm) | | | | Order Codes |
|-------|-------------------------------------|-----------|--------------------------|----------|---------|----------|----------------------|
| | Group | Flux (lm) | Minimum | | Maximum | | |
| | | | Group | DWL (nm) | Group | DWL (nm) | |
| Blue | K2 | 30.6 | B3 | 465 | B6 | 485 | XPEBLU-L1-0000-00Y01 |
| | | | B3 | 465 | B5 | 480 | XPEBLU-L1-0000-00Y02 |
| | | | B4 | 470 | B5 | 480 | XPEBLU-L1-0000-00Y05 |
| | K3 | 35.2 | B3 | 465 | B6 | 485 | XPEBLU-L1-0000-00Z01 |
| | | | B3 | 465 | B5 | 480 | XPEBLU-L1-0000-00Z02 |
| | | | B4 | 470 | B5 | 480 | XPEBLU-L1-0000-00Z05 |
| | M2 | 39.8 | B3 | 465 | B6 | 485 | XPEBLU-L1-0000-00201 |
| | | | B3 | 465 | B5 | 480 | XPEBLU-L1-0000-00202 |
| | | | B4 | 470 | B5 | 480 | XPEBLU-L1-0000-00205 |

Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, and $\pm 1\text{ nm}$ on dominant wavelength measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.
- Calculated Photosynthetic Photon Flux (PPF) values are for reference only.

FLUX CHARACTERISTICS - COLOR (T_j = 25 °C) - CONTINUED

| Color | Minimum Luminous Flux (lm)@ 350 mA | | Calculated Minimum PPF (μmol/s) | Dominant Wavelength (nm) | | | | Order Codes |
|-------|------------------------------------|-----------|---------------------------------|--------------------------|----------|---------|----------|----------------------|
| | Group | Flux (lm) | | Minimum | | Maximum | | |
| | | | | Group | DWL (nm) | Group | DWL (nm) | |
| Green | P4 | 80.6 | 0.74 | G2 | 520 | G4 | 535 | XPEGRN-L1-0000-00901 |
| | | | | G2 | 520 | G3 | 530 | XPEGRN-L1-0000-00902 |
| | | | | G3 | 525 | G4 | 535 | XPEGRN-L1-0000-00903 |
| | Q2 | 87.4 | 0.80 | G2 | 520 | G4 | 535 | XPEGRN-L1-0000-00A01 |
| | | | | G2 | 520 | G3 | 530 | XPEGRN-L1-0000-00A02 |
| | | | | G3 | 525 | G4 | 535 | XPEGRN-L1-0000-00A03 |
| | Q3 | 93.9 | 0.86 | G2 | 520 | G4 | 535 | XPEGRN-L1-0000-00B01 |
| | | | | G2 | 520 | G3 | 530 | XPEGRN-L1-0000-00B02 |
| | | | | G3 | 525 | G4 | 535 | XPEGRN-L1-0000-00B03 |
| | Q4 | 100 | 0.91 | G2 | 520 | G4 | 535 | XPEGRN-L1-0000-00C01 |
| | | | | G2 | 520 | G3 | 530 | XPEGRN-L1-0000-00C02 |
| | | | | G3 | 525 | G4 | 535 | XPEGRN-L1-0000-00C03 |
| | Q5 | 107 | 0.98 | G2 | 520 | G4 | 535 | XPEGRN-L1-0000-00D01 |
| | | | | G2 | 520 | G3 | 530 | XPEGRN-L1-0000-00D02 |
| | | | | G3 | 525 | G4 | 535 | XPEGRN-L1-0000-00D03 |
| | R2 | 114 | 1.04 | G2 | 520 | G4 | 535 | XPEGRN-L1-0000-00E01 |
| | | | | G2 | 520 | G3 | 530 | XPEGRN-L1-0000-00E02 |
| | | | | G3 | 525 | G4 | 535 | XPEGRN-L1-0000-00E03 |
| | R3 | 122 | 1.11 | G2 | 520 | G4 | 535 | XPEGRN-L1-0000-00F01 |
| | | | | G2 | 520 | G3 | 530 | XPEGRN-L1-0000-00F02 |

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, and ±1 nm on dominant wavelength measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.
- Calculated Photosynthetic Photon Flux (PPF) values are for reference only.

FLUX CHARACTERISTICS - COLOR (T_j = 25 °C) - CONTINUED

| Color | Minimum Luminous Flux (lm)@ 350 mA | | Dominant Wavelength (nm) | | | | Order Codes |
|-------|------------------------------------|-----------|--------------------------|----------|---------|----------|----------------------|
| | | | Minimum | | Maximum | | |
| | Group | Flux (lm) | Group | DWL (nm) | Group | DWL (nm) | |
| Amber | M3 | 45.7 | A2 | 585 | A3 | 595 | XPEAMB-L1-0000-00301 |
| | | | A3 | 590 | A3 | 595 | XPEAMB-L1-0000-00303 |
| | N2 | 51.7 | A2 | 585 | A3 | 595 | XPEAMB-L1-0000-00401 |
| | | | A3 | 590 | A3 | 595 | XPEAMB-L1-0000-00403 |
| | N3 | 56.8 | A2 | 585 | A3 | 595 | XPEAMB-L1-0000-00501 |
| | | | A3 | 590 | A3 | 595 | XPEAMB-L1-0000-00503 |
| | N4 | 62.0 | A2 | 585 | A3 | 595 | XPEAMB-L1-0000-00601 |
| | | | A3 | 590 | A3 | 595 | XPEAMB-L1-0000-00603 |
| | P2 | 67.2 | A2 | 585 | A3 | 595 | XPEAMB-L1-0000-00701 |
| | | | A3 | 590 | A3 | 595 | XPEAMB-L1-0000-00703 |
| | P3 | 73.9 | A2 | 585 | A3 | 595 | XPEAMB-L1-0000-00801 |
| | | | A3 | 590 | A3 | 595 | XPEAMB-L1-0000-00803 |
| | P4 | 80.6 | A2 | 585 | A3 | 595 | XPEAMB-L1-0000-00901 |
| | | | A3 | 590 | A3 | 595 | XPEAMB-L1-0000-00903 |

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, and ±1 nm on dominant wavelength measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.
- Calculated Photosynthetic Photon Flux (PPF) values are for reference only.

FLUX CHARACTERISTICS - COLOR (T_J = 25 °C) - CONTINUED

| Color | Minimum Luminous Flux (lm)@ 350 mA | | Dominant Wavelength (nm) | | | | Order Codes |
|------------|------------------------------------|-----------|--------------------------|----------|---------|----------|----------------------|
| | | | Minimum | | Maximum | | |
| | Group | Flux (lm) | Group | DWL (nm) | Group | DWL (nm) | |
| Red-Orange | N3 | 56.8 | O3 | 610 | O4 | 620 | XPERDO-L1-0000-00501 |
| | | | O3 | 610 | O3 | 615 | XPERDO-L1-0000-00502 |
| | | | O4 | 615 | O4 | 620 | XPERDO-L1-0000-00503 |
| | N4 | 62.0 | O3 | 610 | O4 | 620 | XPERDO-L1-0000-00601 |
| | | | O3 | 610 | O3 | 615 | XPERDO-L1-0000-00602 |
| | | | O4 | 615 | O4 | 620 | XPERDO-L1-0000-00603 |
| | P2 | 67.2 | O3 | 610 | O4 | 620 | XPERDO-L1-0000-00701 |
| | | | O3 | 610 | O3 | 615 | XPERDO-L1-0000-00702 |
| | | | O4 | 615 | O4 | 620 | XPERDO-L1-0000-00703 |
| | P3 | 73.9 | O3 | 610 | O4 | 620 | XPERDO-L1-0000-00801 |
| | | | O3 | 610 | O3 | 615 | XPERDO-L1-0000-00802 |
| | | | O4 | 615 | O4 | 620 | XPERDO-L1-0000-00803 |
| | P4 | 80.6 | O3 | 610 | O4 | 620 | XPERDO-L1-0000-00901 |
| | | | O3 | 610 | O3 | 615 | XPERDO-L1-0000-00902 |
| | | | O4 | 615 | O4 | 620 | XPERDO-L1-0000-00903 |
| | Q2 | 87.4 | O3 | 610 | O4 | 620 | XPERDO-L1-0000-00A01 |
| | | | O3 | 610 | O3 | 615 | XPERDO-L1-0000-00A02 |
| | | | O4 | 615 | O4 | 620 | XPERDO-L1-0000-00A03 |

| Color | Minimum Luminous Flux (lm)@ 350 mA | | Calculated Minimum PPF (μmol/s) | Dominant Wavelength (nm) | | | | Order Codes |
|-------|------------------------------------|-----------|---------------------------------|--------------------------|----------|---------|----------|----------------------|
| | | | | Minimum | | Maximum | | |
| | Group | Flux (lm) | | Group | DWL (nm) | Group | DWL (nm) | |
| Red | M3 | 45.7 | 1.19 | R2 | 620 | R3 | 630 | XPERED-L1-0000-00301 |
| | | | | R2 | 620 | R2 | 625 | XPERED-L1-0000-00302 |
| | N2 | 51.7 | 1.35 | R2 | 620 | R3 | 630 | XPERED-L1-0000-00401 |
| | | | | R2 | 620 | R2 | 625 | XPERED-L1-0000-00402 |
| | N3 | 56.8 | 1.48 | R2 | 620 | R3 | 630 | XPERED-L1-0000-00501 |
| | | | | R2 | 620 | R2 | 625 | XPERED-L1-0000-00502 |
| | N4 | 62 | 1.61 | R2 | 620 | R3 | 630 | XPERED-L1-0000-00601 |
| | | | | R2 | 620 | R2 | 625 | XPERED-L1-0000-00602 |
| | P2 | 67.2 | 1.75 | R2 | 620 | R3 | 630 | XPERED-L1-0000-00701 |
| | | | | R2 | 620 | R2 | 625 | XPERED-L1-0000-00702 |
| | P3 | 73.9 | 1.92 | R2 | 620 | R3 | 630 | XPERED-L1-0000-00801 |
| | | | | R2 | 620 | R2 | 625 | XPERED-L1-0000-00802 |

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, and ±1 nm on dominant wavelength measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.
- Calculated Photosynthetic Photon Flux (PPF) values are for reference only.

FLUX CHARACTERISTICS - COLOR (T_J = 25 °C) - CONTINUED

| Color | Minimum Radiant Flux (mW)@ 350 mA | | Calculated Minimum PPF (μmol/s) | Peak Wavelength (nm) | | | | Order Codes |
|--------------|-----------------------------------|-----------|---------------------------------|----------------------|----------|---------|----------|----------------------|
| | | | | Minimum | | Maximum | | |
| | Group | Flux (mW) | | Group | PWL (nm) | Group | PWL (nm) | |
| HE Photo Red | 26 | 350 | 1.93 | P2 | 650 | P5 | 670 | XPEEPR-L1-0000-00901 |
| | 27 | 375 | 2.06 | P2 | 650 | P5 | 670 | XPEEPR-L1-0000-00A01 |
| | 28 | 400 | 2.20 | P2 | 650 | P5 | 670 | XPEEPR-L1-0000-00B01 |
| | 29 | 425 | 2.34 | P2 | 650 | P5 | 670 | XPEEPR-L1-0000-00C01 |

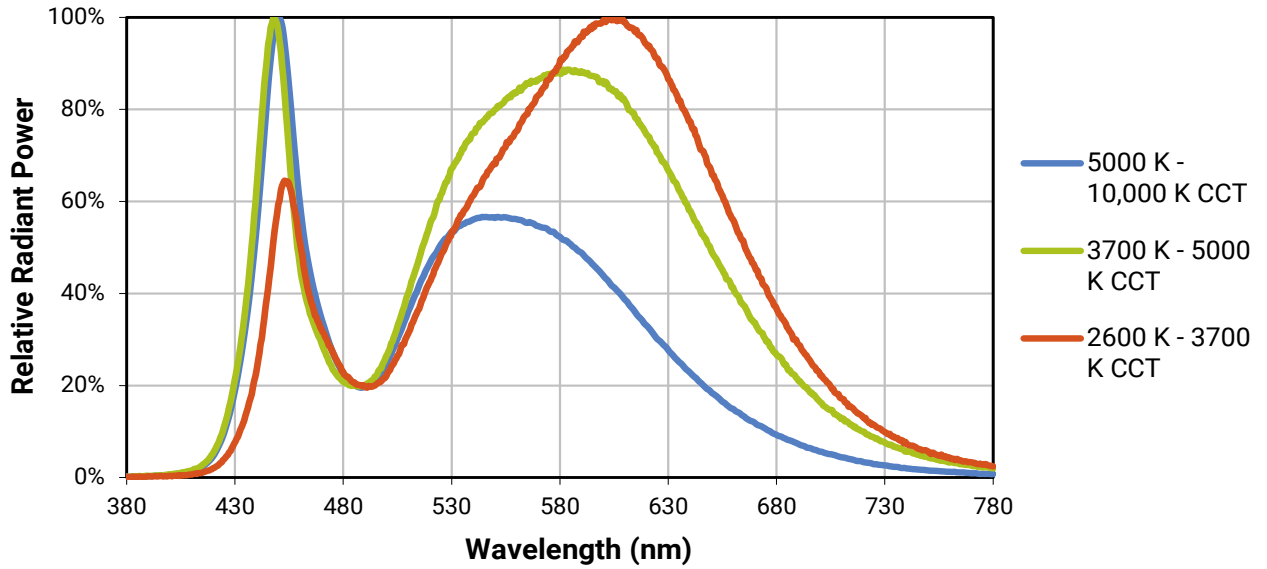
| Color | Minimum Radiant Flux (mW)@ 350 mA | | Peak Wavelength (nm) | | | | Order Codes |
|---------|-----------------------------------|-----------|----------------------|----------|---------|----------|----------------------|
| | | | Minimum | | Maximum | | |
| | Group | Flux (mW) | Group | PWL (nm) | Group | PWL (nm) | |
| Far Red | 10 | 175 | F2 | 720 | F5 | 740 | XPEFAR-L1-0000-00501 |
| | 11 | 210 | F2 | 720 | F5 | 740 | XPEFAR-L1-0000-00601 |
| | 12 | 250 | F2 | 720 | F5 | 740 | XPEFAR-L1-0000-00701 |

Notes:

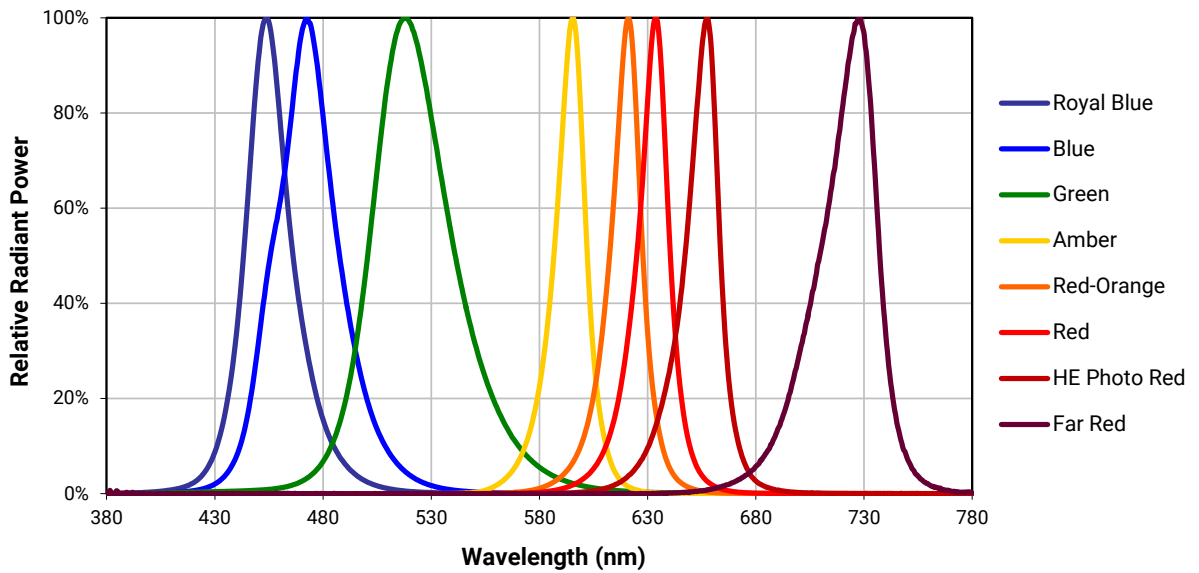
- Cree maintains a tolerance of ±7% on flux and power measurements, and ±1 nm on dominant wavelength measurements. See the Measurements section (page 40).
- Cree XLamp XP-E LED order codes specify only a minimum flux bin and not a maximum. Cree may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.
- Calculated Photosynthetic Photon Flux (PPF) values are for reference only.

