

## Cree® XLamp® CXB3050 LED



### PRODUCT DESCRIPTION

XLamp® CXA2 LED Arrays lead the industry in efficacy and reliability for ceramic-based COB LEDs. Cree CXA2 LEDs easily deliver TM-21 lifetimes well beyond L90 60,000 hours under a wide range of operating conditions. CXA2 LED Arrays share the same physical design as XLamp CXA and CMA LED families, allowing lighting manufacturers to leverage the existing optical, mechanical and electrical design elements to accelerate time to market without additional cost.

CXA2 Standard Density LED Arrays are now available in two different versions: Standard and eTone™ LEDs. The eTone version delivers beautiful 90 CRI light quality at the same efficacy as today's standard 80 CRI LEDs.

### FEATURES

- 23-mm optical source
- Mechanical and optical design consistent with other CXA30 and CXB30 LEDs
- Cree EasyWhite® 2-, 3- and 5-step binning
- Standard LEDs available in 70, 80 and 90 CRI minimum options
- eTone™ LEDs available in 90 CRI minimum option
- 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

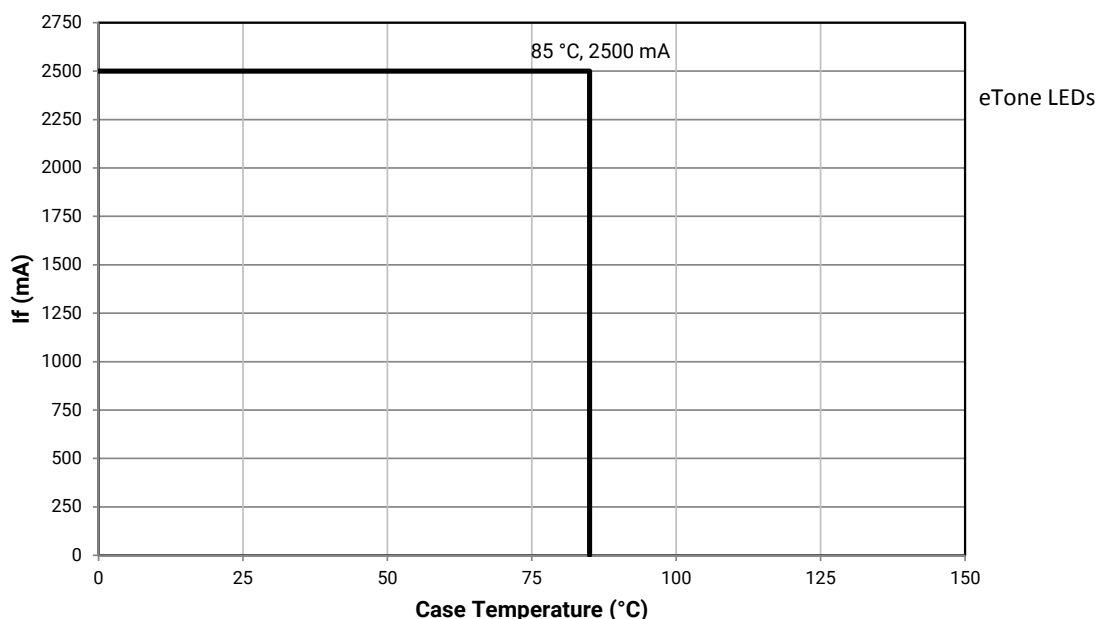
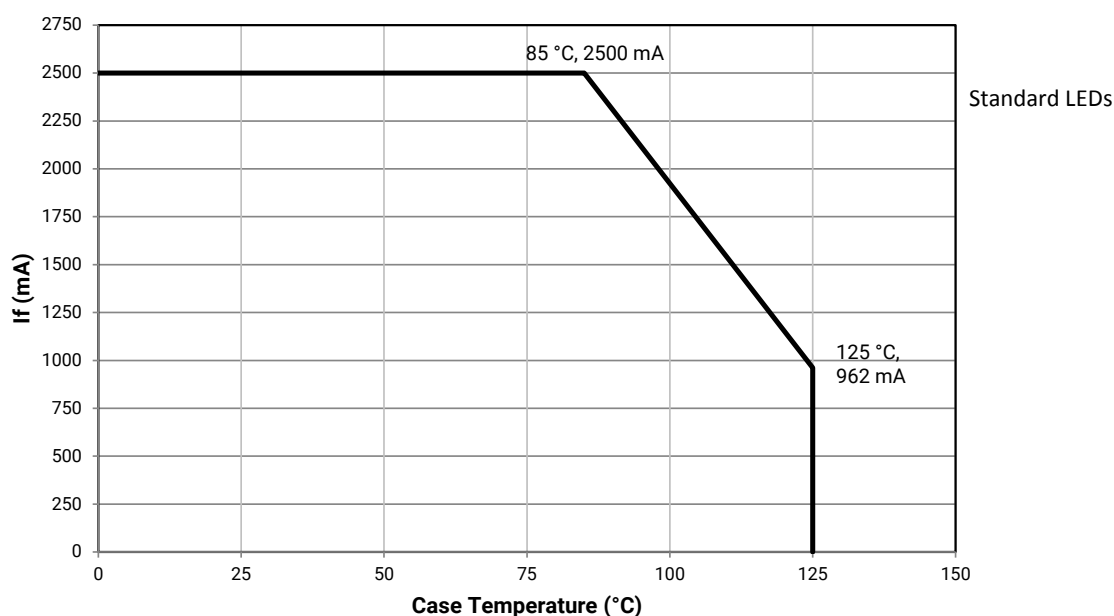
Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current - Standard	mA			2500*
DC forward current - eTone	mA			2500*
Reverse current	mA			0.1
Forward voltage (@ 1400 mA, T <sub>j</sub> = 85 °C)	V		34.8	38

