# Cree® XLamp® CXB3070 LED

## PRODUCT DESCRIPTION

The XLamp® CXB3070 LED Array is a member of the second generation of the CXA family that delivers up to 30% higher efficacy and up to 20% higher lumens than the first generation in the same LES. The higher performance second generation CXA LED Arrays provide a drop-in performance upgrade to existing CXA LED designs to shorten product development time. In addition, the CXB LEDs also allow lighting manufacturers to achieve the same or better performance with a smaller LES, enabling a smaller, more impactful luminaire. Available in 2-step, 3-step and 5-step EasyWhite® bins, the CXB3070 LED delivers high lumen output and high efficacy in a single, easy-to-use package that eliminates the need for reflow soldering.

The CX Family LED Design Guide provides basic information on the requirements to use the CXB3070 LED successfully in luminaire designs.

## FEATURES

- 23-mm optical source
- Mechanical and optical design consistent with other CXA30 and CXB30 LEDs
- Available in 70-, 80- and 90-minimum CRI options
- Cree EasyWhite® 2-, 3- and 5-step binning
- Forward voltage option: 36-V class
- 85 °C binning and characterization
- Extremely uniform color over viewing angle
- Top-side solder connections
- Thermocouple attach point
- NEMA SSL-3 2011 standard flux bins
- RoHS and REACh compliant
- UL® recognized component (E349212)

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## CHARACTERISTICS

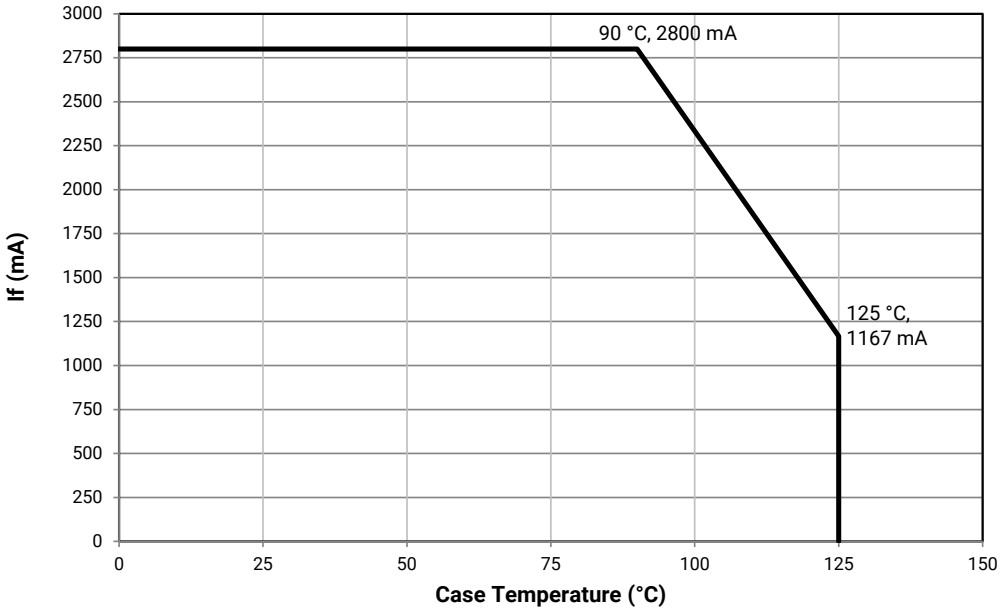
| Characteristics | Unit | Minimum | Typical | Maximum |
|---|---|---|---|---|
| Viewing angle (FWHM) | degrees | | 115 | |
| ESD withstand voltage (HBM per Mil-Std-883D) | V | | | 8000 |
| DC forward current | mA | | | 2800* |
| Reverse current | mA | | | 0.1 |
| Forward voltage (@ 1900 mA, $T_j$ = 85 °C) | V | | 36 | 39 |

* Refer to the Operating Limits section.

## OPERATING LIMITS

The maximum current rating of the CXB3070 depends on the case temperature (Tc) when the LED has reached thermal equilibrium under steady-state operation. The graph shown below assumes that the system design employs good thermal management (thermal interface material and heat sink) and may vary when poor thermal management is employed. Please refer to the Mechanical Dimensions section on page 11 for the location of the Tc measurement point.

Another important factor in good thermal management is the temperature of the Light Emitting Surface (LES). Cree recommends a maximum LES temperature of 135 °C to ensure optimal LED lifetime. Please refer to the Thermal Design section on page 12 for more information on LES temperature measurement.

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## FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS ($I_F$ = 1900 mA, $T_J$ = 85 °C)

The following table provides order codes for XLamp CXB3070 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 11).