RELATIVE SPECTRAL POWER DISTRIBUTION

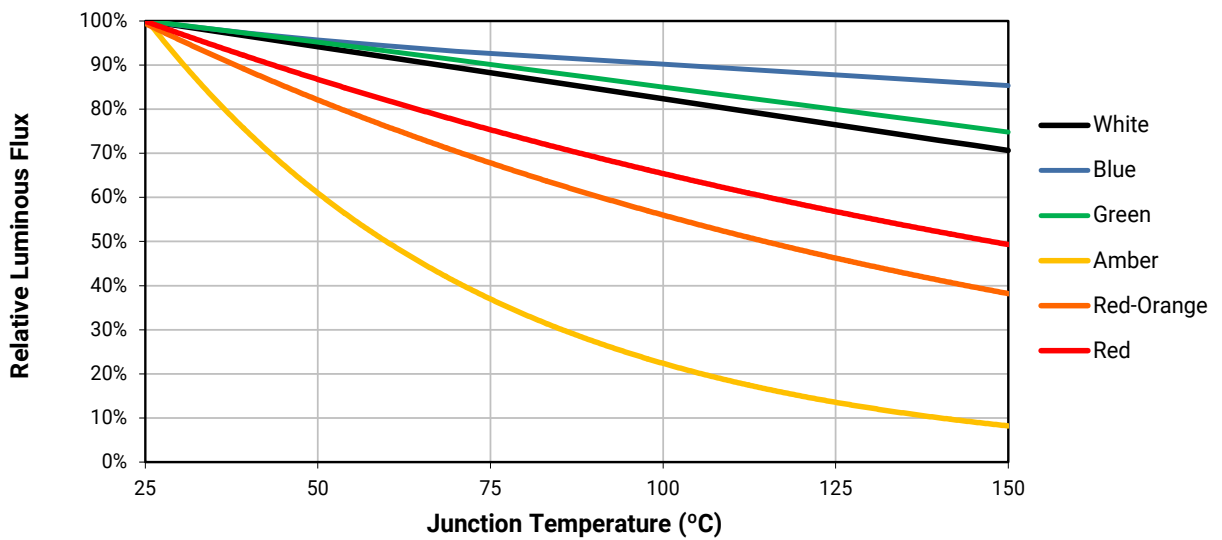
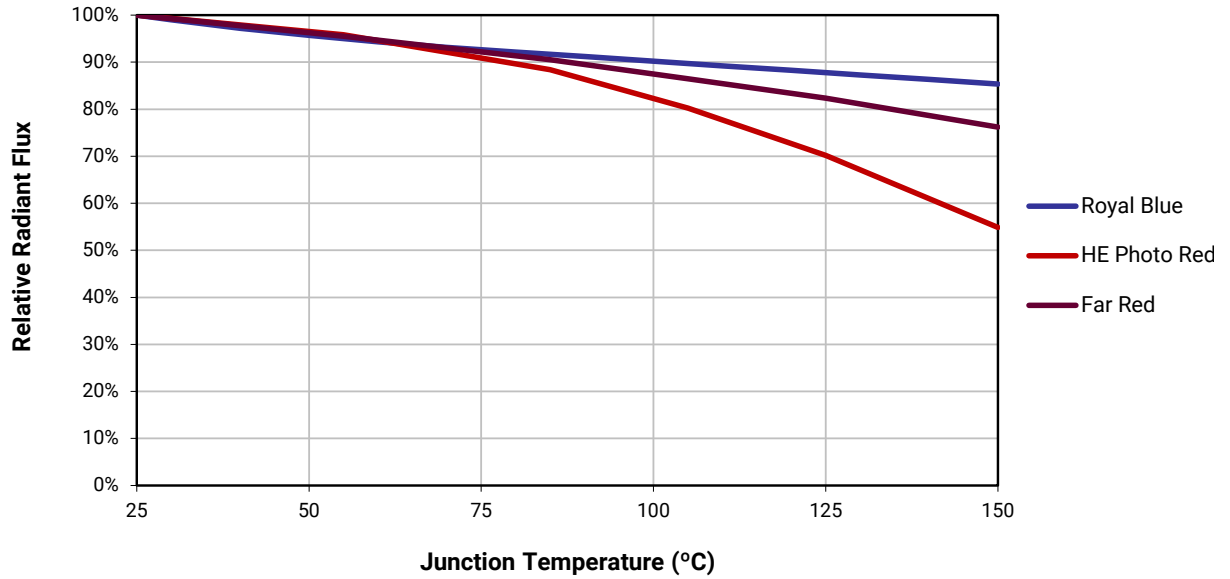
White



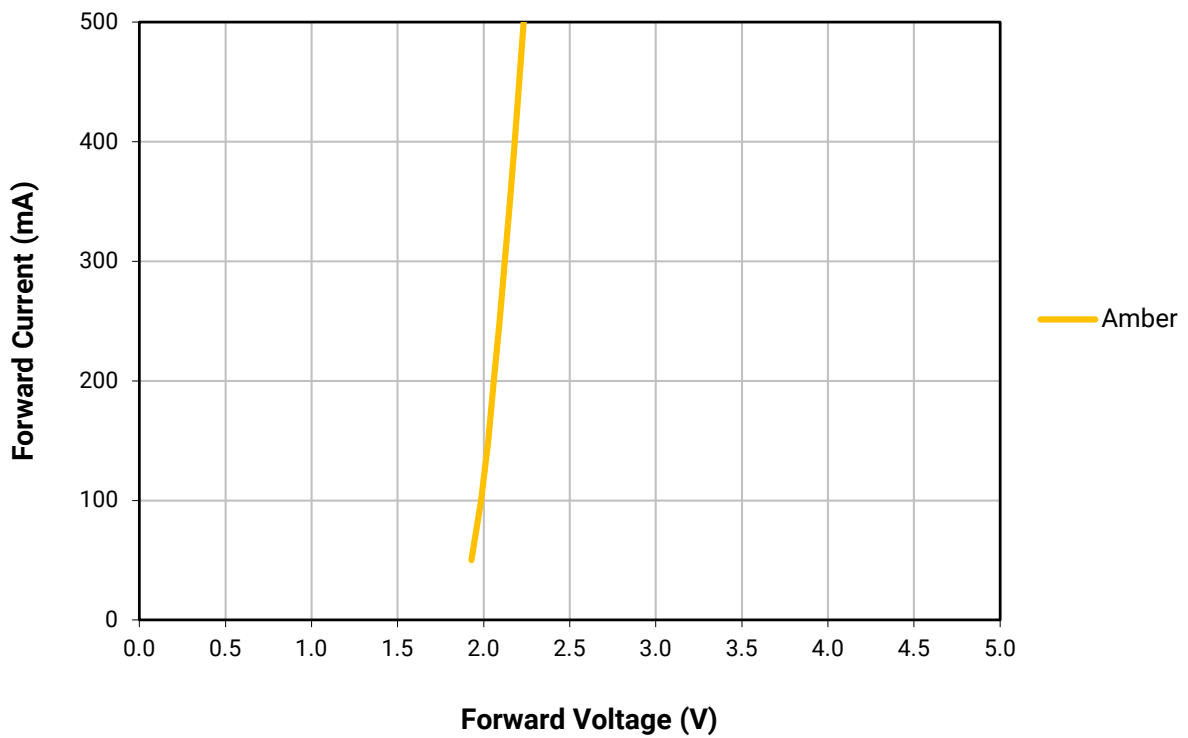
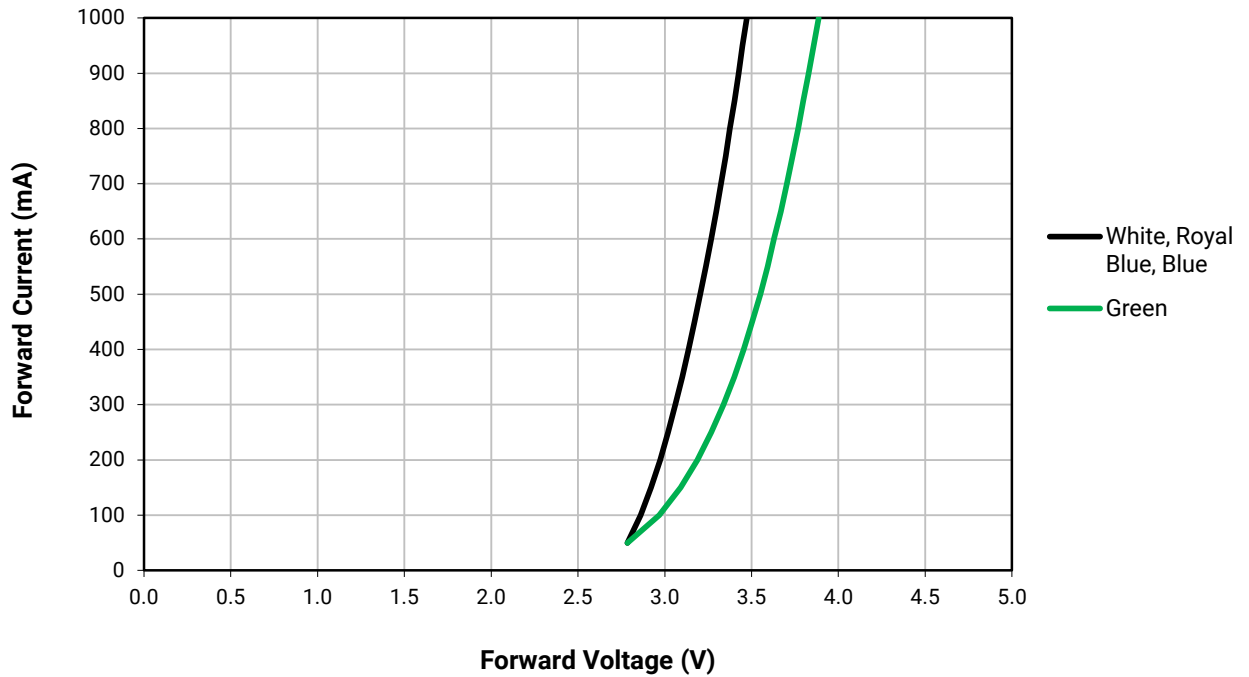
Color



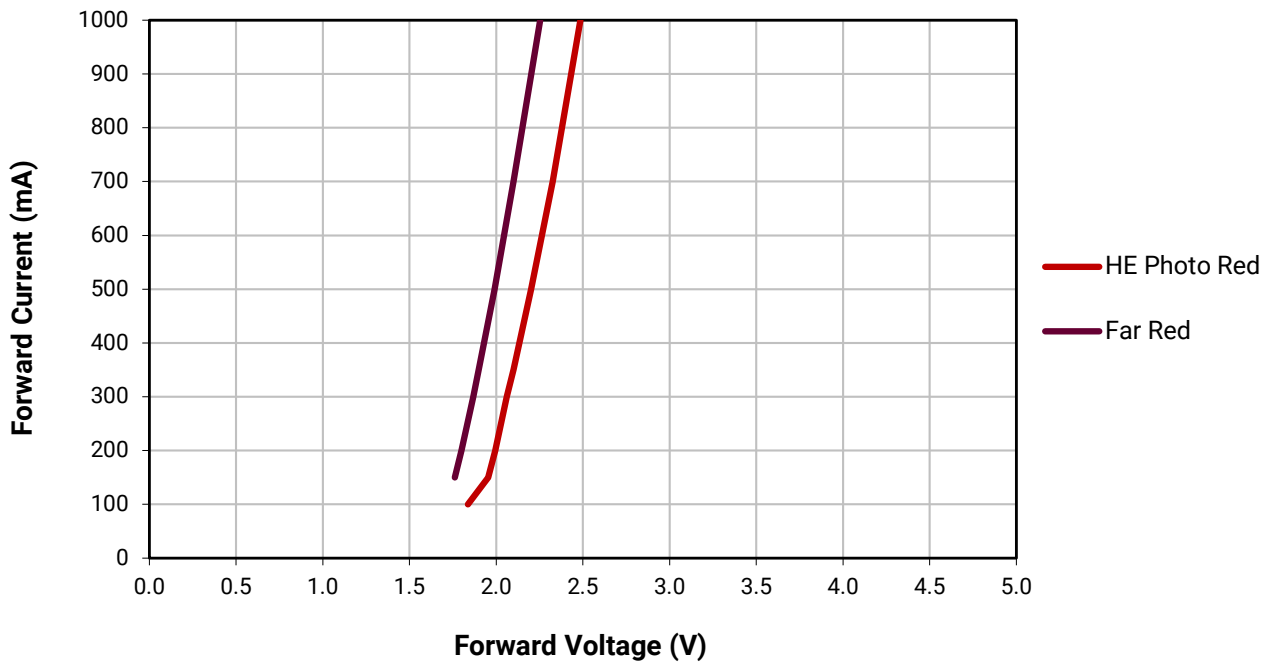
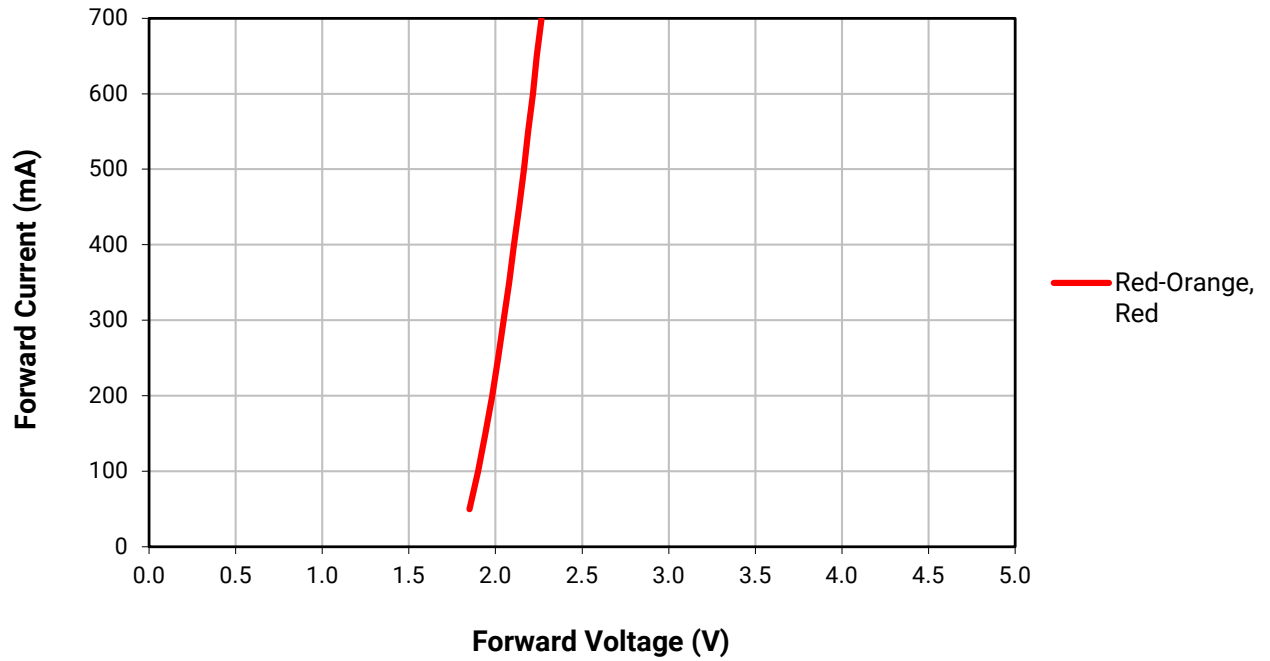
RELATIVE FLUX VS. JUNCTION TEMPERATURE ($I_F = 350$ mA)