\* Refer to the Operating Limits section.

## OPERATING LIMITS

The maximum current rating of the CXB3050 depends on the case temperature ( $T_c$ ) 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 14 for the location of the  $T_c$  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 15 for more information on LES temperature measurement.



## FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS ( $I_F = 1400 \text{ mA}$ , $T_J = 85^\circ\text{C}$ )

The following table provides order codes for XLamp CXB3050 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 14).

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	---	Y4	6910	7648					65E	CXB3050-0000-000N0BY465E
			Z2	7390	8179						CXB3050-0000-000N0BZ265E
			Z4	7945	8793						CXB3050-0000-000N0BZ465E
	80	---	Y2	6430	7116					65E	CXB3050-0000-000N0HY265E
			Y4	6910	7648						CXB3050-0000-000N0HY465E
			Z2	7390	8179						CXB3050-0000-000N0HZ265E
5700 K	70	---	Y4	6910	7648					57E	CXB3050-0000-000N0BY457E
			Z2	7390	8179						CXB3050-0000-000N0BZ257E
			Z4	7945	8793						CXB3050-0000-000N0BZ457E
	80	---	Y2	6430	7116					57E	CXB3050-0000-000N0HY257E
			Y4	6910	7648						CXB3050-0000-000N0HY457E
			Z2	7390	8179						CXB3050-0000-000N0HZ257E

### Notes

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 16).
- Cree XLamp CXB3050 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  $\pm 2$  tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.
- \*\* Flux values @ 25 °C are calculated and for reference only.

# FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS (I<sub>F</sub> = 1400 mA, T<sub>J</sub> = 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
5000 K	70	---	Y4	6910	7648					50E	CXB3050-0000-000N0BY450E
			Z2	7390	8179						CXB3050-0000-000N0BZ250E
			Z4	7945	8793						CXB3050-0000-000N0BZ450E
	80	---	Y2	6430	7116			50G	CXB3050-0000-000N0HY250G	50E	CXB3050-0000-000N0HY250E
			Y4	6910	7648				CXB3050-0000-000N0HY450G		CXB3050-0000-000N0HY450E
			Z2	7390	8179				CXB3050-0000-000N0HZ250G		
	90	92	X4	6010	6652			50G	CXB3050-0000-000N0UX450G		
			Y2	6430	7116				CXB3050-0000-000N0UY250G		
			Y4	6910	7648				CXB3050-0000-000N0UY450G		
4000 K	70	---	Y4	6910	7648					40E	CXB3050-0000-000N0BY440E
			Z2	7390	8179						CXB3050-0000-000N0BZ240E
			Z4	7945	8793						CXB3050-0000-000N0BZ440E
	80	---	Y2	6430	7116	40H	CXB3050-0000-000N0HY240H	40G	CXB3050-0000-000N0HY240G		
			Y4	6910	7648		CXB3050-0000-000N0HY440H		CXB3050-0000-000N0HY440G		
			Z2	7390	8179		CXB3050-0000-000N0HZ240H		CXB3050-0000-000N0HZ240G		
	90	92	X2	5590	6187	40H	CXB3050-0000-000N0UX240H	40G	CXB3050-0000-000N0UX240G		
			X4	6010	6652		CXB3050-0000-000N0UX440H		CXB3050-0000-000N0UX440G		
			Y2	6430	7116		CXB3050-0000-000N0UY240H		CXB3050-0000-000N0UY240G		

## 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 16).
- Cree XLamp CXB3050 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.

# FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS (I<sub>F</sub> = 1400 mA, T<sub>J</sub> = 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
3500 K	80	—	Y2	6430	7116	35H	CXB3050-0000-000N0HY235H	35G	CXB3050-0000-000N0HY235G		
			Y4	6910	7648		CXB3050-0000-000N0HY435H		CXB3050-0000-000N0HY435G		
	90	92	X2	5590	6187	35H	CXB3050-0000-000N0UX235H	35G	CXB3050-0000-000N0UX235G		
			X4	6010	6652		CXB3050-0000-000N0UX435H		CXB3050-0000-000N0UX435G		
			Y2	6430	7116		CXB3050-0000-000N0UY235H		CXB3050-0000-000N0UY235G		
	3000 K	80	—	X4	6010	6652	30H	CXB3050-0000-000N0HX430H	30G	CXB3050-0000-000N0HX430G	
Y2				6430	7116	CXB3050-0000-000N0HY230H		CXB3050-0000-000N0HY230G			
Y4				6910	7648	CXB3050-0000-000N0HY430H		CXB3050-0000-000N0HY430G			
90		92	W4	5225	5783	30H	CXB3050-0000-000N0UW430H	30G	CXB3050-0000-000N0UW430G		
			X2	5590	6187		CXB3050-0000-000N0UX230H		CXB3050-0000-000N0UX230G		
			X4	6010	6652		CXB3050-0000-000N0UX430H		CXB3050-0000-000N0UX430G		
2700 K	80	—	X4	6010	6652	27H	CXB3050-0000-000N0HX427H	27G	CXB3050-0000-000N0HX427G		
			Y2	6430	7116		CXB3050-0000-000N0HY227H		CXB3050-0000-000N0HY227G		
	90	92	W2	4860	5379	27H	CXB3050-0000-000N0UW227H	27G	CXB3050-0000-000N0UW227G		
			W4	5225	5783		CXB3050-0000-000N0UW427H		CXB3050-0000-000N0UW427G		
			X2	5590	6187		CXB3050-0000-000N0UX227H		CXB3050-0000-000N0UX227G		
	2200 K	80	—	X2	5590	6187			22G	CXB3050-0000-000N0HX222G	

## 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 16).
- Cree XLamp CXB3050 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.

# FLUX CHARACTERISTICS, ORDER CODES & BINS - ETONE™ LEDS ( $I_F = 1400\text{ mA}$ , $T_J = 85\text{ °C}$ )

Nominal CCT	CRI*		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step		3-Step	
	Min.	Typ			Group	Order Code	Group	Order Code
4000 K	90	92	5916	6959	40H	CXB3050-0000-00PN0U0A40H	40G	CXB3050-0000-00PN0U0A40G
3500 K	90	92	5980	6842	35H	CXB3050-0000-00PN0U0A35H	35G	CXB3050-0000-00PN0U0A35G
3000 K	90	92	5710	6773	30H	CXB3050-0000-00PN0U0A30H	30G	CXB3050-0000-00PN0U0A30G
2700 K	90	92	5710	6502	27H	CXB3050-0000-00PN0U0A27H	27G	CXB3050-0000-00PN0U0A27G