| Nominal CCT | CRI* | | Minimum Luminous Flux | | | 2-Step | | 3-Step | | 5-Step | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Typ | Group | Flux (lm) @ 85 °C | Flux (lm) @ 25 °C** | Group | Order Code | Group | Order Code | Group | Order Code |
| 6500 K | 70 | --- | BB | 9,500 | 10,520 | | | | | 65E | CXB3070-0000-000N0BBB65E |
| | | | BD | 10,000 | 11,074 | | | | | | CXB3070-0000-000N0BBD65E |
| | | | CB | 11,000 | 12,181 | | | | | | CXB3070-0000-000N0BCB65E |
| | 80 | --- | BB | 9,500 | 10,520 | | | | | 65E | CXB3070-0000-000N0HBB65E |
| | | | BD | 10,000 | 11,074 | | | | | | CXB3070-0000-000N0HBD65E |
| 5700 K | 70 | --- | BB | 9,500 | 10,520 | | | | | 57E | CXB3070-0000-000N0BBB57E |
| | | | BD | 10,000 | 11,074 | | | | | | CXB3070-0000-000N0BBD57E |
| | | | CB | 11,000 | 12,181 | | | | | | CXB3070-0000-000N0BCB57E |
| | 80 | --- | BB | 9,500 | 10,520 | | | | | 57E | CXB3070-0000-000N0HBB57E |
| | | | BD | 10,000 | 11,074 | | | | | | CXB3070-0000-000N0HBD57E |
| 5000 K | 70 | --- | BB | 9,500 | 10,520 | | | | | 50E | CXB3070-0000-000N0BBB50E |
| | | | BD | 10,000 | 11,074 | | | | | | CXB3070-0000-000N0BBD50E |
| | | | CB | 11,000 | 12,181 | | | | | | CXB3070-0000-000N0BCB50E |
| | 80 | --- | BB | 9,500 | 10,520 | | | 50G | CXB3070-0000-000N0HBB50G | 50E | CXB3070-0000-000N0HBB50E |
| | | | BD | 10,000 | 11,074 | | | | CXB3070-0000-000N0HBD50G | | CXB3070-0000-000N0HBD50E |
| | 90 | 92 | Z4 | 7,945 | 8,798 | | | 50G | CXB3070-0000-000N0UZ450G | | |
| | | | AB | 8,500 | 9,413 | | | | CXB3070-0000-000N0UAB50G | | |
| | | | AD | 9,000 | 9,967 | | | | CXB3070-0000-000N0UAD50G | | |

Notes

- Cree maintains a tolerance of ±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 21).
- Cree XLamp CXB3070 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.

* For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

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

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## FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS ($I_F$ = 1900 mA, $T_J$ = 85 °C) - CONTINUED

| Nominal CCT | CRI* | | Minimum Luminous Flux | | | 2-Step | | 3-Step | | 5-Step | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Typ | Group | Flux (lm) @ 85 °C | Flux (lm) @ 25 °C** | Group | Order Code | Group | Order Code | Group | Order Code |
| 4000 K | 70 | --- | BB | 9,500 | 10,520 | | | | | 40E | CXB3070-0000-000N0BBB40E |
| | | | BD | 10,000 | 11,074 | | | | | | CXB3070-0000-000N0BBD40E |
| | | | CB | 11,000 | 12,181 | | | | | | CXB3070-0000-000N0BCB40E |
| | 80 | --- | AD | 9,000 | 9,967 | 40H | CXB3070-0000-000N0HAD40H | 40G | CXB3070-0000-000N0HAD40G | | |
| | | | BB | 9,500 | 10,520 | | CXB3070-0000-000N0HBB40H | | CXB3070-0000-000N0HBB40G | | |
| | | | BD | 10,000 | 11,074 | | CXB3070-0000-000N0HBD40H | | CXB3070-0000-000N0HBD40G | | |
| | 90 | 92 | Z4 | 7,945 | 8,798 | 40H | CXB3070-0000-000N0UZ440H | 40G | CXB3070-0000-000N0UZ440G | | |
| | | | AB | 8,500 | 9,413 | | CXB3070-0000-000N0UAB40H | | CXB3070-0000-000N0UAB40G | | |
| 3500 K | 80 | --- | AD | 9,000 | 9,967 | 35H | CXB3070-0000-000N0HAD35H | 35G | CXB3070-0000-000N0HAD35G | | |
| | | | BB | 9,500 | 10,520 | | CXB3070-0000-000N0HBB35H | | CXB3070-0000-000N0HBB35G | | |
| | 90 | 92 | Z2 | 7,390 | 8,184 | 35H | CXB3070-0000-000N0UZ235H | 35G | CXB3070-0000-000N0UZ235G | | |
| | | | Z4 | 7,945 | 8,798 | | CXB3070-0000-000N0UZ435H | | CXB3070-0000-000N0UZ435G | | |
| | | | AB | 8,500 | 9,413 | | CXB3070-0000-000N0UAB35H | | CXB3070-0000-000N0UAB35G | | |
| 3000 K | 80 | --- | AB | 8,500 | 9,413 | 30H | CXB3070-0000-000N0HAB30H | 30G | CXB3070-0000-000N0HAB30G | | |
| | | | AD | 9,000 | 9,967 | | CXB3070-0000-000N0HAD30H | | CXB3070-0000-000N0HAD30G | | |
| | | | BB | 9,500 | 10,520 | | CXB3070-0000-000N0HBB30H | | CXB3070-0000-000N0HBB30G | | |
| | 90 | 92 | Y4 | 6,910 | 7,652 | 30H | CXB3070-0000-000N0UY430H | 30G | CXB3070-0000-000N0UY430G | | |
| | | | Z2 | 7,390 | 8,184 | | CXB3070-0000-000N0UZ230H | | CXB3070-0000-000N0UZ230G | | |
| | | | Z4 | 7,945 | 8,798 | | CXB3070-0000-000N0UZ430H | | CXB3070-0000-000N0UZ430G | | |

Notes

- Cree maintains a tolerance of ±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 21).
- Cree XLamp CXB3070 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.