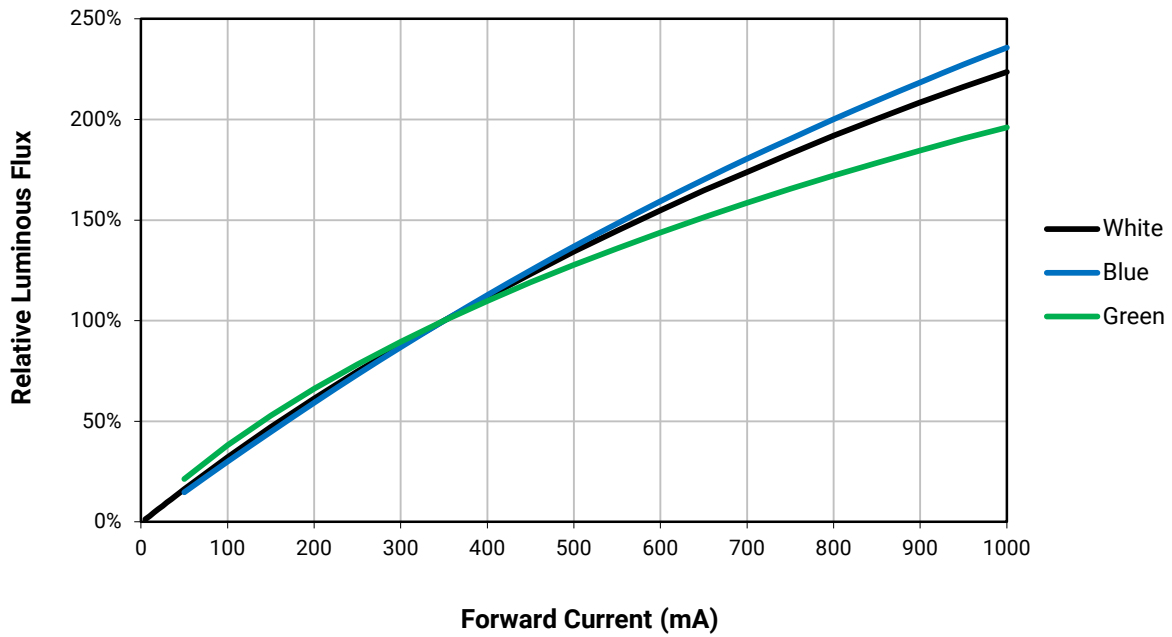
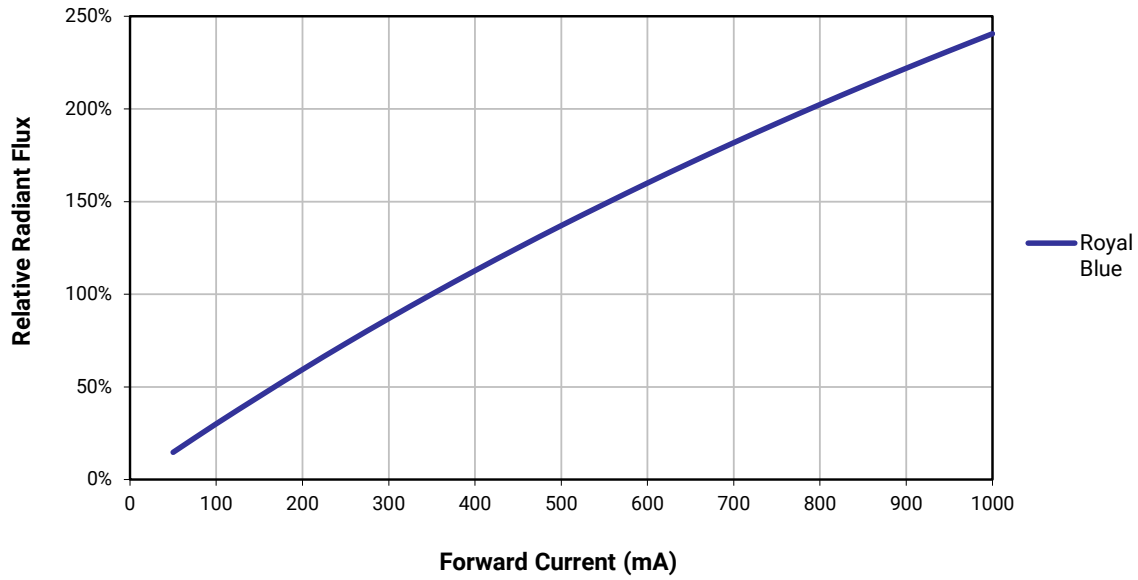
ELECTRICAL CHARACTERISTICS ($T_j = 25\text{ }^\circ\text{C}$)



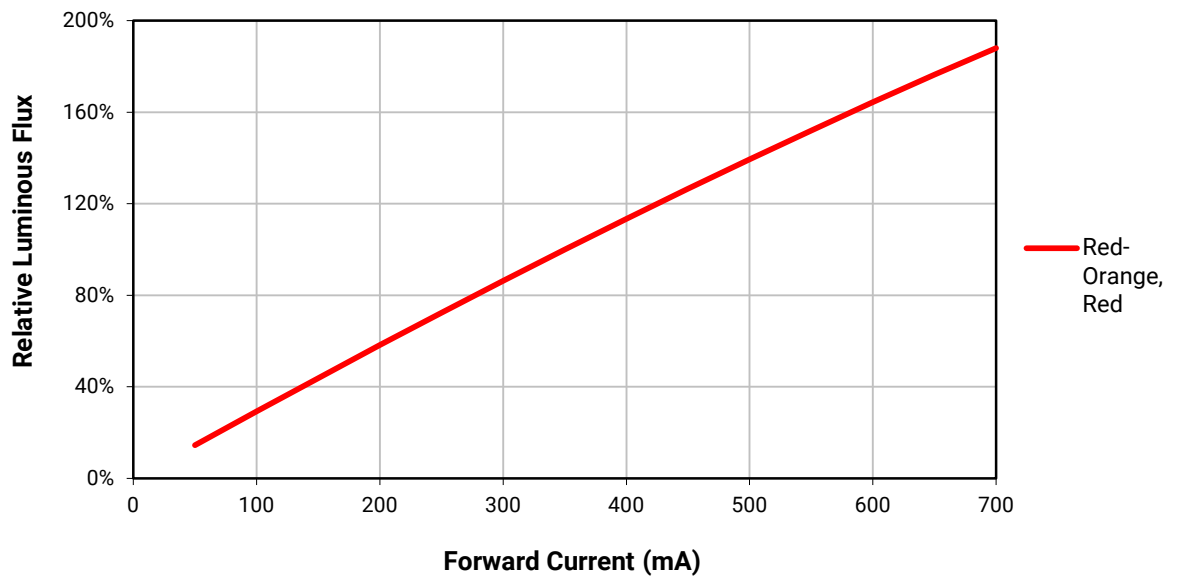
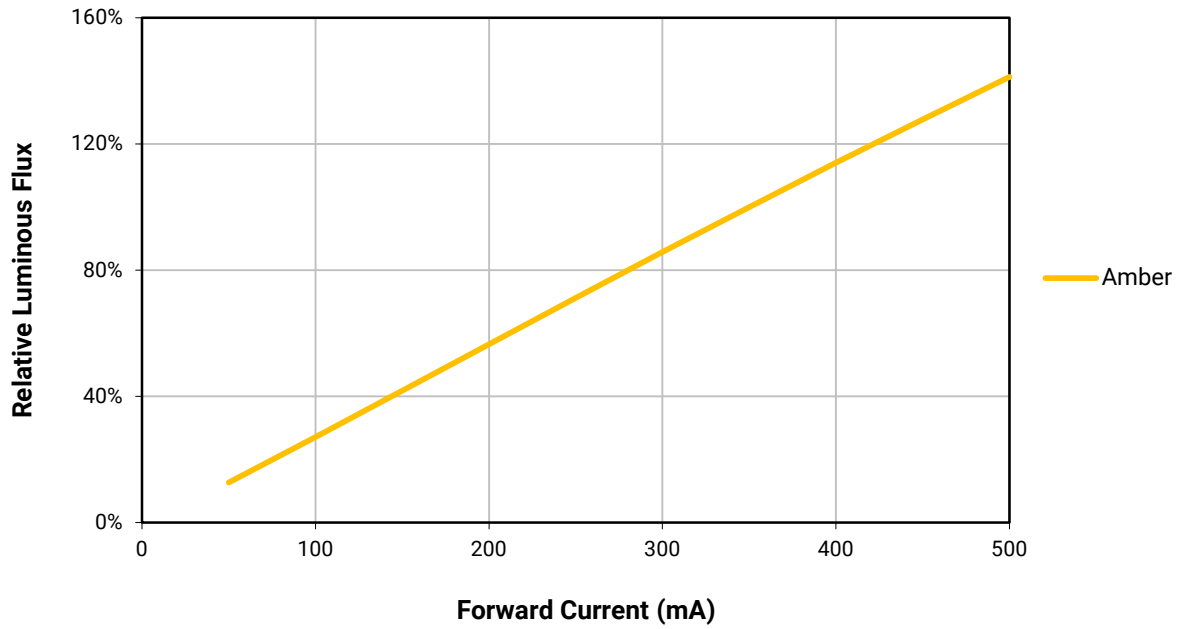
ELECTRICAL CHARACTERISTICS ($T_j = 25\text{ }^\circ\text{C}$) - CONTINUED



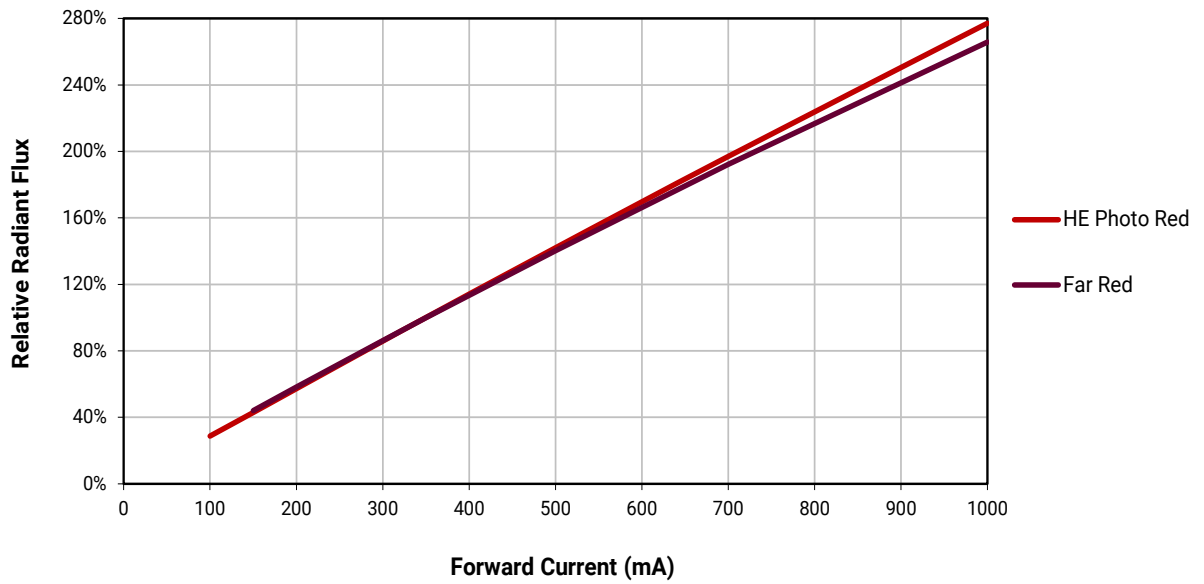
RELATIVE FLUX VS. CURRENT ($T_j = 25\text{ }^\circ\text{C}$)