## Specialty

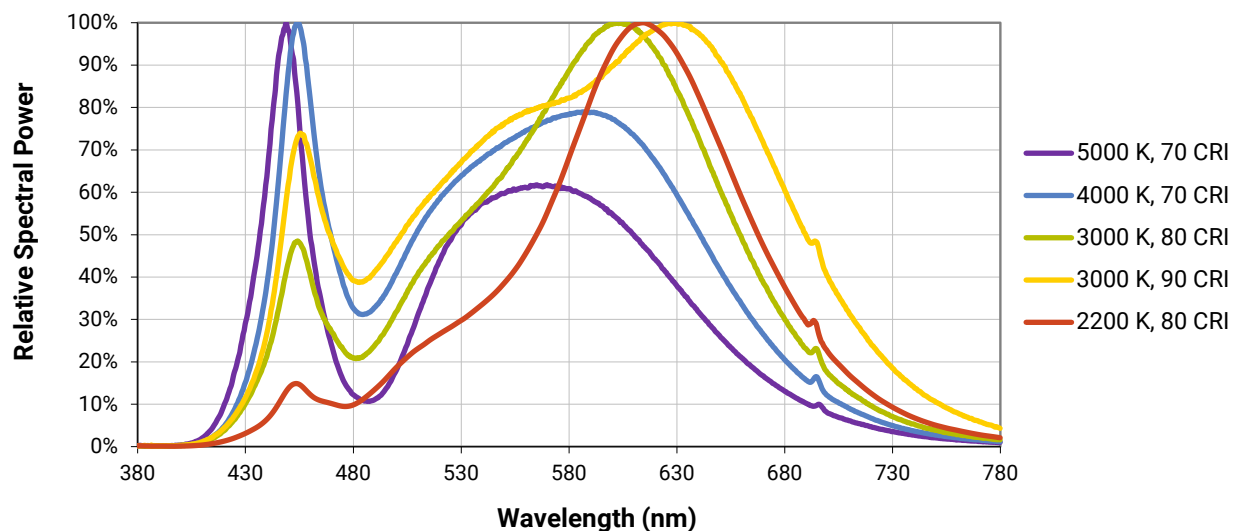
Nominal CCT	CRI		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	3-Step			
	Min.	Typ			Group	Order Code	Group	Order Code
3100 K	90	92	5649	6701	31Q	CXB3050-0000-00PN0U0A31Q		
3000 K	90	92	5710	6773	30Q	CXB3050-0000-00PN0U0A30Q	30U	CXB3050-0000-00PN0U0A30U

## Notes

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 16).
- Cree XLamp CXB3050 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  $\pm 2$  tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

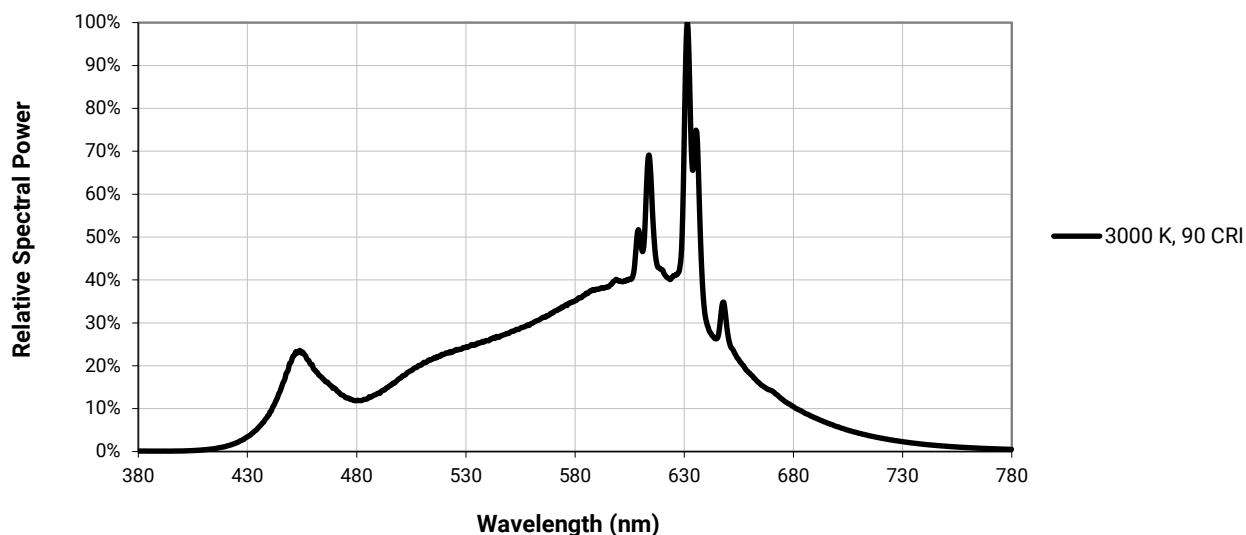
## RELATIVE SPECTRAL POWER DISTRIBUTION- STANDARD LEDS

The following graph is the result of a series of pulsed measurements at 1400 mA and  $T_j = 85^\circ\text{C}$ .