* For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

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

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## FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS ($I_F$ = 1900 mA, $T_J$ = 85 °C) - CONTINUED

| Nominal CCT | CRI* | | Minimum Luminous Flux | | | 2-Step | | 3-Step | | 5-Step | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Typ | Group | Flux (lm) @ 85 °C | Flux (lm) @ 25 °C** | Group | Order Code | Group | Order Code | Group | Order Code |
| 2700 K | 80 | --- | Z4 | 7,945 | 8,798 | 27H | CXB3070-0000-000N0HZ427H | 27G | CXB3070-0000-000N0HZ427G | | |
| | | | AB | 8,500 | 9,413 | | CXB3070-0000-000N0HAB27H | | CXB3070-0000-000N0HAB27G | | |
| | | | AD | 9,000 | 9,967 | | CXB3070-0000-000N0HAD27H | | CXB3070-0000-000N0HAD27G | | |
| | 90 | 92 | Y4 | 6,910 | 7,652 | 27H | CXB3070-0000-000N0UY427H | 27G | CXB3070-0000-000N0UY427G | | |
| | | | Z2 | 7,390 | 8,184 | | CXB3070-0000-000N0UZ227H | | CXB3070-0000-000N0UZ227G | | |
| 2200 K | 80 | --- | Z2 | 7,390 | 8,184 | | | 22G | CXB3070-0000-000N0HZ222G | | |

Notes

- Cree maintains a tolerance of ±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 21).
- Cree XLamp CXB3070 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.

* For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

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

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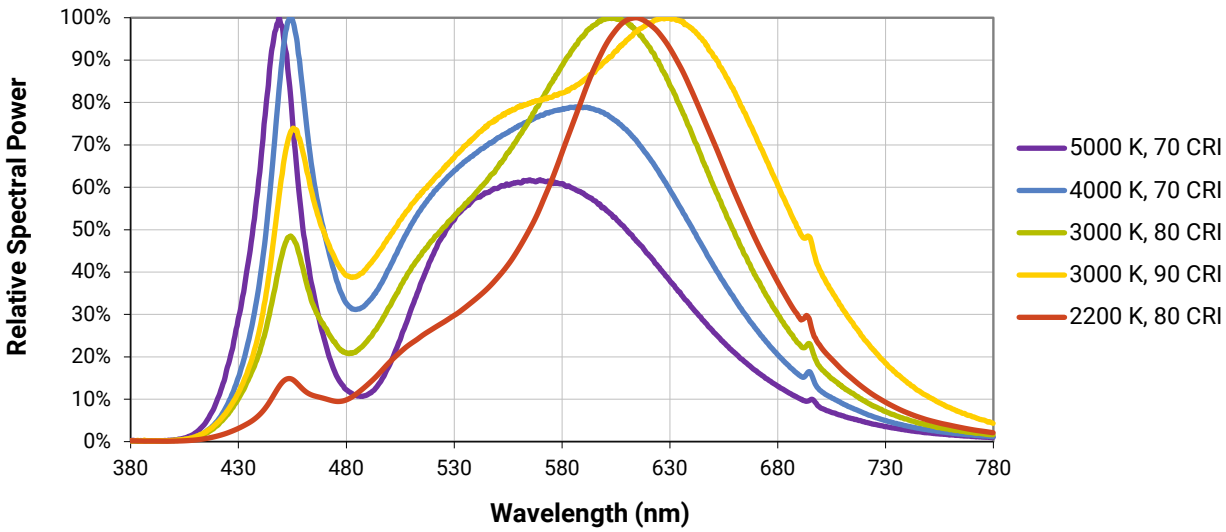
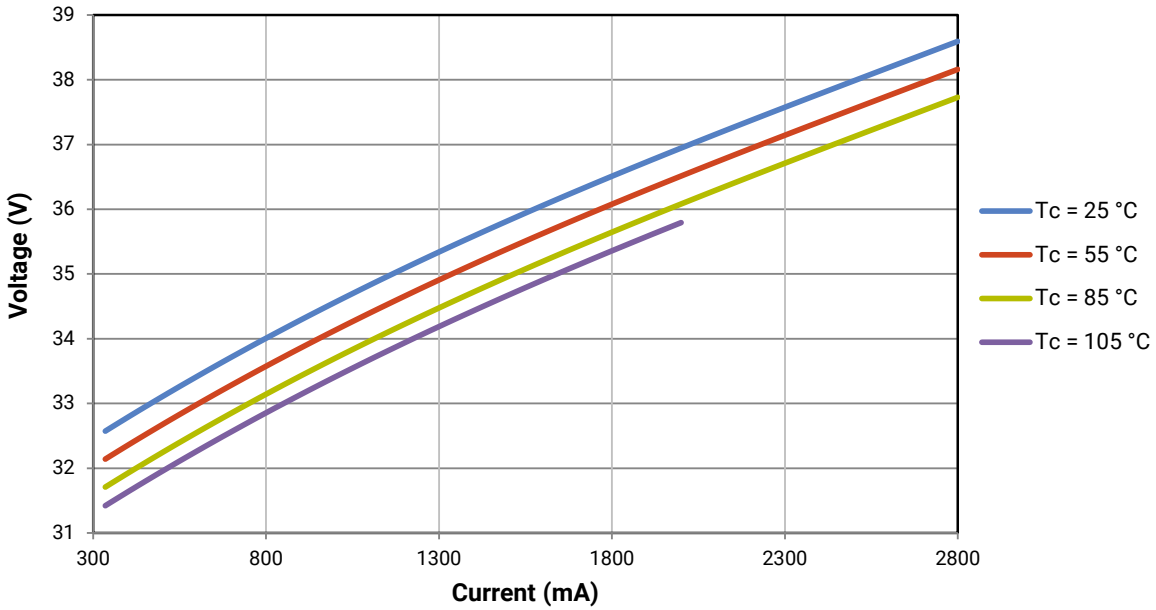
## RELATIVE SPECTRAL POWER DISTRIBUTION

The following graph is the result of a series of pulsed measurements at 1900 mA and $T_J$ = 85 °C.




