Cree® XLamp® XR LED
Binning and Labeling

Cree XLamp LEDs combine the brightness of power LED chips with a rugged package capable of operating in excess of one watt. XLamp LEDs lead the solid-state lighting industry in brightness while providing a reflow-solderable design that is optimized for ease-of-use and thermal management. Lighting applications featuring XLamp LEDs maximize light output and increase design flexibility, while minimizing environmental impact.
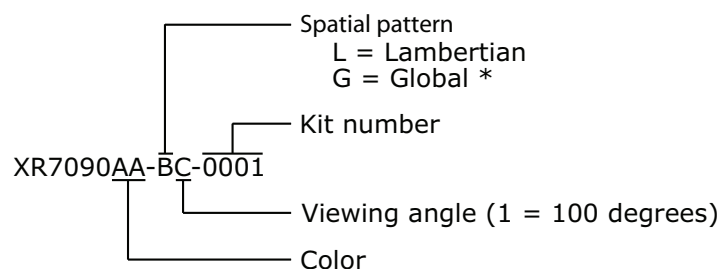
This application note describes Cree's procedures for sorting XLamp LEDs by color (dominant wavelength or chromaticity) and brightness (flux) and then lists the order codes encompassing these color and brightness groups for easy reference.

Nomenclature

XLamp LEDs are tested and sorted into performance bins. A bin is specified by ranges of dominant wavelength and brightness. Sorted XLamp LEDs are packaged on reels. A reel contains lamps from one bin and is labeled with its bin code. For more information on packaging, see the XLamp LED Data Sheets.

XLamp LEDs are sold by order codes in combinations of bins called kits. Kits include a minimum of two dominant wavelength groups and two brightness groups. Order codes are configured in the following manner:

```
                        Spatial pattern
                            L = Lambertian
                            G = Global *

                        Kit number
    XR7090AA-BC-0001
                            Viewing angle (1 = 100 degrees)

                        Color
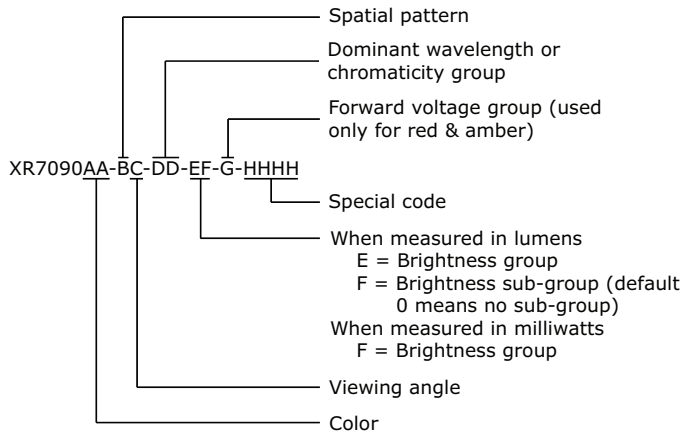```

| Color Codes | | | |
|---|---|---|---|
| RY = Royal blue | BL = Blue | CN = Cyan | GR = Green |
| AM = Amber | RO = Red-orange | RD = Red | WT = White |

* Global - an alternative white product that has higher efficacy with slightly lower color uniformity.

Kit number 0001 is always the order code encompassing the broadest range of color and brightness groups.

## Order Codes Explanation

XR7090AA-BC-DD-EF-G-HHHH

- Spatial pattern
- Dominant wavelength or chromaticity group
- Forward voltage group (used only for red & amber)
- Special code
- When measured in lumens
  - E = Brightness group
  - F = Brightness sub-group (default 0 means no sub-group)
- When measured in milliwatts
  - F = Brightness group
- Viewing angle
- Color

## Performance Groups – Brightness

XLamp LEDs that are tested for luminous flux are placed into one of the following groups:

| Group | Minimum Luminous Flux (lm) @ 350mA | Maximum Luminous Flux (lm) @ 350mA |
|-------|------------------------------------|------------------------------------|
| F | 10.7 | 13.9 |
| G | 13.9 | 18.1 |
| H | 18.1 | 23.5 |
| J | 23.5 | 30.6 |
| K | 30.6 | 39.8 |
| M | 39.8 | 51.7 |
| N | 51.7 | 67.2 |

In order to minimize the perceived luminous flux variation among white lamps from the same reel, Cree bins to tighter luminous flux sub-groups. These sub-groups are defined below.