## RELATIVE SPECTRAL POWER DISTRIBUTION - ETONE™ LEDS

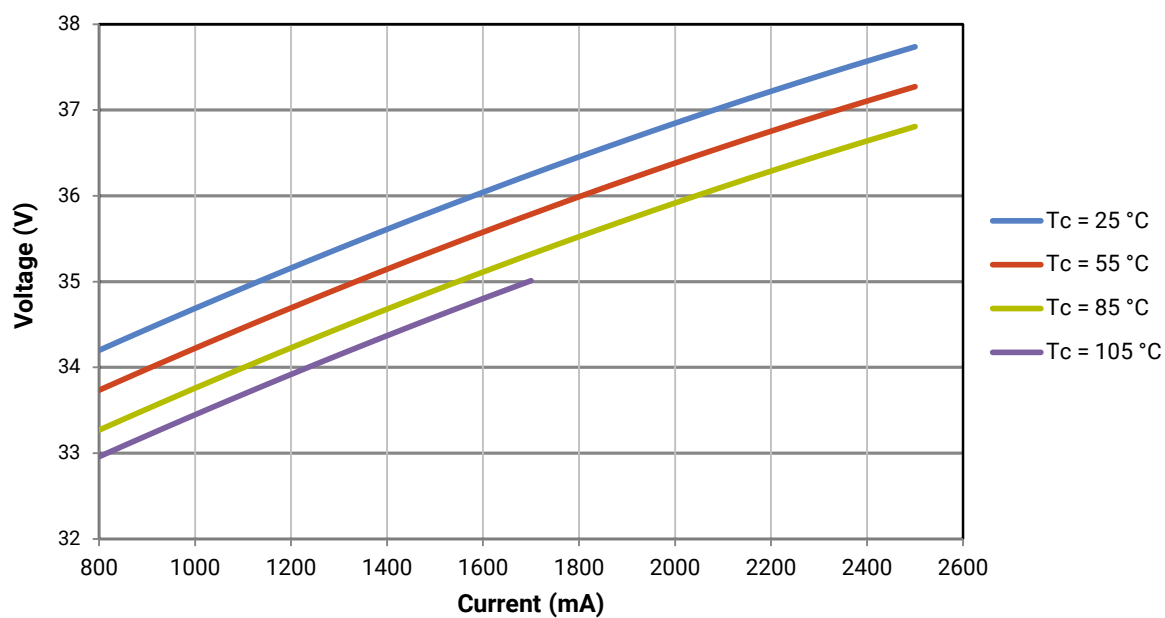
The following graph is the result of a series of pulsed measurements at 1400 mA and  $T_j = 85^\circ\text{C}$ .