## ELECTRICAL CHARACTERISTICS

The following graph is the result of a series of steady-state measurements.

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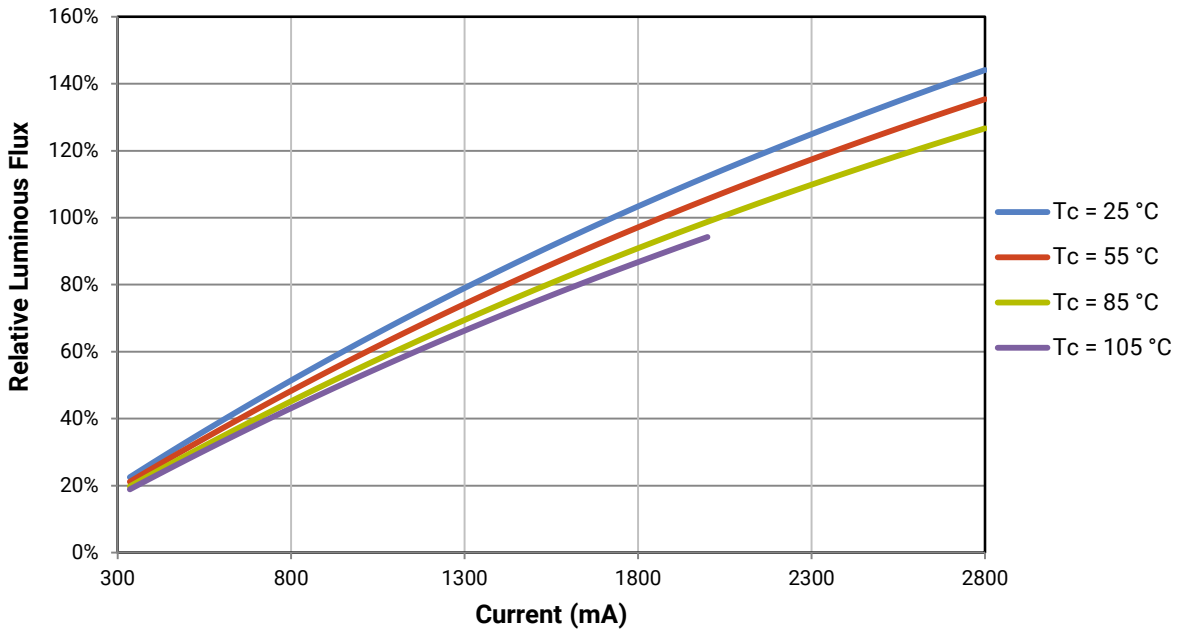
## RELATIVE LUMINOUS FLUX

The relative luminous flux values provided below are the ratio of:

- Measurements of CXB3070 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 1900 mA at $T_J$ = 85 °C.

For example, at steady-state operation of Tc = 25 °C, $I_F$ = 1300 mA, the relative luminous flux ratio is 80% in the chart below. A CXB3070 LED that measures 8500 lm during binning will deliver 6800 lm (8500 * 0.8) at steady-state operation of Tc = 25 °C, $I_F$ = 1300 mA.

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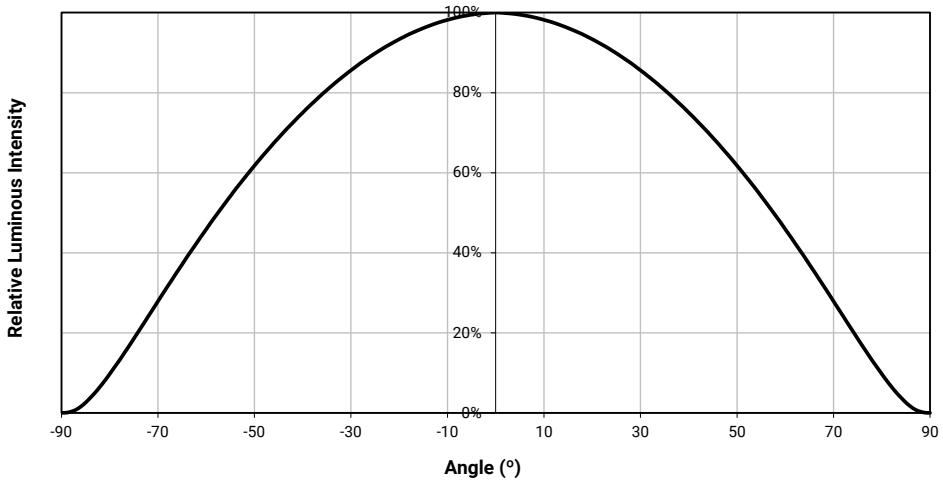
## TYPICAL SPATIAL DISTRIBUTION