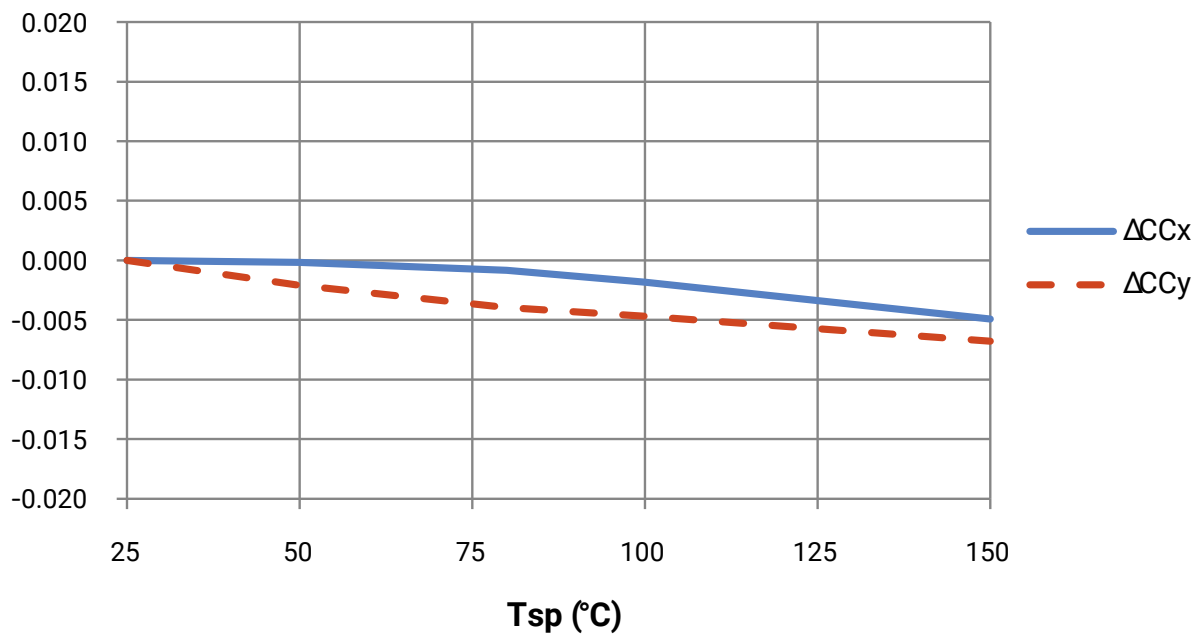
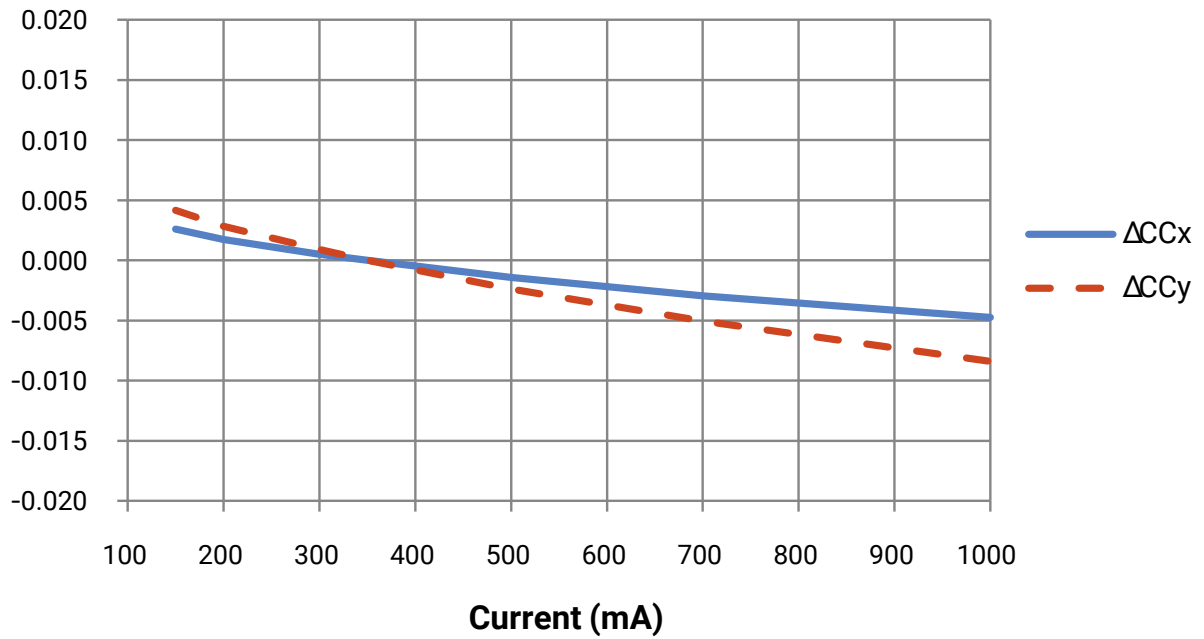
RELATIVE FLUX VS. CURRENT ($T_j = 25\text{ }^\circ\text{C}$) - CONTINUED



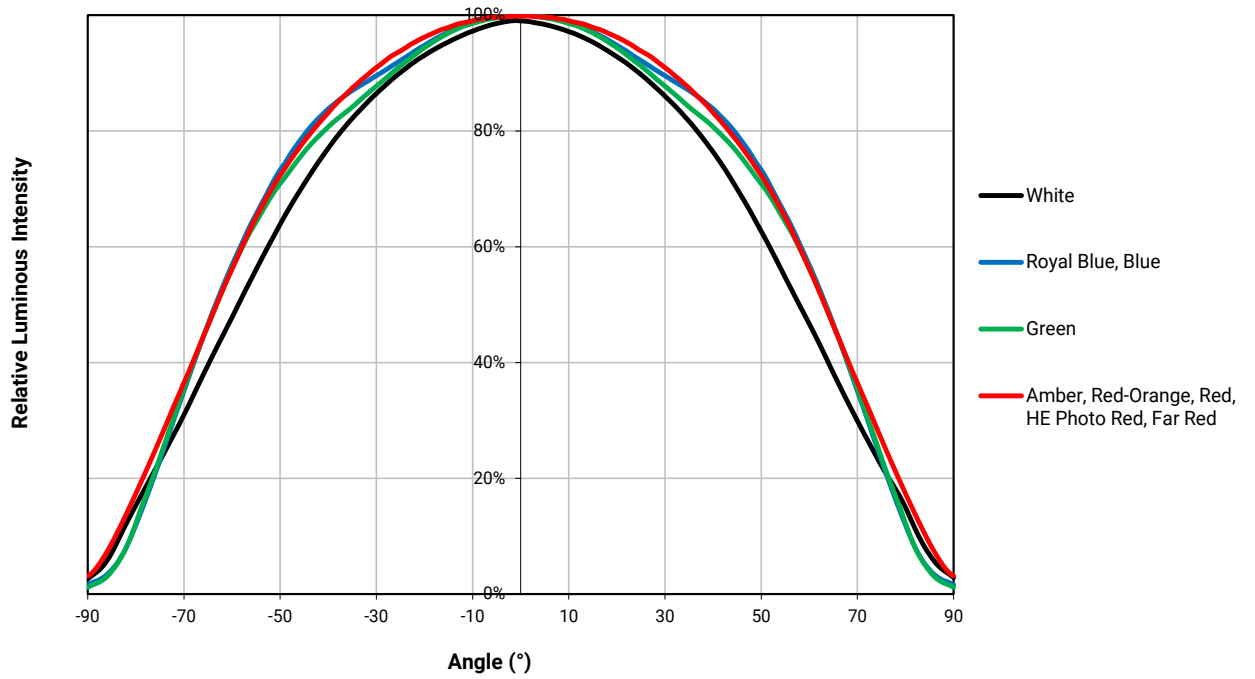
RELATIVE FLUX VS. CURRENT ($T_j = 25\text{ }^\circ\text{C}$) - CONTINUED



RELATIVE CHROMATICITY VS. CURRENT AND TEMPERATURE - WARM WHITE

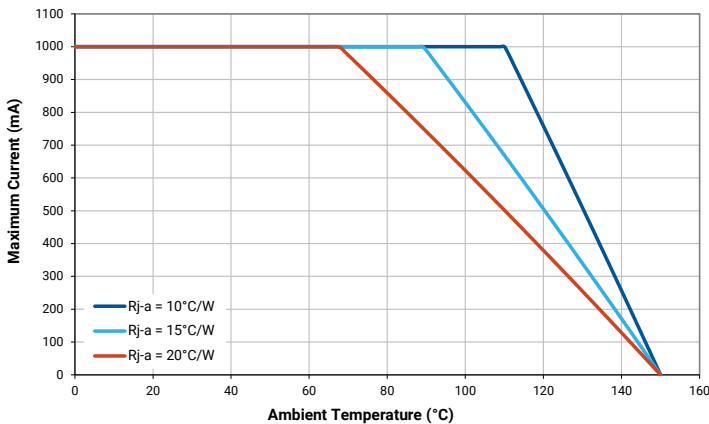


TYPICAL SPATIAL DISTRIBUTION

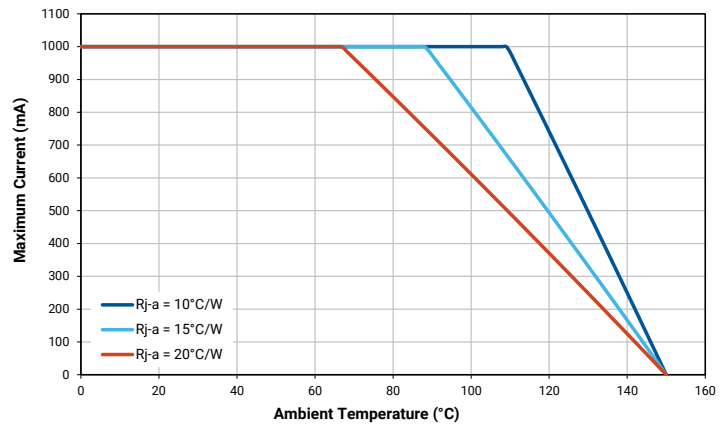


THERMAL DESIGN

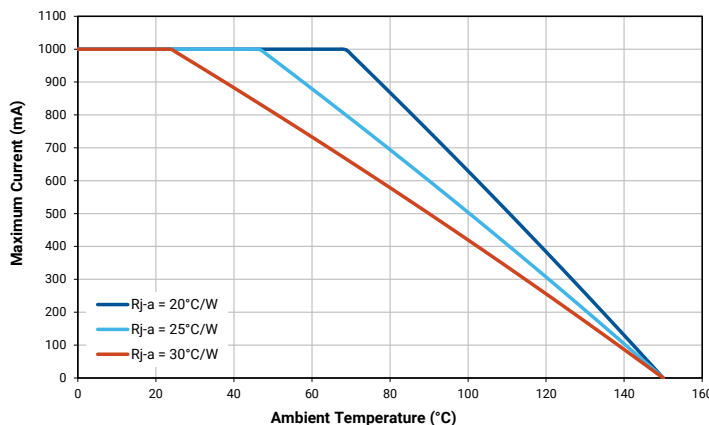
The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.



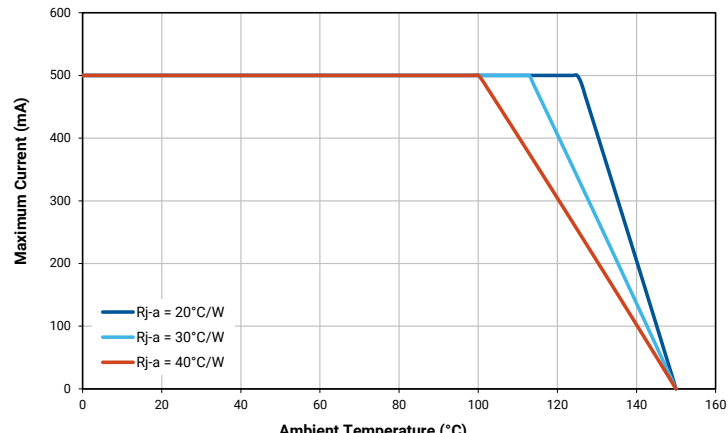
White



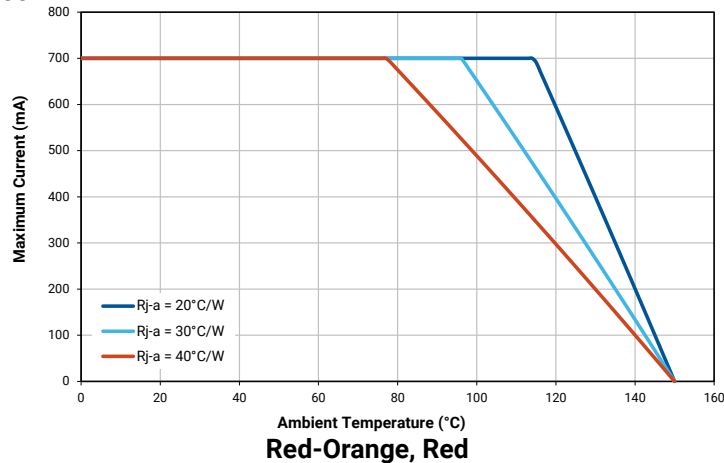
Royal Blue, Blue



Green

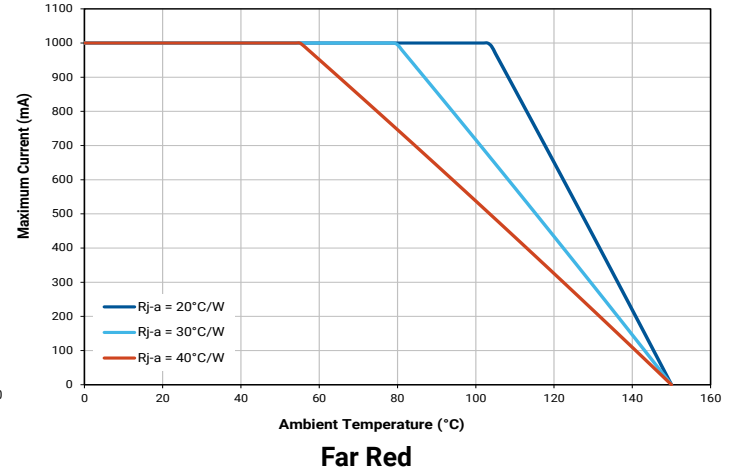
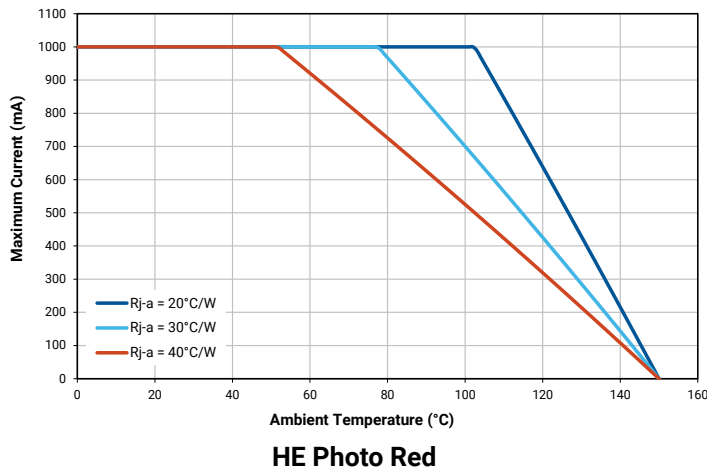