| Group Code | Minimum Luminous Flux (lm) | Maximum Luminous Flux (lm) |
|------------|----------------------------|----------------------------|
| K2 | 30.6 | 35.2 |
| K3 | 35.2 | 39.8 |
| M2 | 39.8 | 45.7 |
| M3 | 45.7 | 51.7 |
| N2 | 51.7 | 56.8 |
| N3 | 56.8 | 62.0 |
| N4 | 62.0 | 67.2 |

Royal Blue XLamp LEDs are tested for radiant flux and are placed into one of the following groups:

| 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 |

## Performance Groups – Dominant Wavelength

Monochromatic XLamp LEDs are tested for dominant wavelength and placed into one of the following groups.

| Color | DWL Group | Min. DWL (nm) @ 350mA | Max. DWL (nm) @ 350mA |
|-------|-----------|-----------------------|-----------------------|
| Royal Blue | D4 | 455 | 460 |
| | D5 | 460 | 465 |
| Blue | B3 | 465 | 470 |
| | B4 | 470 | 475 |
| Cyan | C2 | 500 | 505 |
| | C3 | 505 | 510 |
| 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 |
| | R4 | 630 | 635 |

Amber and red XLamp LEDs are binned according to forward voltage at the rated current. Cree's forward voltage groups are:

| Forward Voltage Group | Minimum Forward Voltage @ 350 mA | Maximum Forward Voltage @ 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 |

# Performance Groups – Chromaticity

White XLamp LEDs are tested for chromaticity and placed into one of the regions defined by the bounding coordinates below.

### White Color Region Coordinates - 5000K – 10000K

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

### White Color Region Coordinates - 3500K – 5000K

| Region | x | y | Region | x | y | Region | x | y |
|---|---|---|---|---|---|---|---|---|
| TA | .344 | .342 | TD | .387 | .374 | TG | .3755 | .372 |
| | .346 | .359 | | .402 | .382 | | .380 | .389 |