## PERFORMANCE GROUPS - BRIGHTNESS ($I_F$ = 1900 mA, $T_J$ = 85 °C)

XLamp CXB3070 LEDs are tested for luminous flux and placed into one of the following bins.

| Group Code | Minimum Luminous Flux | Maximum Luminous Flux |
|---|---|---|
| Y4 | 6910 | 7390 |
| Z2 | 7390 | 7945 |
| Z4 | 7945 | 8500 |
| AB | 8500 | 9000 |
| AD | 9000 | 9500 |
| BB | 9500 | 10,000 |
| BD | 10,000 | 11,000 |
| CB | 11,000 | 12,000 |
| CD | 12,000 | 13,000 |

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## PERFORMANCE GROUPS - CHROMATICITY ($T_J$ = 85 °C)

XLamp CXB3070 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

| EasyWhite Color Temperatures – 2-Step | | | |
|---|---|---|---|
| Code | CCT | x | y |
| 40H | 4000 K | 0.3777 | 0.3739 |
| | | 0.3797 | 0.3816 |
| | | 0.3861 | 0.3855 |
| | | 0.3838 | 0.3777 |
| 35H | 3500 K | 0.4022 | 0.3858 |
| | | 0.4053 | 0.3942 |
| | | 0.4125 | 0.3977 |
| | | 0.4091 | 0.3891 |
| 30H | 3000 K | 0.4287 | 0.3975 |
| | | 0.4328 | 0.4064 |
| | | 0.4390 | 0.4086 |
| | | 0.4347 | 0.3996 |
| 27H | 2700 K | 0.4524 | 0.4048 |
| | | 0.4574 | 0.4140 |
| | | 0.4633 | 0.4154 |
| | | 0.4581 | 0.4062 |

| EasyWhite Color Temperatures – 3-Step Ellipse | | | | | | |
|---|---|---|---|---|---|---|
| Bin Code | CCT | Center Point | | Major Axis | Minor Axis | Rotation Angle (°) |
| | | x | y | a | b | |
| 50G | 5000 K | 0.3447 | 0.3553 | 0.00840 | 0.00312 | 65.0 |
| 40G | 4000 K | 0.3818 | 0.3797 | 0.00939 | 0.00402 | 53.7 |
| 35G | 3500 K | 0.4073 | 0.3917 | 0.00927 | 0.00414 | 54.0 |
| 30G | 3000 K | 0.4338 | 0.4030 | 0.00834 | 0.00408 | 53.2 |
| 27G | 2700 K | 0.4577 | 0.4099 | 0.00834 | 0.00420 | 48.5 |
| 22G | 2200 K | 0.5066 | 0.4158 | 0.00980 | 0.00480 | 45.5 |

| EasyWhite Color Temperatures – 5-Step Ellipse | | | | | | |
|---|---|---|---|---|---|---|
| Bin Code | CCT | Center Point | | Major Axis | Minor Axis | Rotation Angle (°) |
| | | x | y | a | b | |
| 65E | 6500 K | 0.3123 | 0.3282 | 0.01110 | 0.00550 | 61.0 |
| 57E | 5700 K | 0.3287 | 0.3417 | 0.01230 | 0.00600 | 72.0 |
| 50E | 5000 K | 0.3447 | 0.3553 | 0.01400 | 0.00520 | 65.0 |
| 40E | 4000 K | 0.3818 | 0.3797 | 0.01565 | 0.00670 | 53.7 |

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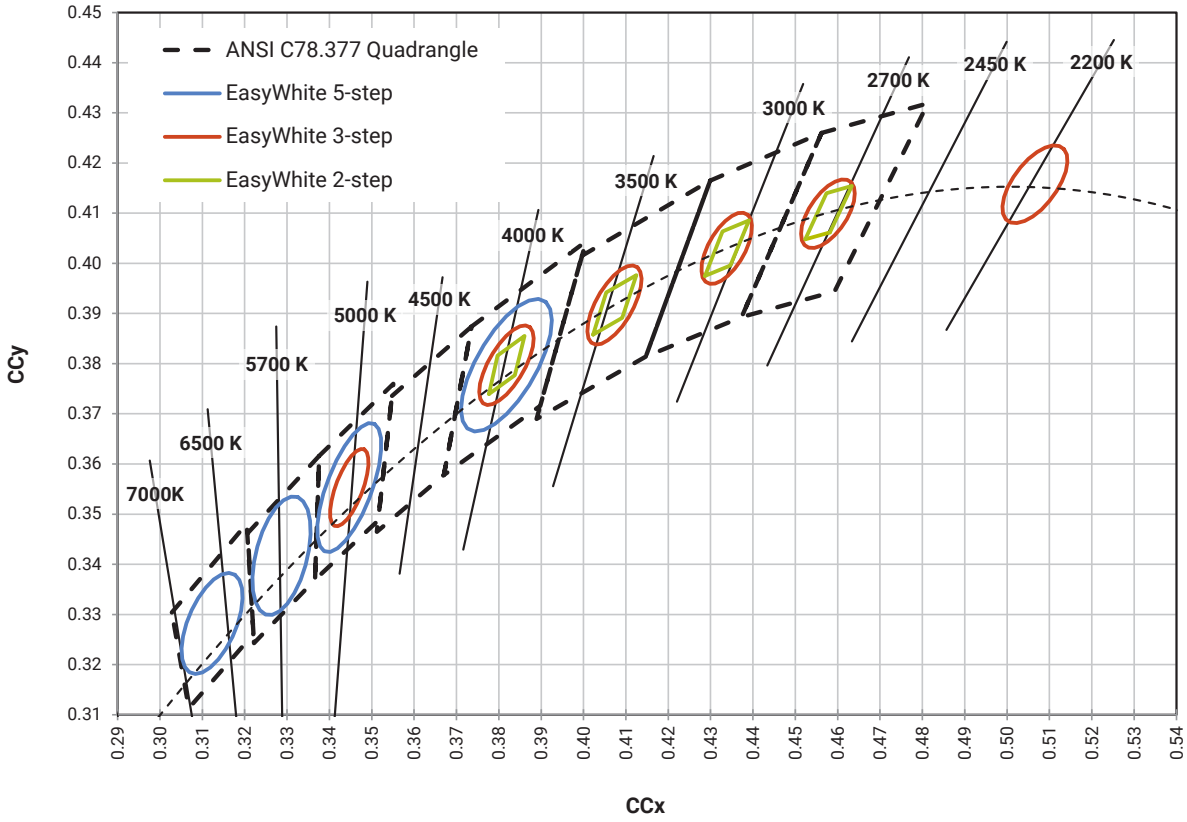
## CREE EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE

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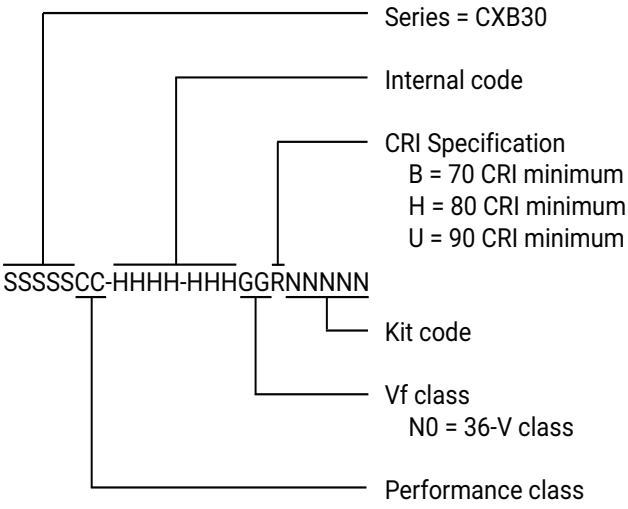
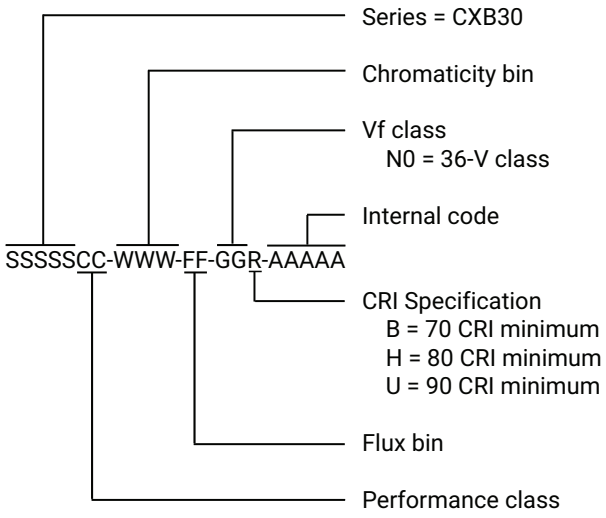
## BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows:

**Order Code**




**Bin Code**




## MECHANICAL DIMENSIONS

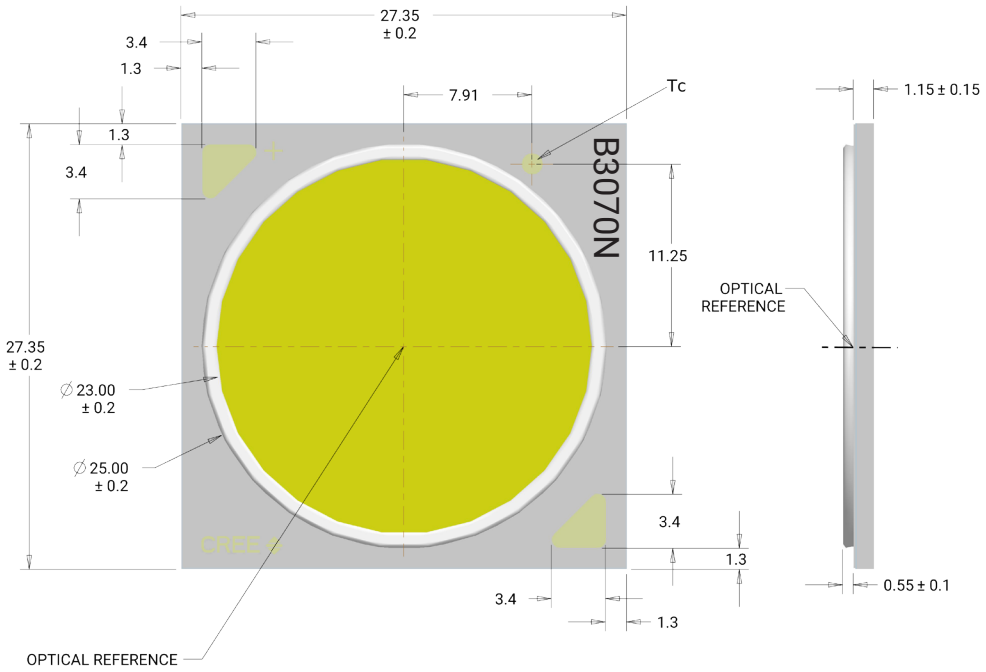
Dimensions are in mm.