Amber



Red-Orange, Red

THERMAL DESIGN - CONTINUED



PERFORMANCE GROUPS - LUMINOUS FLUX

XP-E LEDs (except royal blue and far red) are tested for luminous flux and placed into one of the following luminous-flux groups:

| Group Code | Minimum Luminous Flux (lm) @ 350 mA | Maximum Luminous Flux (lm) @ 350 mA |
|------------|-------------------------------------|-------------------------------------|
| N3 | 56.8 | 62.0 |
| N4 | 62.0 | 67.2 |
| P2 | 67.2 | 73.9 |
| P3 | 73.9 | 80.6 |
| P4 | 80.6 | 87.4 |
| Q2 | 87.4 | 93.9 |
| Q3 | 93.9 | 100 |
| Q4 | 100 | 107 |
| Q5 | 107 | 114 |
| R2 | 114 | 122 |
| R3 | 122 | 130 |
| R4 | 130 | 139 |

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

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

| Group | Minimum Radiant Flux (mW) @ 350 mA | Maximum Radiant Flux (mW) @ 350 mA |
|-------|------------------------------------|------------------------------------|
| 10 | 175 | 210 |
| 11 | 210 | 250 |
| 12 | 250 | 300 |
| 13 | 300 | 350 |
| 14 | 350 | 425 |
| 15 | 425 | 500 |
| 16 | 500 | 600 |

XLamp XP-E HE photo red LEDs are tested for radiant flux and sorted into one of the following radiant-flux bins:

| Group | Minimum Radiant Flux (mW) @ 350 mA | Maximum Radiant Flux (mW) @ 350 mA |
|-------|------------------------------------|------------------------------------|
| 26 | 350 | 375 |
| 27 | 375 | 400 |
| 28 | 400 | 425 |
| 29 | 425 | 450 |

PERFORMANCE GROUPS - CHROMATICITY

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

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

PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0A | 0.2950 | 0.2970 | 0B | 0.2920 | 0.3060 | 0C | 0.2984 | 0.3133 | 0D | 0.2984 | 0.3133 |
| | 0.2920 | 0.3060 | | 0.2895 | 0.3135 | | 0.2962 | 0.3220 | | 0.3048 | 0.3207 |
| | 0.2984 | 0.3133 | | 0.2962 | 0.3220 | | 0.3028 | 0.3304 | | 0.3068 | 0.3113 |
| | 0.3009 | 0.3042 | | 0.2984 | 0.3133 | | 0.3048 | 0.3207 | | 0.3009 | 0.3042 |
| 0R | 0.2980 | 0.2880 | 0S | 0.2895 | 0.3135 | 0T | 0.2962 | 0.3220 | 0U | 0.3037 | 0.2937 |
| | 0.2950 | 0.2970 | | 0.2870 | 0.3210 | | 0.2937 | 0.3312 | | 0.3009 | 0.3042 |
| | 0.3009 | 0.3042 | | 0.2937 | 0.3312 | | 0.3005 | 0.3415 | | 0.3068 | 0.3113 |
| | 0.3037 | 0.2937 | | 0.2962 | 0.3220 | | 0.3028 | 0.3304 | | 0.3093 | 0.2993 |
| 1A | 0.3048 | 0.3207 | 1B | 0.3028 | 0.3304 | 1C | 0.3115 | 0.3391 | 1D | 0.3130 | 0.3290 |
| | 0.3130 | 0.3290 | | 0.3115 | 0.3391 | | 0.3205 | 0.3481 | | 0.3213 | 0.3373 |
| | 0.3144 | 0.3186 | | 0.3130 | 0.3290 | | 0.3213 | 0.3373 | | 0.3221 | 0.3261 |
| | 0.3068 | 0.3113 | | 0.3048 | 0.3207 | | 0.3130 | 0.3290 | | 0.3144 | 0.3186 |
| 1R | 0.3068 | 0.3113 | 1S | 0.3005 | 0.3415 | 1T | 0.3099 | 0.3509 | 1U | 0.3144 | 0.3186 |
| | 0.3144 | 0.3186 | | 0.3099 | 0.3509 | | 0.3196 | 0.3602 | | 0.3221 | 0.3261 |
| | 0.3161 | 0.3059 | | 0.3115 | 0.3391 | | 0.3205 | 0.3481 | | 0.3231 | 0.3120 |
| | 0.3093 | 0.2993 | | 0.3028 | 0.3304 | | 0.3115 | 0.3391 | | 0.3161 | 0.3059 |
| 2A | 0.3215 | 0.3350 | 2B | 0.3207 | 0.3462 | 2C | 0.3290 | 0.3538 | 2D | 0.3290 | 0.3417 |
| | 0.3290 | 0.3417 | | 0.3290 | 0.3538 | | 0.3376 | 0.3616 | | 0.3371 | 0.3490 |
| | 0.3290 | 0.3300 | | 0.3290 | 0.3417 | | 0.3371 | 0.3490 | | 0.3366 | 0.3369 |
| | 0.3222 | 0.3243 | | 0.3215 | 0.3350 | | 0.3290 | 0.3417 | | 0.3290 | 0.3300 |
| 2R | 0.3222 | 0.3243 | 2S | 0.3196 | 0.3602 | 2T | 0.3290 | 0.3690 | 2U | 0.3290 | 0.3300 |
| | 0.3290 | 0.3300 | | 0.3290 | 0.3690 | | 0.3381 | 0.3762 | | 0.3366 | 0.3369 |
| | 0.3290 | 0.3180 | | 0.3290 | 0.3538 | | 0.3376 | 0.3616 | | 0.3361 | 0.3245 |
| | 0.3231 | 0.3120 | | 0.3207 | 0.3462 | | 0.3290 | 0.3538 | | 0.3290 | 0.3180 |
| 3A | 0.3371 | 0.3490 | 3B | 0.3376 | 0.3616 | 3C | 0.3463 | 0.3687 | 3D | 0.3451 | 0.3554 |
| | 0.3451 | 0.3554 | | 0.3463 | 0.3687 | | 0.3551 | 0.3760 | | 0.3533 | 0.3620 |
| | 0.3440 | 0.3427 | | 0.3451 | 0.3554 | | 0.3533 | 0.3620 | | 0.3515 | 0.3487 |
| | 0.3366 | 0.3369 | | 0.3371 | 0.3490 | | 0.3451 | 0.3554 | | 0.3440 | 0.3427 |
| 3R | 0.3366 | 0.3369 | 3S | 0.3381 | 0.3762 | | | | | | |
| | 0.3440 | 0.3428 | | 0.3480 | 0.3840 | | | | | | |
| | 0.3429 | 0.3307 | | 0.3463 | 0.3687 | | | | | | |
| | 0.3361 | 0.3245 | | 0.3376 | 0.3616 | | | | | | |
| 4A | 0.3530 | 0.3597 | 4B | 0.3548 | 0.3736 | 4C | 0.3641 | 0.3804 | 4D | 0.3615 | 0.3659 |
| | 0.3615 | 0.3659 | | 0.3641 | 0.3804 | | 0.3736 | 0.3874 | | 0.3702 | 0.3722 |
| | 0.3590 | 0.3521 | | 0.3615 | 0.3659 | | 0.3702 | 0.3722 | | 0.3670 | 0.3578 |
| | 0.3512 | 0.3465 | | 0.3530 | 0.3597 | | 0.3615 | 0.3659 | | 0.3590 | 0.3521 |
| 5A1 | 0.3670 | 0.3578 | 5A2 | 0.3686 | 0.3649 | 5A3 | 0.3744 | 0.3685 | 5A4 | 0.3726 | 0.3612 |
| | 0.3686 | 0.3649 | | 0.3702 | 0.3722 | | 0.3763 | 0.3760 | | 0.3744 | 0.3685 |
| | 0.3744 | 0.3685 | | 0.3763 | 0.3760 | | 0.3825 | 0.3798 | | 0.3804 | 0.3721 |
| | 0.3726 | 0.3612 | | 0.3744 | 0.3685 | | 0.3804 | 0.3721 | | 0.3783 | 0.3646 |

PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 5B1 | 0.3702 | 0.3722 | 5B2 | 0.3719 | 0.3797 | 5B3 | 0.3782 | 0.3837 | 5B4 | 0.3763 | 0.3760 |
| | 0.3719 | 0.3797 | | 0.3736 | 0.3874 | | 0.3802 | 0.3916 | | 0.3782 | 0.3837 |
| | 0.3782 | 0.3837 | | 0.3802 | 0.3916 | | 0.3869 | 0.3958 | | 0.3847 | 0.3877 |
| | 0.3763 | 0.3760 | | 0.3782 | 0.3837 | | 0.3847 | 0.3877 | | 0.3825 | 0.3798 |
| 5C1 | 0.3825 | 0.3798 | 5C2 | 0.3847 | 0.3877 | 5C3 | 0.3912 | 0.3917 | 5C4 | 0.3887 | 0.3836 |
| | 0.3847 | 0.3877 | | 0.3869 | 0.3958 | | 0.3937 | 0.4001 | | 0.3912 | 0.3917 |
| | 0.3912 | 0.3917 | | 0.3937 | 0.4001 | | 0.4006 | 0.4044 | | 0.3978 | 0.3958 |
| | 0.3887 | 0.3836 | | 0.3912 | 0.3917 | | 0.3978 | 0.3958 | | 0.3950 | 0.3875 |
| 5D1 | 0.3783 | 0.3646 | 5D2 | 0.3804 | 0.3721 | 5D3 | 0.3863 | 0.3758 | 5D4 | 0.3840 | 0.3681 |
| | 0.3804 | 0.3721 | | 0.3825 | 0.3798 | | 0.3887 | 0.3836 | | 0.3863 | 0.3758 |
| | 0.3863 | 0.3758 | | 0.3887 | 0.3836 | | 0.3950 | 0.3875 | | 0.3924 | 0.3794 |
| | 0.3840 | 0.3681 | | 0.3863 | 0.3758 | | 0.3924 | 0.3794 | | 0.3898 | 0.3716 |
| 6A1 | 0.3889 | 0.3690 | 6A2 | 0.3915 | 0.3768 | 6A3 | 0.3981 | 0.3800 | 6A4 | 0.3953 | 0.3720 |
| | 0.3915 | 0.3768 | | 0.3941 | 0.3848 | | 0.4010 | 0.3882 | | 0.3981 | 0.3800 |
| | 0.3981 | 0.3800 | | 0.4010 | 0.3882 | | 0.4080 | 0.3916 | | 0.4048 | 0.3832 |
| | 0.3953 | 0.3720 | | 0.3981 | 0.3800 | | 0.4048 | 0.3832 | | 0.4017 | 0.3751 |
| 6B1 | 0.3941 | 0.3848 | 6B2 | 0.3968 | 0.3930 | 6B3 | 0.4040 | 0.3966 | 6B4 | 0.4010 | 0.3882 |
| | 0.3968 | 0.3930 | | 0.3996 | 0.4015 | | 0.4071 | 0.4052 | | 0.4040 | 0.3966 |
| | 0.4040 | 0.3966 | | 0.4071 | 0.4052 | | 0.4146 | 0.4089 | | 0.4113 | 0.4001 |
| | 0.4010 | 0.3882 | | 0.4040 | 0.3966 | | 0.4113 | 0.4001 | | 0.4080 | 0.3916 |
| 6C1 | 0.4080 | 0.3916 | 6C2 | 0.4113 | 0.4001 | 6C3 | 0.4186 | 0.4037 | 6C4 | 0.4150 | 0.3950 |
| | 0.4113 | 0.4001 | | 0.4146 | 0.4089 | | 0.4222 | 0.4127 | | 0.4186 | 0.4037 |
| | 0.4186 | 0.4037 | | 0.4222 | 0.4127 | | 0.4299 | 0.4165 | | 0.4259 | 0.4073 |
| | 0.4150 | 0.3950 | | 0.4186 | 0.4037 | | 0.4259 | 0.4073 | | 0.4221 | 0.3984 |
| 6D1 | 0.4017 | 0.3751 | 6D2 | 0.4048 | 0.3832 | 6D3 | 0.4116 | 0.3865 | 6D4 | 0.4082 | 0.3782 |
| | 0.4048 | 0.3832 | | 0.4080 | 0.3916 | | 0.4150 | 0.3950 | | 0.4116 | 0.3865 |
| | 0.4116 | 0.3865 | | 0.4150 | 0.3950 | | 0.4221 | 0.3984 | | 0.4183 | 0.3898 |
| | 0.4082 | 0.3782 | | 0.4116 | 0.3865 | | 0.4183 | 0.3898 | | 0.4147 | 0.3814 |
| 7A1 | 0.4147 | 0.3814 | 7A2 | 0.4183 | 0.3898 | 7A3 | 0.4242 | 0.3919 | 7A4 | 0.4203 | 0.3833 |
| | 0.4183 | 0.3898 | | 0.4221 | 0.3984 | | 0.4281 | 0.4006 | | 0.4242 | 0.3919 |
| | 0.4242 | 0.3919 | | 0.4281 | 0.4006 | | 0.4342 | 0.4028 | | 0.4300 | 0.3939 |
| | 0.4203 | 0.3833 | | 0.4242 | 0.3919 | | 0.4300 | 0.3939 | | 0.4259 | 0.3853 |
| 7B1 | 0.4221 | 0.3984 | 7B2 | 0.4259 | 0.4073 | 7B3 | 0.4322 | 0.4096 | 7B4 | 0.4281 | 0.4006 |
| | 0.4259 | 0.4073 | | 0.4299 | 0.4165 | | 0.4364 | 0.4188 | | 0.4322 | 0.4096 |
| | 0.4322 | 0.4096 | | 0.4364 | 0.4188 | | 0.4430 | 0.4212 | | 0.4385 | 0.4119 |
| | 0.4281 | 0.4006 | | 0.4322 | 0.4096 | | 0.4385 | 0.4119 | | 0.4342 | 0.4028 |
| 7C1 | 0.4342 | 0.4028 | 7C2 | 0.4385 | 0.4119 | 7C3 | 0.4449 | 0.4141 | 7C4 | 0.4403 | 0.4049 |
| | 0.4385 | 0.4119 | | 0.4430 | 0.4212 | | 0.4496 | 0.4236 | | 0.4449 | 0.4141 |
| | 0.4449 | 0.4141 | | 0.4496 | 0.4236 | | 0.4562 | 0.4260 | | 0.4513 | 0.4164 |
| | 0.4403 | 0.4049 | | 0.4449 | 0.4141 | | 0.4513 | 0.4164 | | 0.4465 | 0.4071 |

PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

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

PERFORMANCE GROUPS - DOMINANT WAVELENGTH

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

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

PERFORMANCE GROUPS - PEAK WAVELENGTH

HE photo red and far red XLamp XP-E LEDs are tested for peak wavelength (PWL) and sorted into one of the PWL bins defined below.

| Color | PWL Group | Minimum PWL (nm) @ 350 mA | Maximum PWL (nm) @ 350 mA |
|--------------|-----------|------------------------------|------------------------------|
| HE Photo Red | P2 | 650 | 655 |
| | P3 | 655 | 660 |
| | P4 | 660 | 665 |
| | P5 | 665 | 670 |
| Far Red | F2 | 720 | 725 |
| | F3 | 725 | 730 |
| | F4 | 730 | 735 |
| | F5 | 735 | 740 |