| | .363 | .368 | | .395 | .364 | | .392 | .391 |
| | .360 | .353 | | .382 | .358 | | .387 | .374 |
| TB | .36 | .353 | TE | .346 | .359 | TH | .392 | .391 |
| | .363 | .368 | | .348 | .384 | | .387 | .374 |
| | .3755 | .3715 | | .367 | .386 | | .402 | .382 |
| | .371 | .3555 | | .363 | .368 | | .409 | .399 |
| TC | .371 | .3555 | TF | .363 | .368 | | | |
| | .3755 | .3715 | | .367 | .386 | | | |
| | .387 | .374 | | .380 | .389 | | | |
| | .382 | .358 | | .3755 | .372 | | | |

## Performance Groups – Chromaticity (continued)

### White Color Region Coordinates - 2600K – 3500K

| Region | x | y | Region | x | y | Region | x | y |
|--------|------|------|--------|------|------|--------|------|------|
| SA | .402 | .382 | SD | .444 | .399 | SG | .438 | .412 |
|    | .416 | .389 |    | .461 | .404 |    | .429 | .394 |
|    | .409 | .370 |    | .450 | .385 |    | .444 | .399 |
|    | .395 | .364 |    | .435 | .380 |    | .453 | .416 |
| SB | .409 | .370 | SE | .409 | .399 | SH | .444 | .399 |
|    | .416 | .389 |    | .402 | .382 |    | .461 | .404 |
|    | .429 | .394 |    | .416 | .389 |    | .470 | .420 |
|    | .420 | .375 |    | .424 | .406 |    | .453 | .416 |
| SC | .429 | .394 | SF | .424 | .406 |    |      |      |
|    | .444 | .399 |    | .416 | .389 |    |      |      |
|    | .435 | .380 |    | .429 | .394 |    |      |      |
|    | .420 | .375 |    | .438 | .412 |    |      |      |

## Cree's Standard Chromaticity Regions Plotted on the 1931 CIE Curve
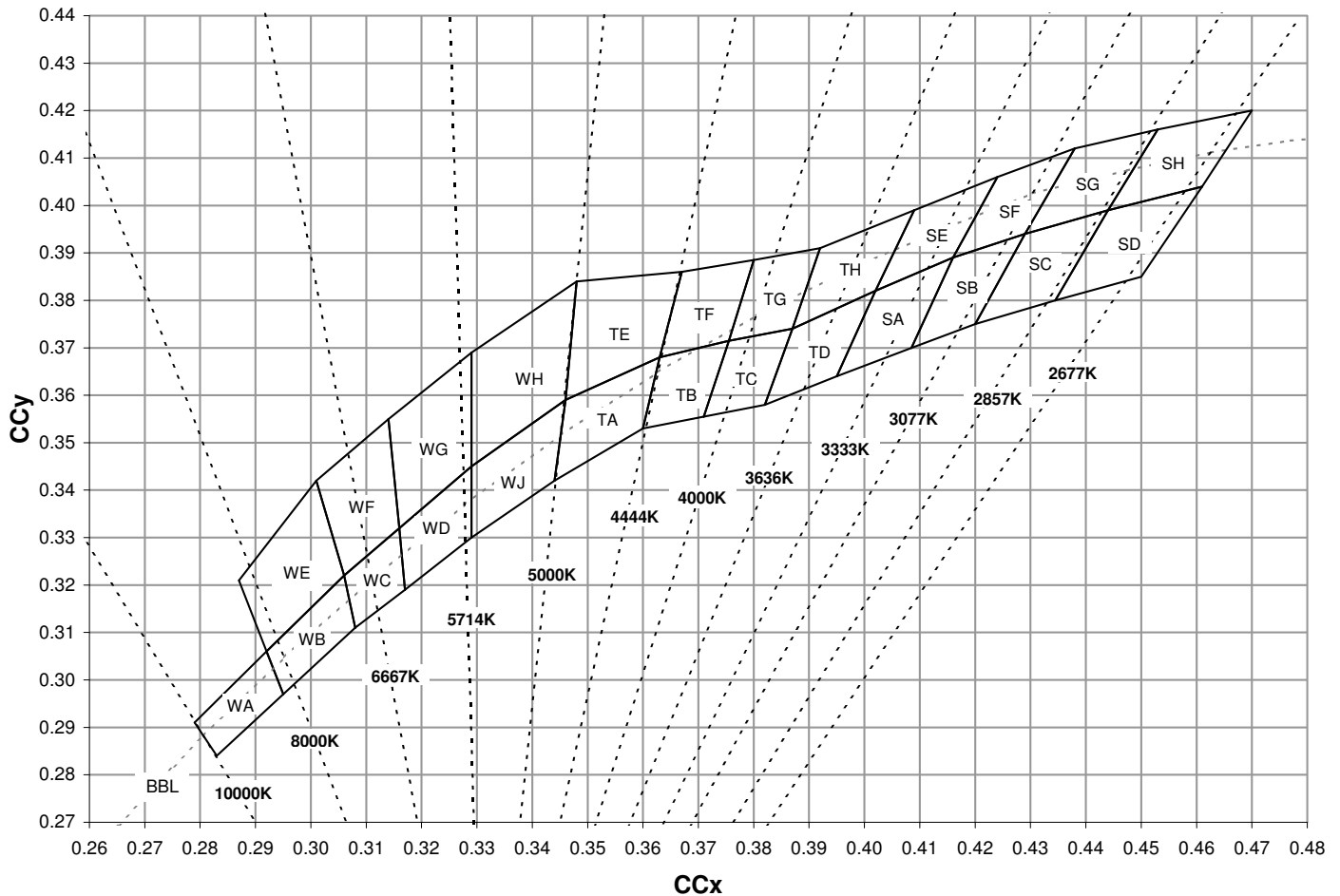
# Standard Order Codes and Bins

The following tables list standard order code configurations and performance bins. Contact Cree at +1 919.313.5300 if custom order codes are required.