Tolerances unless otherwise specified: ±.13

x° ±1°

**Meaning of B3070N**

B3070N = 36-V CXB3070

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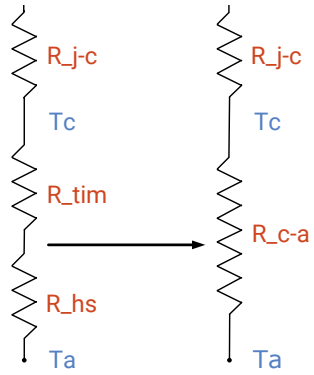
## THERMAL DESIGN

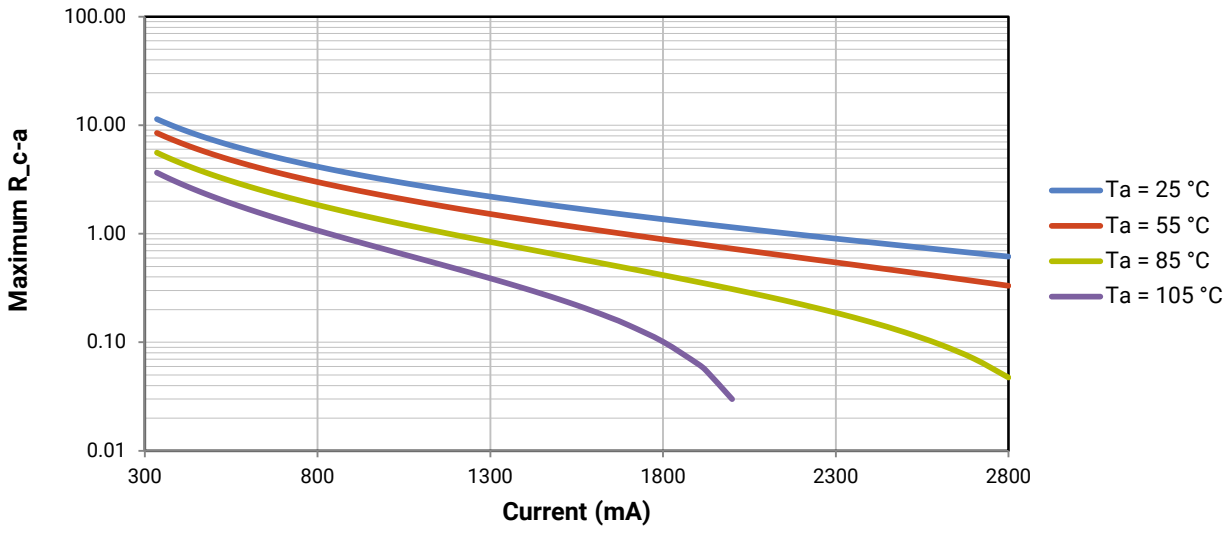
The CXB family of LED arrays can include over a hundred different LED die inside one package, and thus over a hundred different junction temperatures ($T_J$). Cree has intentionally removed junction-temperature-based operating limits and replaced the commonplace maximum $T_J$ calculations with maximum ratings based on forward current ($I_F$) and case temperature (Tc). No additional calculations are required to ensure that the CXB LED is being operated within its designed limits. LES temperature measurement provides additional verification of good thermal design. Please refer to page 2 for the Operating Limit specifications.

There is no need to calculate for $T_J$ inside the package, as the thermal management design process, specifically from $T_{SP}$ to ambient ($T_a$), remains identical to any other LED component. For more information on thermal management of Cree XLamp LEDs, please refer to the Thermal Management application note. For CXB soldering recommendations and more information on thermal interface materials (TIM), LES temperature measurement, and connection methods, please refer to the Cree XLamp CX Family LEDs soldering and handling document. The CX Family LED Design Guide provides basic information on the requirements to use Cree XLamp CXB LEDs successfully in luminaire designs.

To keep the CXB3070 LED at or below the maximum rated Tc, the case to ambient temperature thermal resistance (R_c-a) must be at or below the maximum R_c-a value shown on the following graph, depending on the operating environment. The y-axis in the graph is a base 10 logarithmic scale.

As the figure at right shows, the R_c-a value is the sum of the thermal resistance of the TIM (R_tim) plus the thermal resistance of the heat sink (R_hs).

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## NOTES

### Measurements

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

### Pre-Release Qualification Testing

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

### Lumen Maintenance

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

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

### RoHS Compliance

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

### REACh Compliance

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

### UL® Recognized Component

This product meets the requirements to be considered a UL Recognized Component with Level 4 enclosure consideration. The LED package or a portion thereof has been investigated as a fire and electrical enclosure per ANSI/UL 8750.

### Vision Advisory

WARNING: Do not look at an exposed lamp in operation. Eye injury can result. For more information about LEDs and eye safety, please refer to the LED Eye Safety application note.