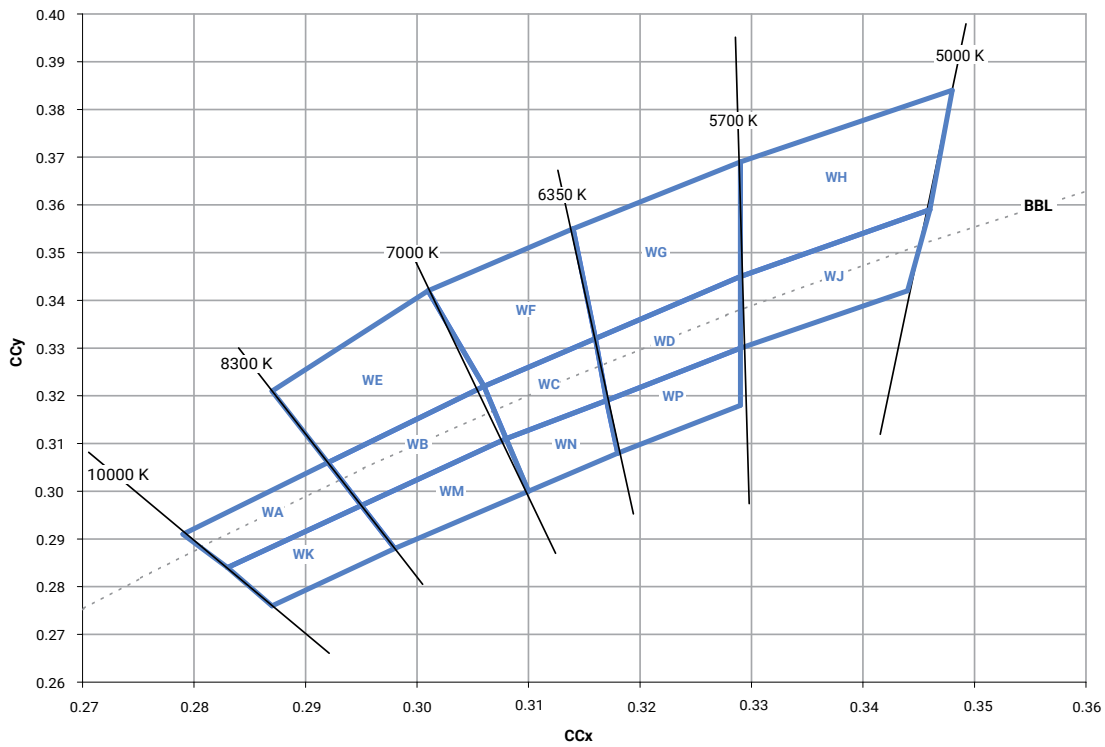
PERFORMANCE GROUPS - FORWARD VOLTAGE

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

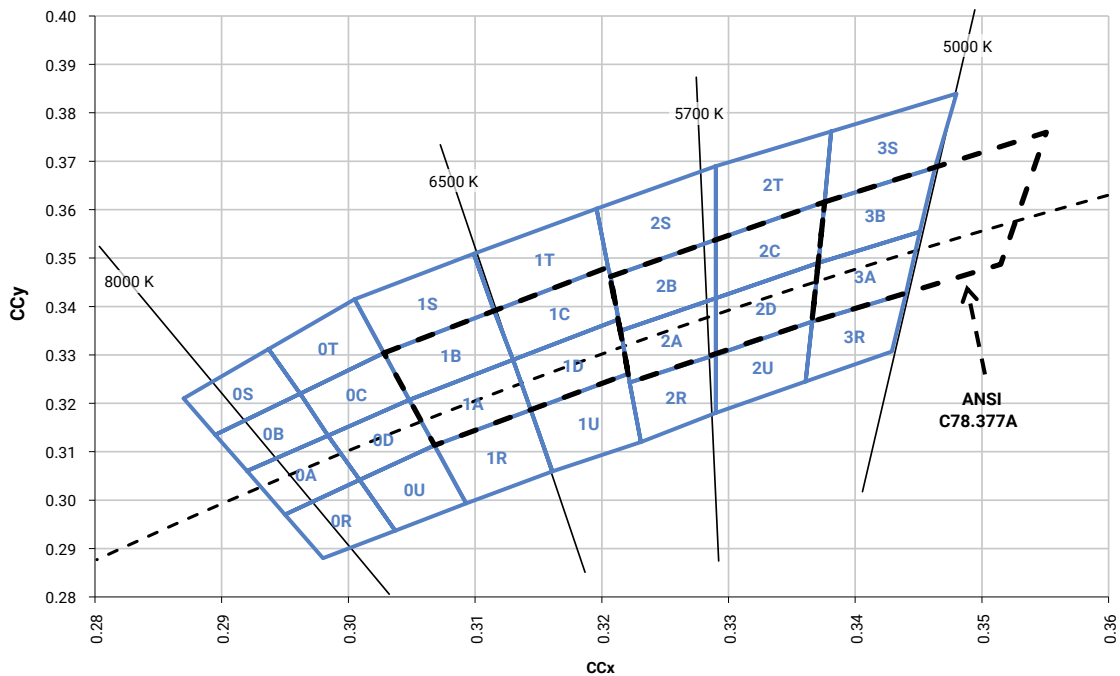
| Forward Voltage Group | Minimum Forward Voltage (V) @ 350 mA | Maximum Forward Voltage (V) @ 350 mA |
|-----------------------|--------------------------------------|--------------------------------------|
| B | 1.75 | 2.0 |
| C | 2.0 | 2.25 |
| D | 2.25 | 2.5 |
| E | 2.5 | 2.75 |
| F | 2.75 | 3.0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