## ELECTRICAL CHARACTERISTICS

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

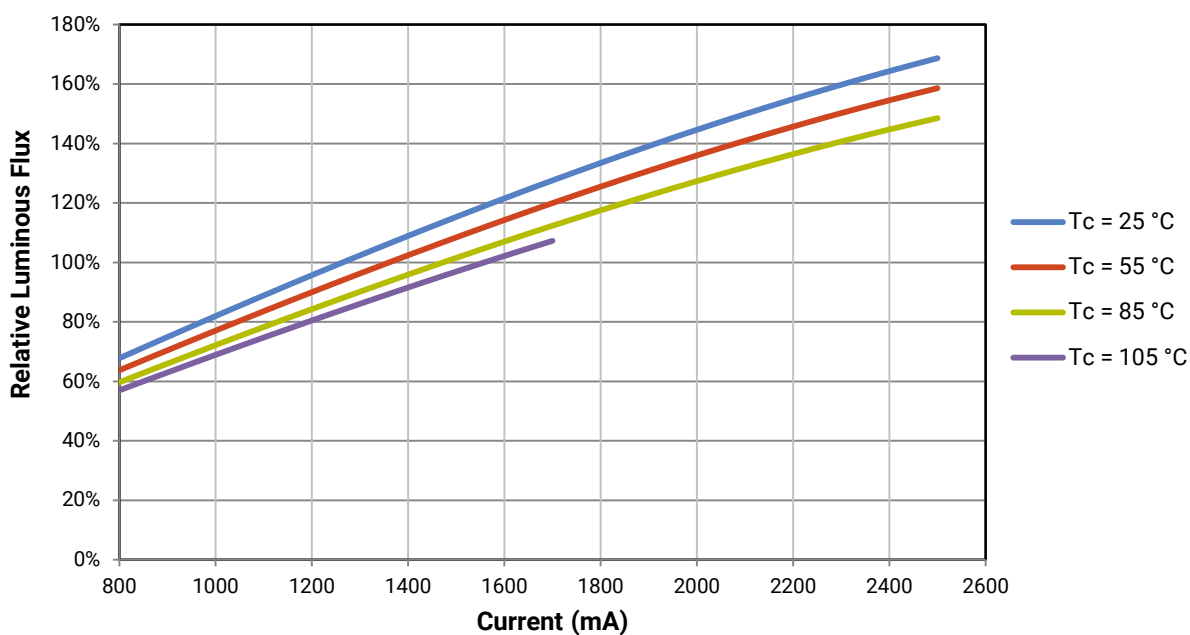


## RELATIVE LUMINOUS FLUX

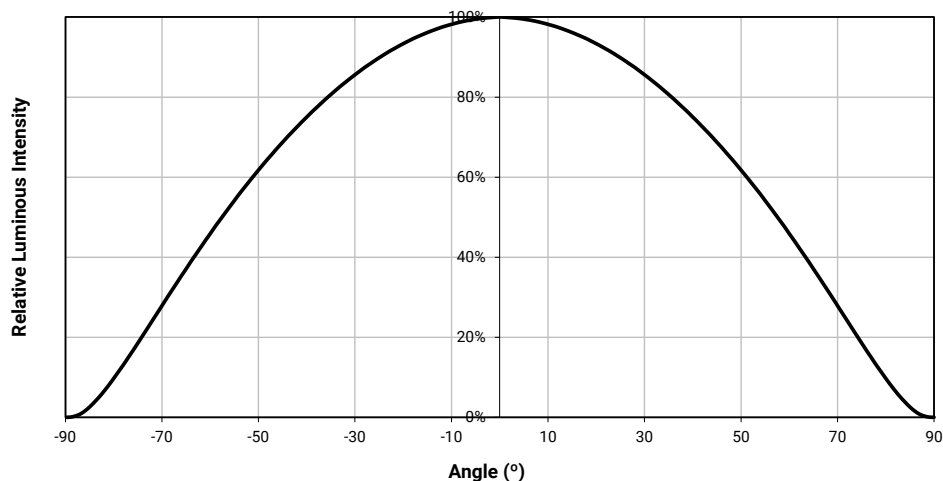
The relative luminous flux values provided below are the ratio of:

- Measurements of CXB3050 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 1400 mA at  $T_j = 85^\circ\text{C}$ .

For example, at steady-state operation of  $T_c = 25^\circ\text{C}$ ,  $I_F = 1600\text{ mA}$ , the relative luminous flux ratio is 120% in the chart below. A CXB3050 LED that measures 6010 lm during binning will deliver 7212 lm ( $6010 \times 1.2$ ) at steady-state operation of  $T_c = 25^\circ\text{C}$ ,  $I_F = 1600\text{ mA}$ .



## TYPICAL SPATIAL DISTRIBUTION



## PERFORMANCE GROUPS - BRIGHTNESS ( $I_F = 1400 \text{ mA}$ , $T_J = 85^\circ\text{C}$ )

XLamp CXB3050 LEDs are tested for luminous flux and placed into one of the following bins.

Group Code	Minimum Luminous Flux	Maximum Luminous Flux
W2	4860	5225
W4	5225	5590
X2	5590	6010
X4	6010	6430
Y2	6430	6910
Y4	6910	7390
Z2	7390	7945
Z4	7945	8500
AB	8500	9000