| Standard Order Codes – Royal Blue | | | | | | |
|---|---|---|---|---|---|---|
| Order Code | Bins | | DWL (nm) | | Radiant Flux (mW) | |
| | Color | Flux | Min. | Max. | Min. | Max. |
| XR7090RY-L1-0001 | D4, D5 | 10, 11, 12, 13 | 455 | 465 | 175 | 350 |

| Standard Order Codes – Blue | | | | | | |
|---|---|---|---|---|---|---|
| Order Code | Bins | | DWL (nm) | | Luminous Flux (lm) | |
| | Color | Flux | Min. | Max. | Min. | Max. |
| XR7090BL-L1-0001 | B3, B4 | F, G, H, J | 465 | 475 | 10.7 | 30.6 |

| Standard Order Codes – Cyan | | | | | | |
|---|---|---|---|---|---|---|
| Order Code | Bins | | DWL (nm) | | Luminous Flux (lm) | |
| | Color | Flux | Min. | Max. | Min. | Max. |
| XR7090CN-L1-0001 | C2, C3 | K, M | 500 | 510 | 30.6 | 51.7 |

| Standard Order Codes – Green | | | | | | |
|---|---|---|---|---|---|---|
| Order Code | Bins | | DWL (nm) | | Luminous Flux (lm) | |
| | Color | Flux | Min. | Max. | Min. | Max. |
| XR7090GR-L1-0001 | G2, G3, G4 | K, M, N | 520 | 535 | 30.6 | 67.2 |

| Standard Order Codes – Amber | | | | | | | |
|---|---|---|---|---|---|---|---|
| Order Code | Bins | | | DWL (nm) | | Luminous Flux (lm) | |
| | Color | Flux | Voltage | Min. | Max. | Min. | Max. |
| XR7090AM-L1-0001 | A2, A3 | J, K, M, N | B, C, D, E, F | 585 | 595 | 23.5 | 67.2 |

| Standard Order Codes – Red-Orange | | | | | | |
|---|---|---|---|---|---|---|
| Order Code | Bins | | DWL (nm) | | Luminous Flux (lm) | |
| | Color | Flux | Min. | Max. | Min. | Max. |
| XR7090RO-L1-0001 | O3, O4 | K, M, N | 610 | 620 | 30.6 | 67.2 |

| Standard Order Codes – Red | | | | | | | |
|---|---|---|---|---|---|---|---|
| Order Code | Bins | | | DWL (nm) | | Luminous Flux (lm) | |
| | Color | Flux | Voltage | Min. | Max. | Min. | Max. |
| XR7090RD-L1-0001 | R2, R3, R4 | H, J, K, M | B, C, D, E, F | 620 | 635 | 18.1 | 51.7 |

| Standard Order Codes – White | | | | |
|---|---|---|---|---|
| **Order Code** | **Bins** | | **Lum. Flux (lm)** | |
| | **Chromaticity** | **Flux** | **Min.** | **Max.** |
| XR7090WT-L1-0001 | WA, WB, WC, WD, WE, WF, WG, WH, WJ | M2, M3, N2 | 39.8 | 56.8 |
| XR7090WT-L1-0002 | WC,WD, WF, WG | M2, M3, N2 | 39.8 | 56.8 |
| XR7090WT-G1-0001 | WA, WB, WC, WD, WE, WF, WG, WH, WJ | M2, M3, N2, N3 | 39.8 | 62 |
| XR7090WT-G1-0002 | WC, WD, WF, WG | M2, M3, N2, N3 | 39.8 | 62 |
| XR7090WT-G1-0003 | WB, WC, WD, WE, WF, WG, WH, WJ | N2, N3 | 51.7 | 62 |
| XR7090WT-L1-1001 | TA, TB, TC, TD, TE, TF, TG, TH | K2, K3, M2, M3 | 30.6 | 51.7 |
| XR7090WT-L1-2001 | SA, SB, SC, SD, SE, SF, SG, SH | K2, K3, M2 | 30.6 | 45.7 |