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

Cool White

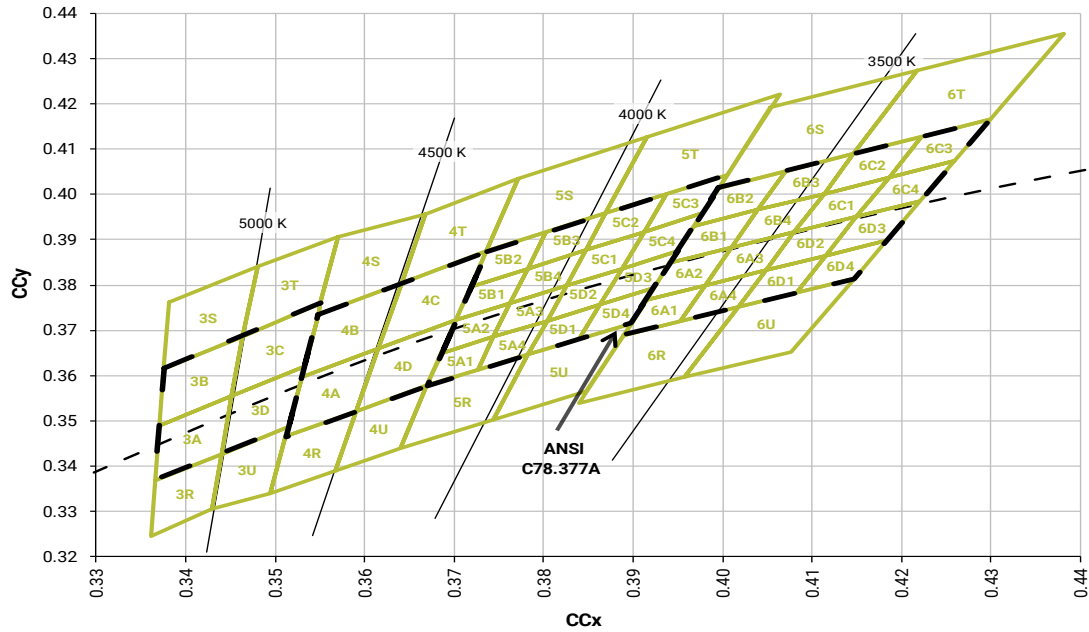


ANSI Cool White

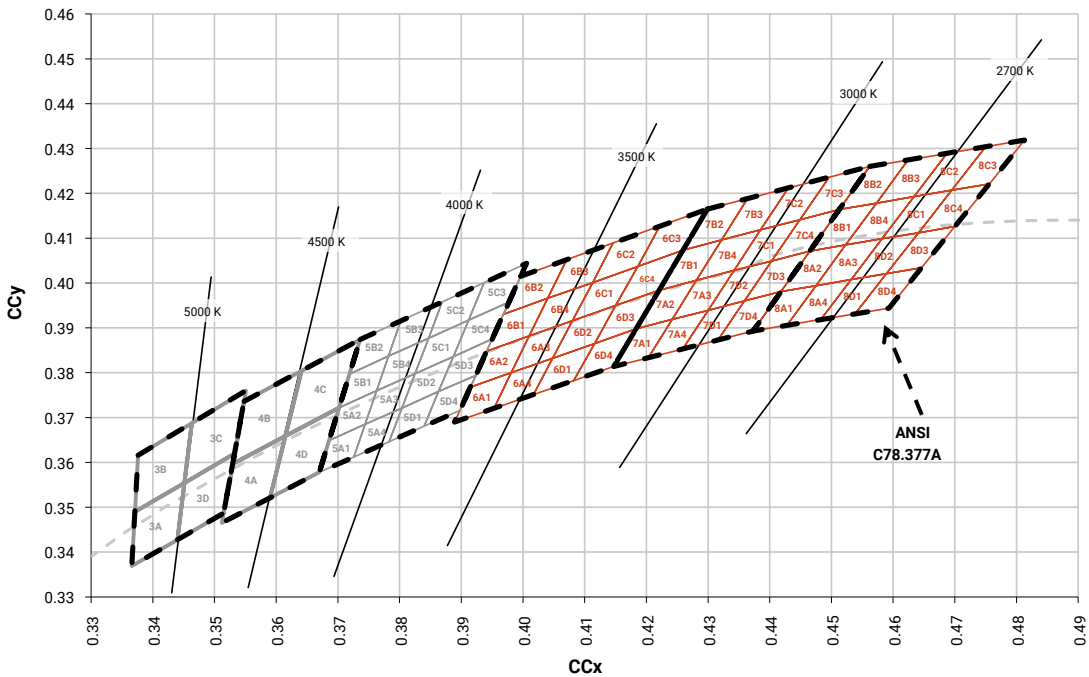


CREE'S STANDARD CHROMATICITY REGIONS PLOTTED ON THE 1931 CIE CURVE - CONTINUED

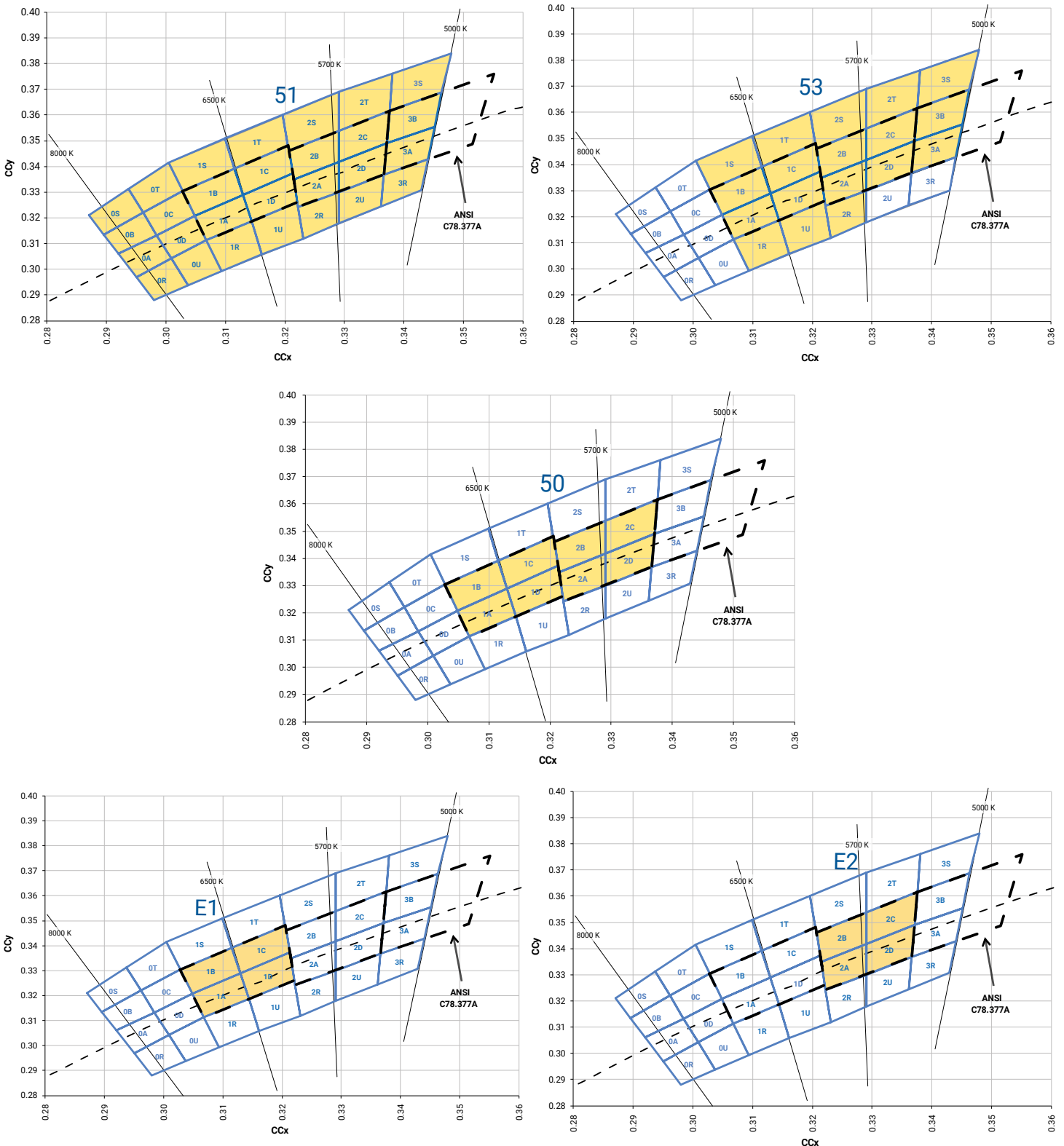
Neutral White



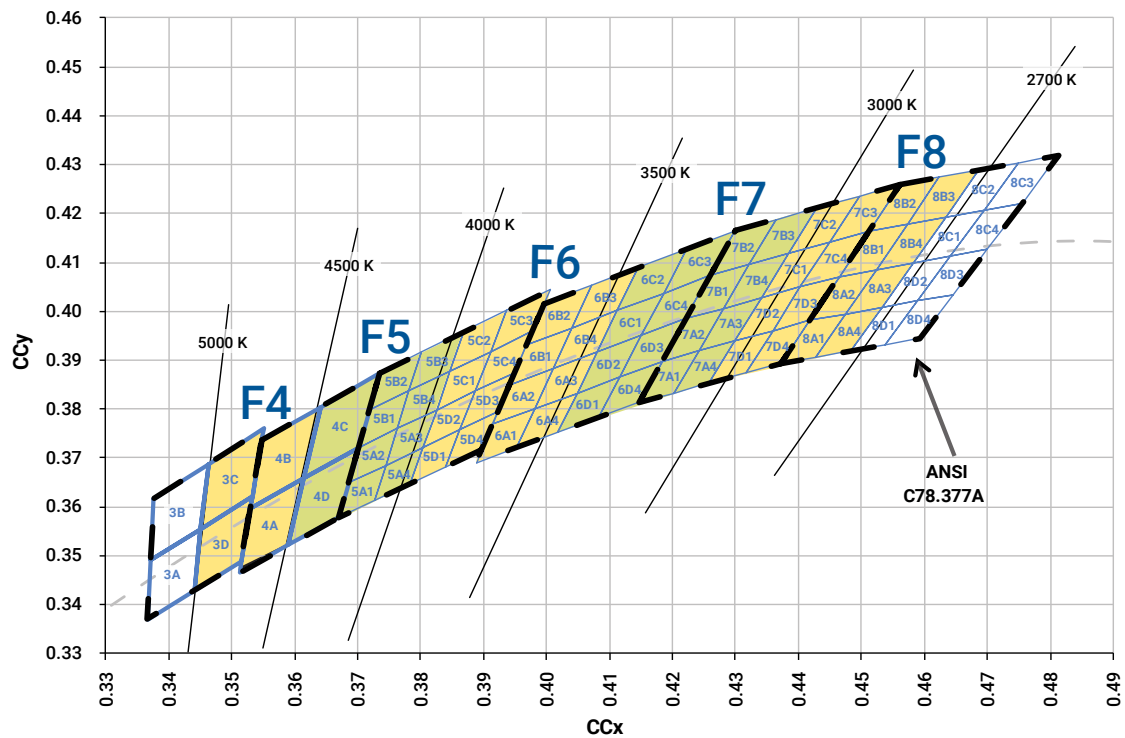
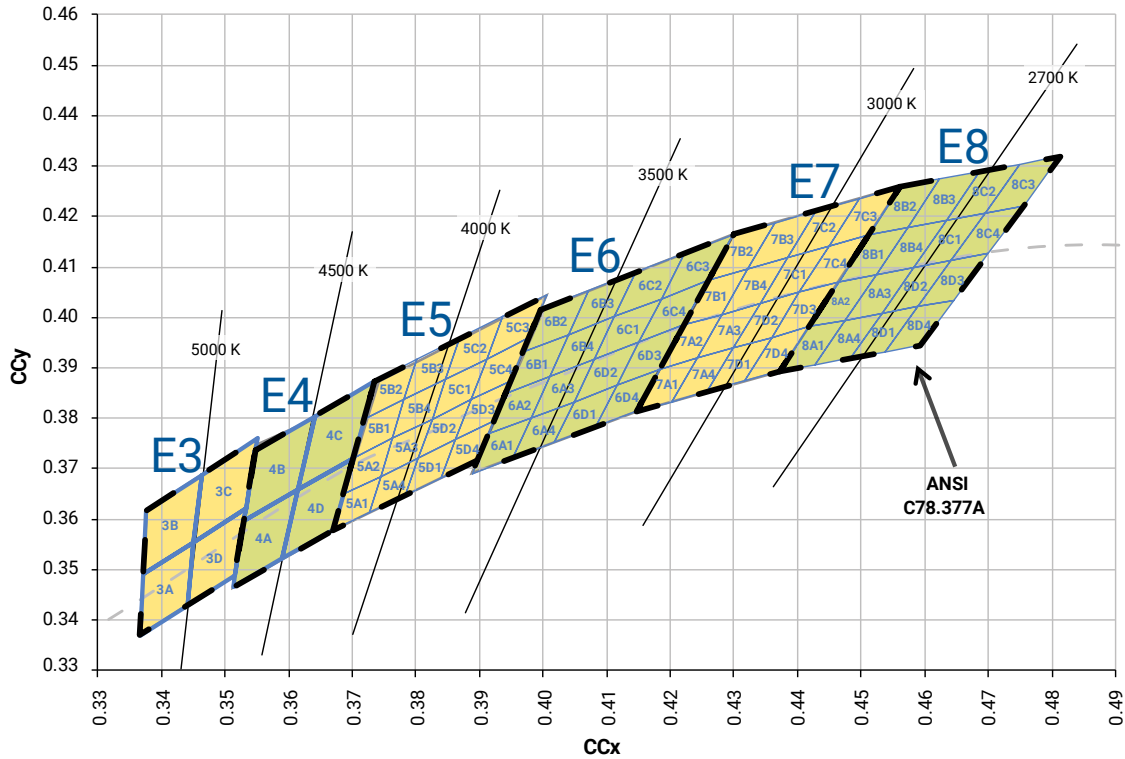
ANSI Neutral White and ANSI Warm White



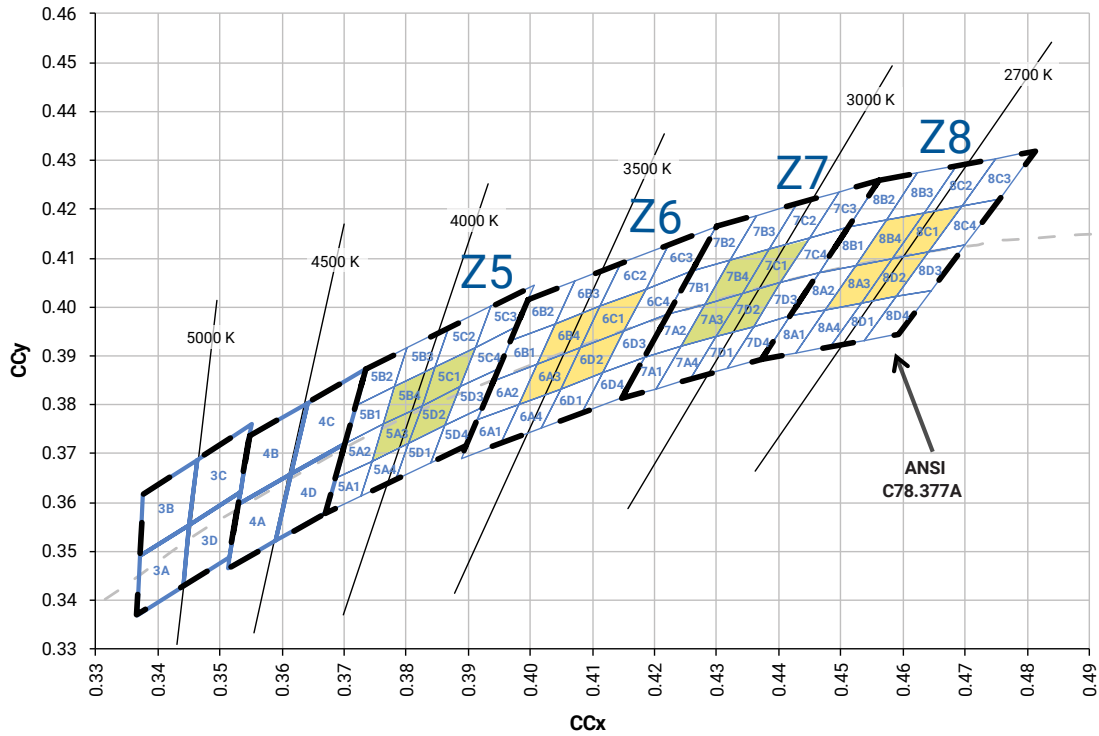
CREE'S STANDARD COOL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS



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



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



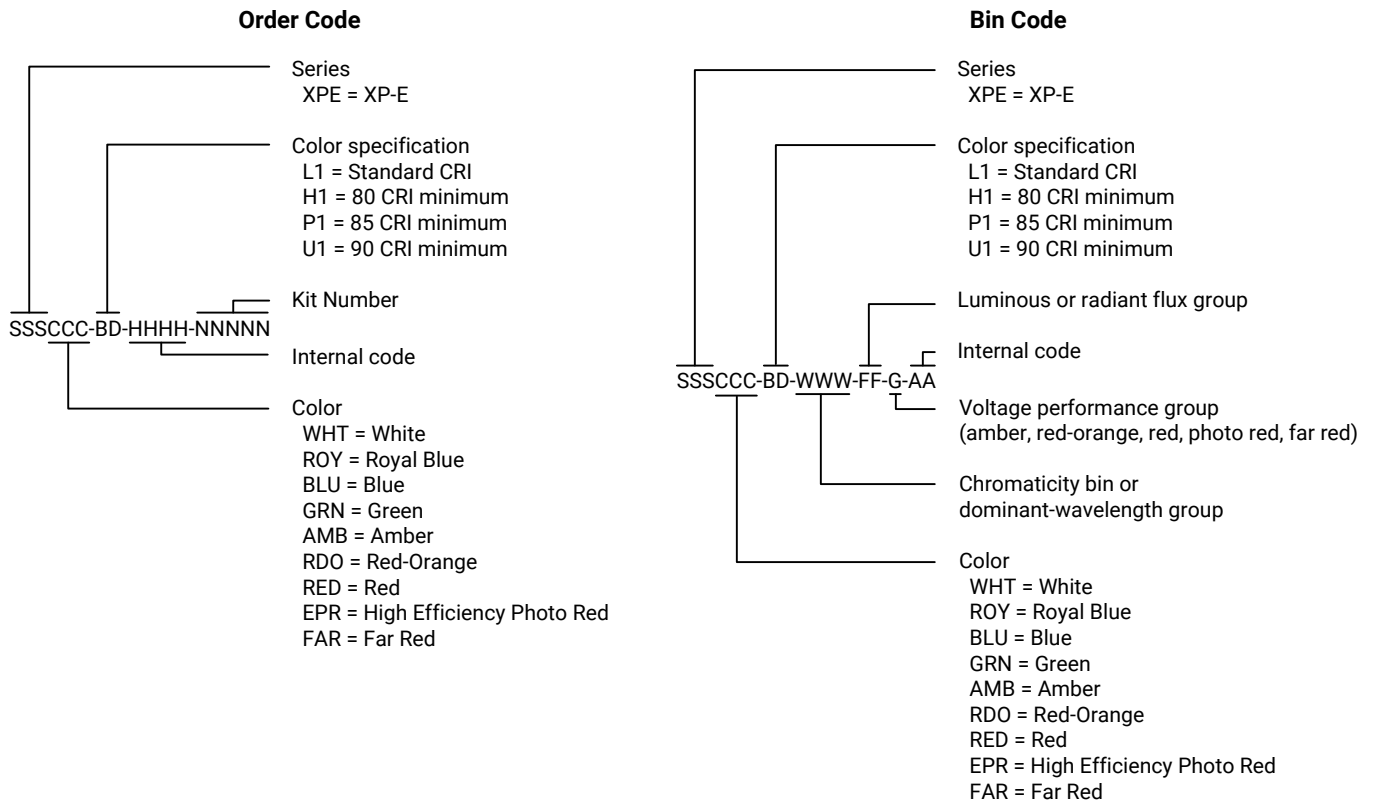
CREE'S STANDARD CHROMATICITY KITS

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

| Color | CCT | Kit | Chromaticity Bins |
|---------------|--------|-----|--|
| Cool White | 6200 K | 51 | 0A, 0B, 0C, 0D, 0R, 0S, 0T, 0U, 1A, 1B, 1C, 1D, 1R, 1S, 1T, 1U, 2A, 2B, 2C, 2D, 2R, 2S, 2T, 2U, 3A, 3B, 3R, 3S |
| | 6000 K | 53 | 1A, 1B, 1C, 1D, 1R, 1S, 1T, 1U, 2A, 2B, 2C, 2D, 2R, 2S, 2T, 3A, 3B, 3S |
| | 6200 K | 50 | 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D |
| | 6500 K | E1 | 1A, 1B, 1C, 1D |
| | 5700 K | E2 | 2A, 2B, 2C, 2D |
| Neutral White | 5000 K | E3 | 3A, 3B, 3C, 3D |
| | 4750 K | F4 | 3C, 3D, 4A, 4B |
| | 4500 K | E4 | 4A, 4B, 4C, 4D |
| | 4250 K | F5 | 4C, 4D, 5A1, 5A2, 5A3, 5A4, 5B1, 5B2, 5B3, 5B4 |
| | 4000 K | E5 | 5A1, 5A2, 5A3, 5A4, 5B1, 5B2, 5B3, 5B4, 5C1, 5C2, 5C3, 5C4, 5D1, 5D2, 5D3, 5D4 |
| | 4000 K | Z5 | 5A3, 5B4, 5C1, 5D2 |
| Warm White | 3750 K | F6 | 5C1, 5C2, 5C3, 5C4, 5D1, 5D2, 5D3, 5D4, 6A1, 6A2, 6A3, 6A4, 6B1, 6B2, 6B3, 6B4 |
| | 3500 K | E6 | 6A1, 6A2, 6A3, 6A4, 6B1, 6B2, 6B3, 6B4, 6C1, 6C2, 6C3, 6C4, 6D1, 6D2, 6D3, 6D4 |
| | 3500 K | Z6 | 6A3, 6B4, 6C1, 6D2 |
| | 3250 K | F7 | 6C1, 6C2, 6C3, 6C4, 6D1, 6D2, 6D3, 6D4, 7A1, 7A2, 7A3, 7A4, 7B1, 7B2, 7B3, 7B4 |
| | 3000 K | E7 | 7A1, 7A2, 7A3, 7A4, 7B1, 7B2, 7B3, 7B4, 7C1, 7C2, 7C3, 7C4, 7D1, 7D2, 7D3, 7D4 |
| | 3000 K | Z7 | 7A3, 7B4, 7C1, 7D2 |
| | 2850 K | F8 | 7C1, 7C2, 7C3, 7C4, 7D1, 7D2, 7D3, 7D4, 8A1, 8A2, 8A3, 8A4, 8B1, 8B2, 8B3, 8B4 |
| | 2700 K | E8 | 8A1, 8A2, 8A3, 8A4, 8B1, 8B2, 8B3, 8B4, 8C1, 8C2, 8C3, 8C4, 8D1, 8D2, 8D3, 8D4 |
| | 2700 K | Z8 | 8A3, 8B4, 8C1, 8D2 |

BIN AND ORDER CODE FORMATS

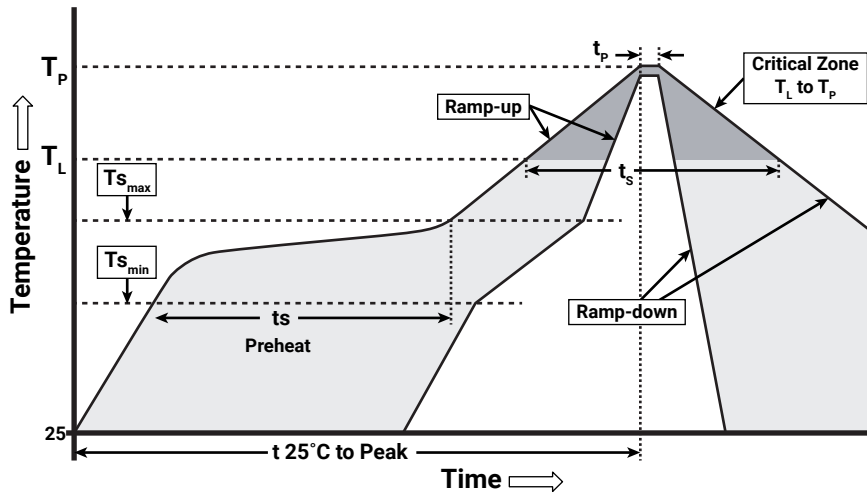
XP-E bin codes and order codes are configured in the following manner:



REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XP-E LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline, Cree recommends that users follow the recommended soldering profile provided by the manufacturer of the solder paste used.