## PERFORMANCE GROUPS - CHROMATICITY ( $T_j = 85\text{ }^{\circ}\text{C}$ )

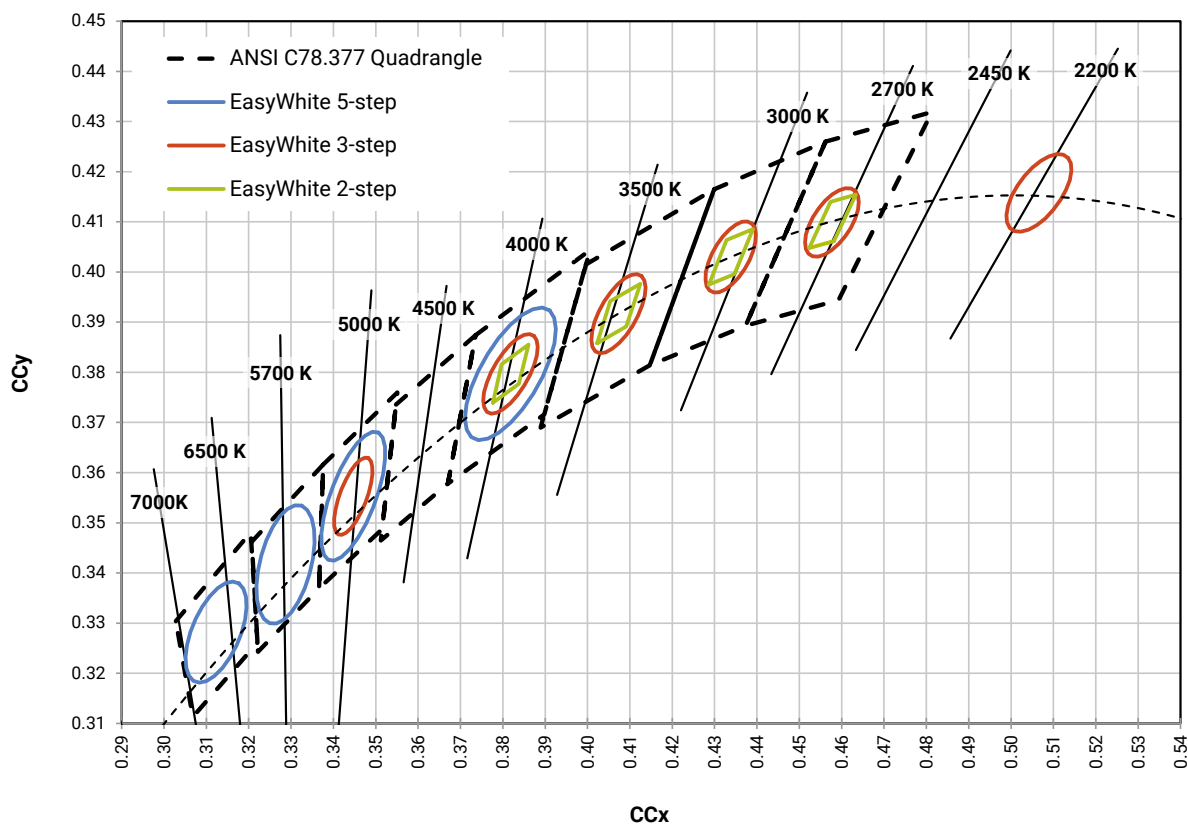
XLamp CXB3050 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

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

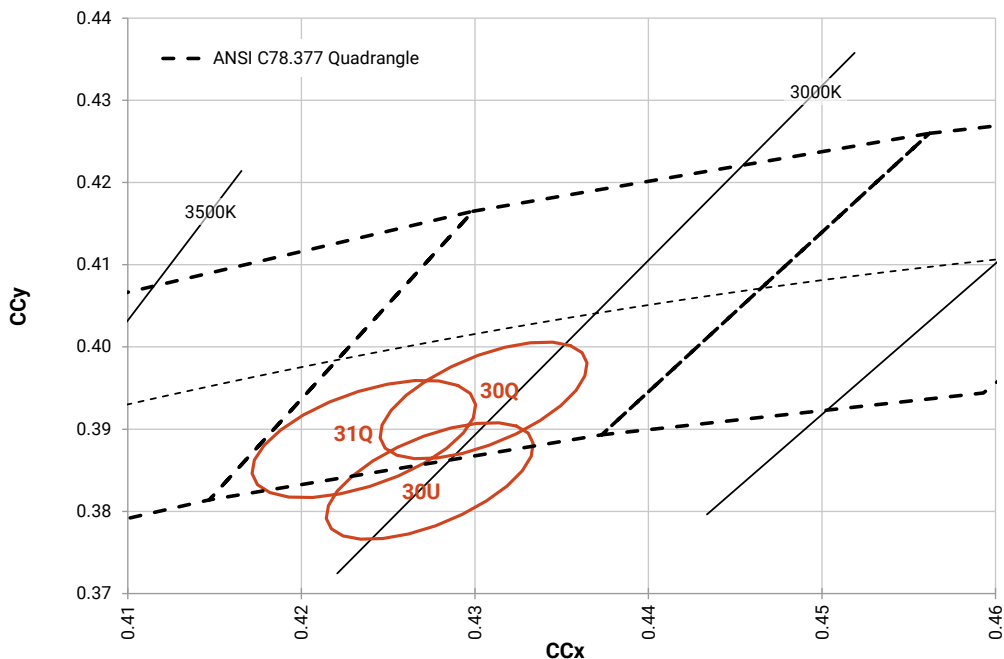
EasyWhite Color Temperatures – 3-Step Ellipse						
Bin Code	CCT	Center Point		Major Axis	Minor Axis	Rotation Angle (°)
		x	y	a	b	
50G	5000 K	0.3447	0.3553	0.00840	0.00312	65.0
40G	4000 K	0.3818	0.3797	0.00939	0.00402	53.7
35G	3500 K	0.4073	0.3917	0.00927	0.00414	54.0
30G	3000 K	0.4338	0.4030	0.00834	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