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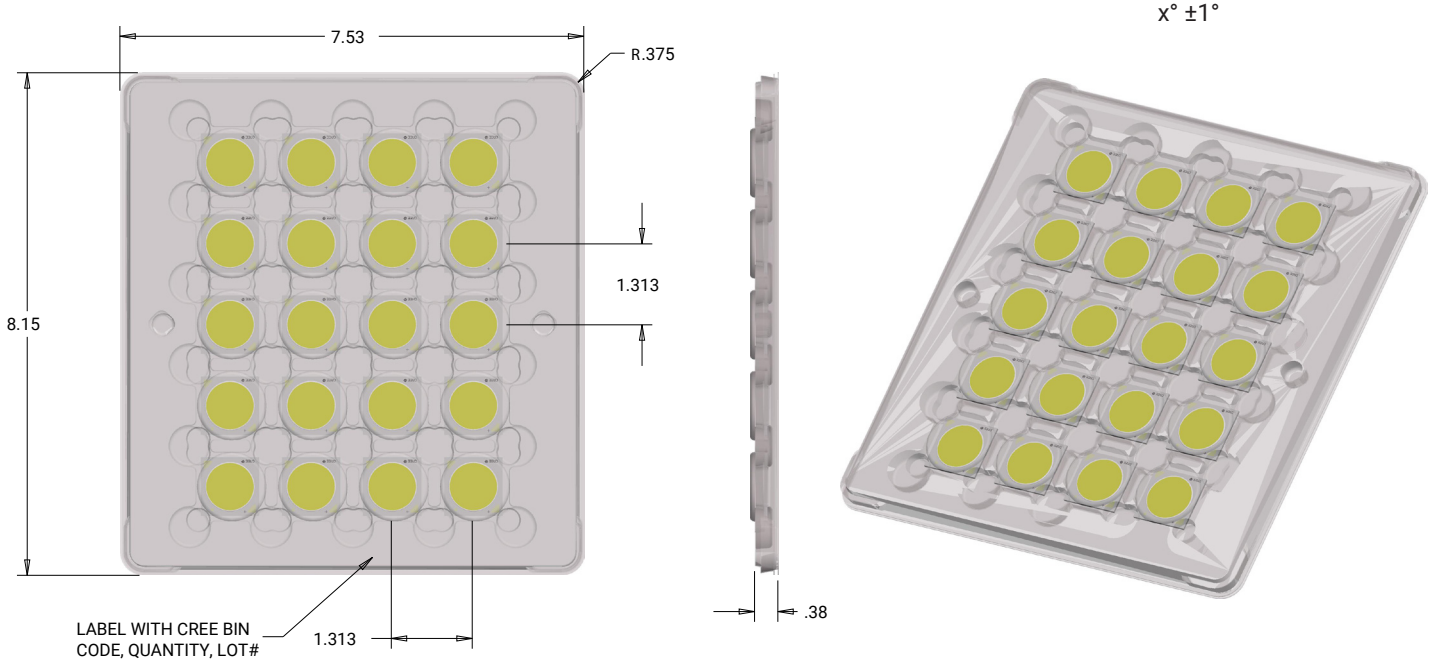
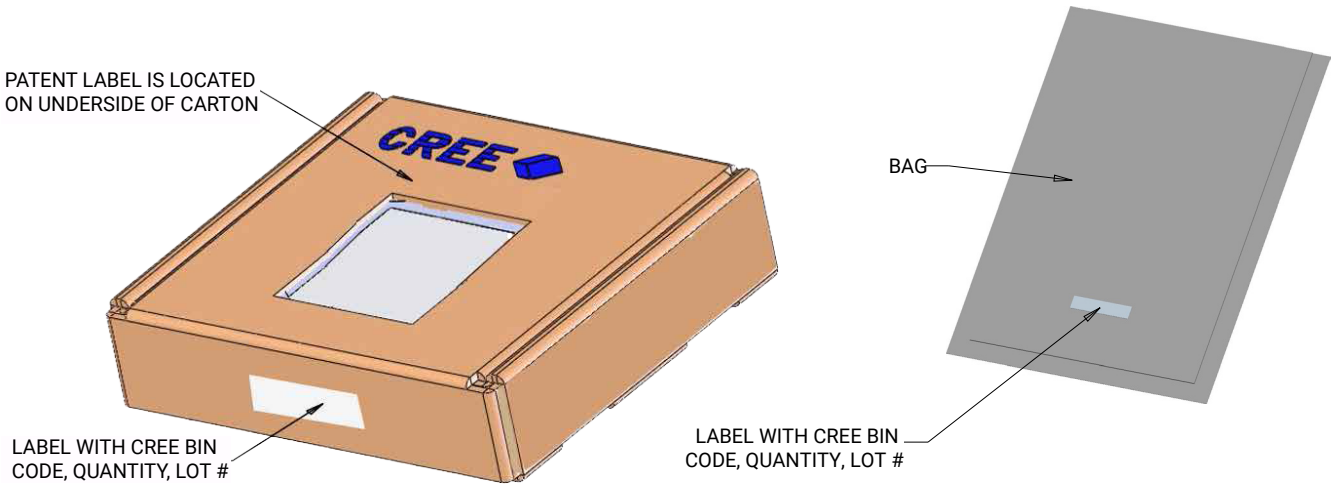
## PACKAGING

Cree CXB3070 LEDs are packaged in trays of 20. Five trays are sealed in an anti-static bag and placed inside a carton, for a total of 100 LEDs per carton. Each carton contains 100 LEDs from the same performance bin.

Dimensions are in inches.
Tolerances: ±.13
x° ±1°

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