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



IPC/JEDEC J-STD-020C

| Profile Feature | Lead-Free Solder |
|---|------------------|
| Average Ramp-Up Rate ($T_{S_{max}}$ to T_P) | 1.2 °C/second |
| Preheat: Temperature Min ($T_{S_{min}}$) | 120 °C |
| Preheat: Temperature Max ($T_{S_{max}}$) | 170 °C |
| Preheat: Time ($t_{s_{min}}$ to $t_{s_{max}}$) | 65-150 seconds |
| Time Maintained Above: Temperature (T_L) | 217 °C |
| Time Maintained Above: Time (t_t) | 45-90 seconds |
| Peak/Classification Temperature (T_P) | 235 - 245 °C |
| Time Within 5 °C of Actual Peak Temperature (t_p) | 20-40 seconds |
| Ramp-Down Rate | 1 - 6 °C/second |
| Time 25 °C to Peak Temperature | 4 minutes max. |

Note: All temperatures refer to topside of the package, measured on the package body surface.

NOTES

Measurements

The luminous flux, radiant power, chromaticity, forward voltage and CRI measurements in this document are binning specifications only and solely represent product measurements as of the date of shipment. These measurements will change over time based on a number of factors that are not within Cree's control and are not intended or provided as operational specifications for the products. Calculated values are provided for informational purposes only and are not intended as specifications.

Pre-Release Qualification Testing

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

Lumen Maintenance

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

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

Moisture Sensitivity

Cree recommends keeping XLamp LEDs in the provided, resealable moisture-barrier packaging (MBP) until immediately prior to soldering. Unopened MBPs that contain XLamp LEDs do not need special storage for moisture sensitivity.

Once the MBP is opened, XLamp XP-E LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of ≤ 30 °C/85% relative humidity (RH). Regardless of the storage condition, Cree recommends sealing any unsoldered LEDs in the original MBP.

RoHS Compliance

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented January 2, 2013. RoHS Declarations for this product can be obtained from your Cree representative or from the Product Documentation sections of www.cree.com.

REACH Compliance

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

NOTES - CONTINUED

UL® Recognized Component

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

Vision Advisory

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](#).

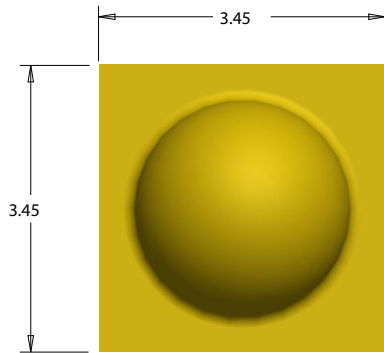
Intellectual Property

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

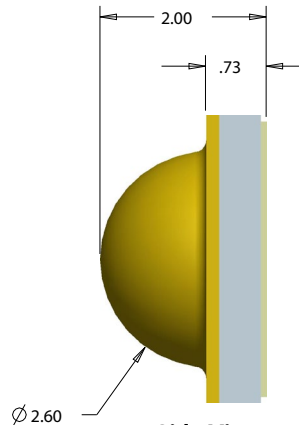
MECHANICAL DIMENSIONS (T_A = 25 °C)

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

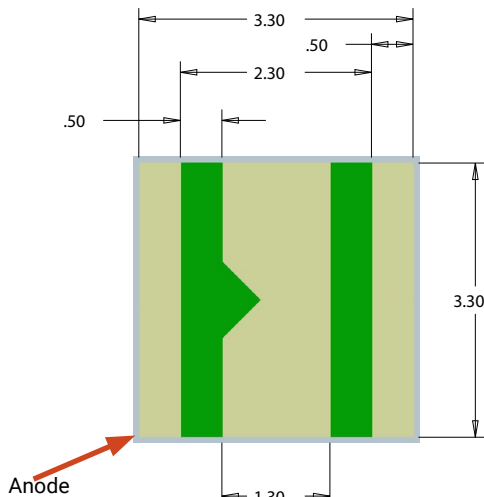
All measurements are ±.13 mm unless otherwise indicated.



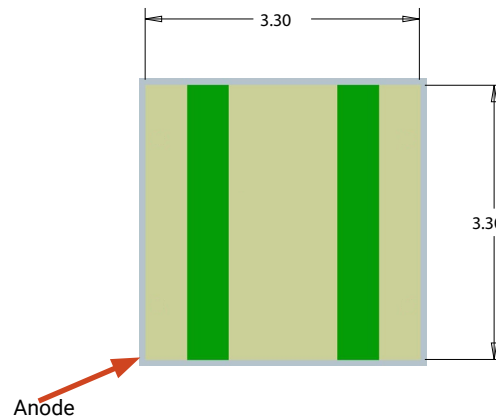
Top View



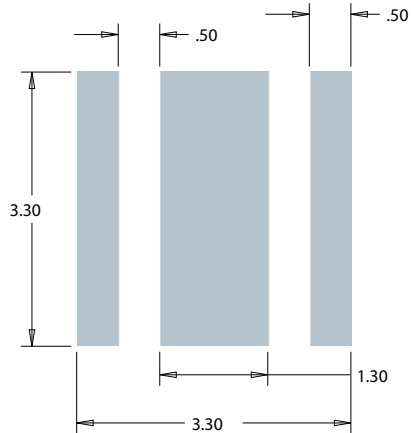
Side View



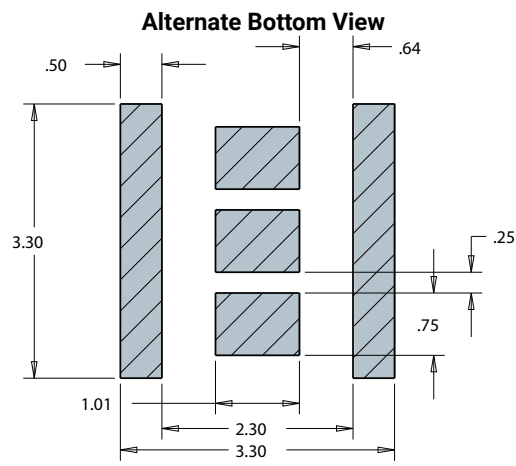
Bottom View



Anode



Recommended PCB Solder Pad

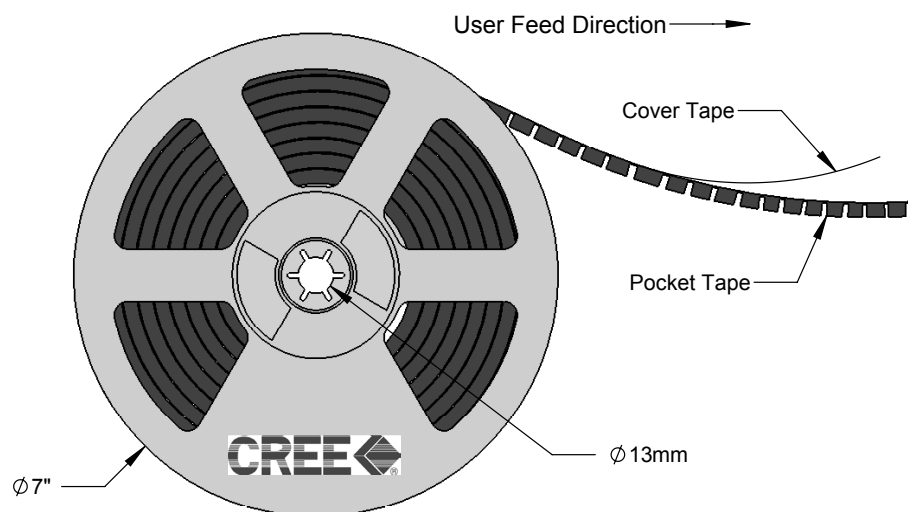
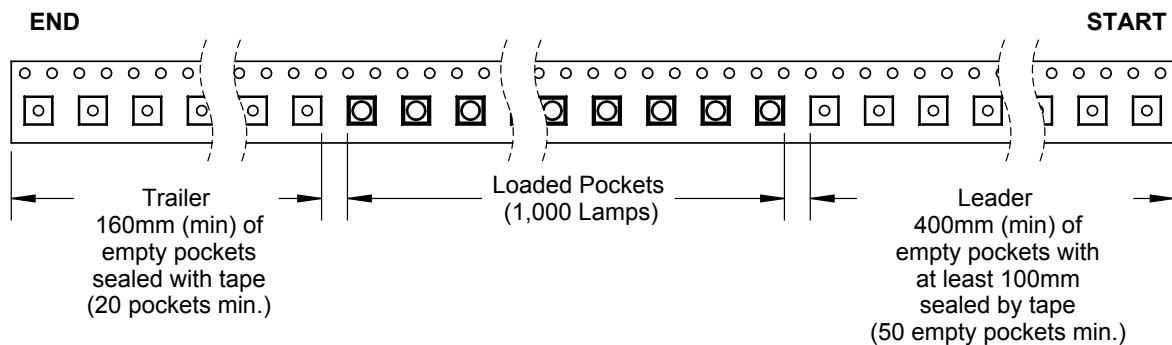
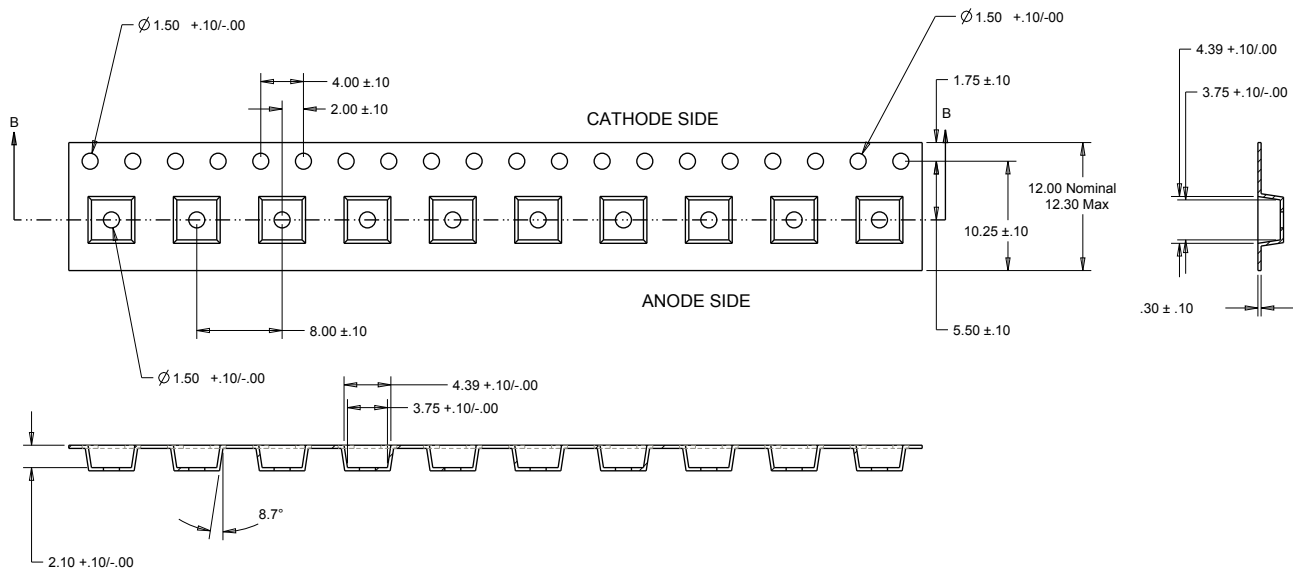


**Recommended Stencil Pattern
(Hatched Area is Open)**

TAPE AND REEL

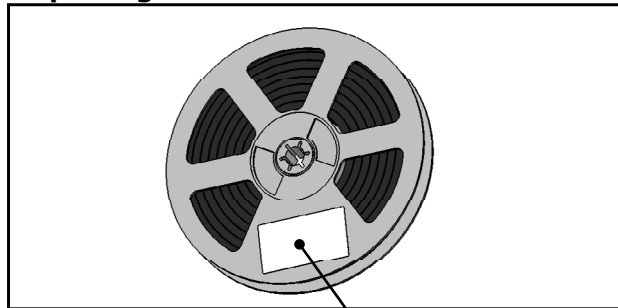
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

Except as noted, all dimensions in mm.



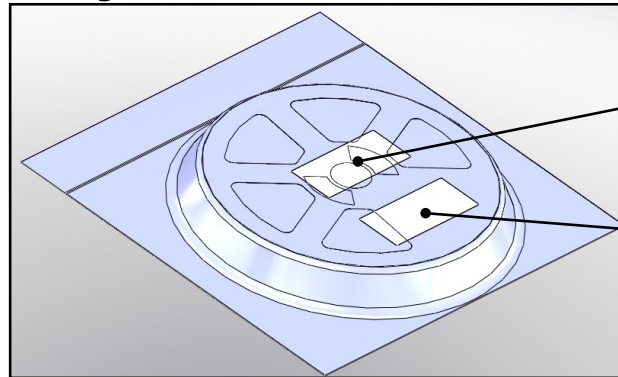
PACKAGING

Unpackaged Reel



Label with Cree Bin Code,
Quantity, Reel ID

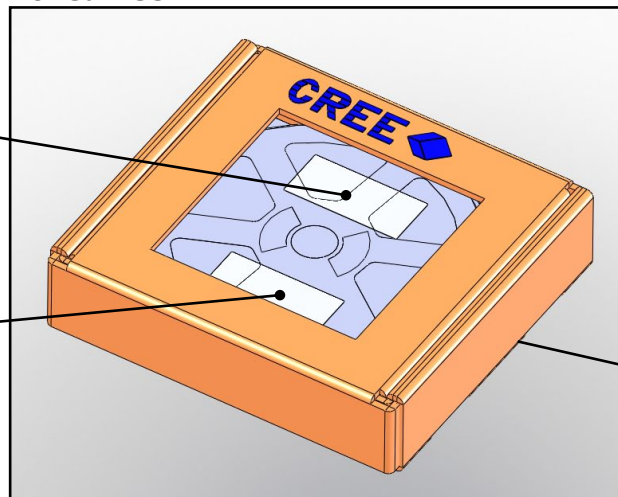
Packaged Reel



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

Label with Cree Bin Code,
Quantity, Reel ID

Boxed Reel



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

Label with Cree Bin Code,
Quantity, Reel ID

Patent Label
(on bottom of box)

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