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



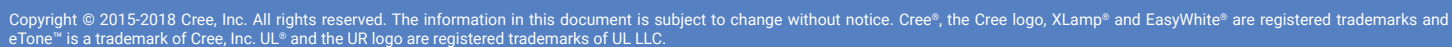
**Speciality (3-step)**



Bin codes and order codes are configured as follows:

 $x^\circ \pm 1^\circ$ 

B3050Ne = 36-V CXB3050 eTone



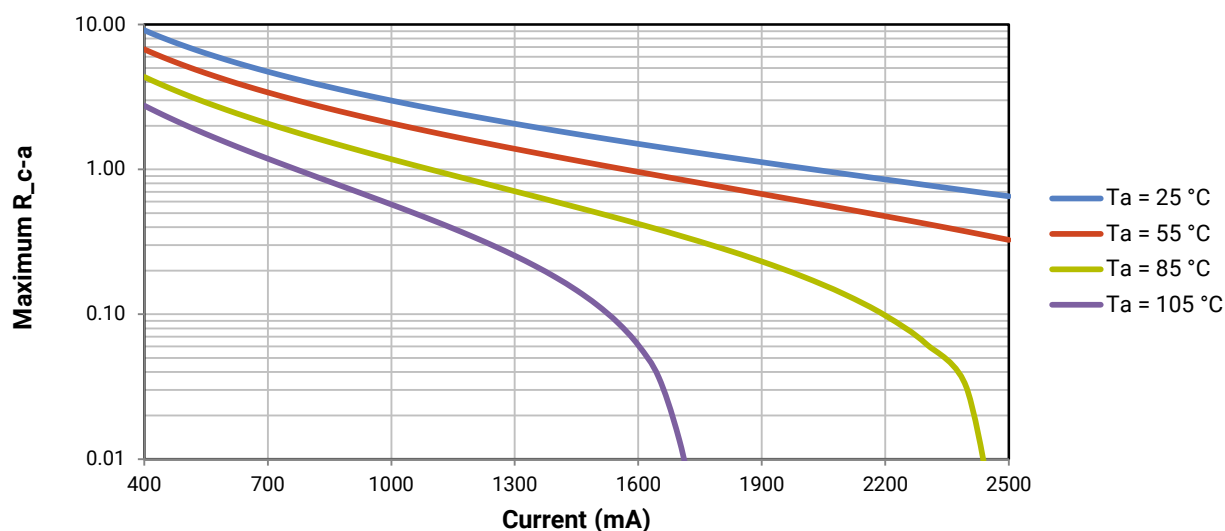
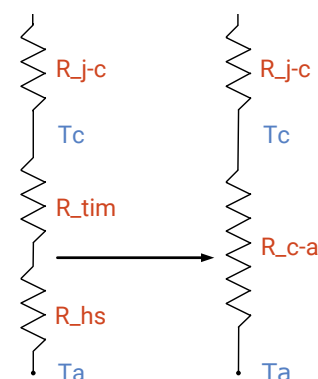
## THERMAL DESIGN

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 ( $T_c$ ). 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 3 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 CXB3050 LED at or below the maximum rated  $T_c$ , 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 ( $R_{hs}$ ).



## NOTES

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### Measurements

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

### Pre-Release Qualification Testing

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

### 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](#).



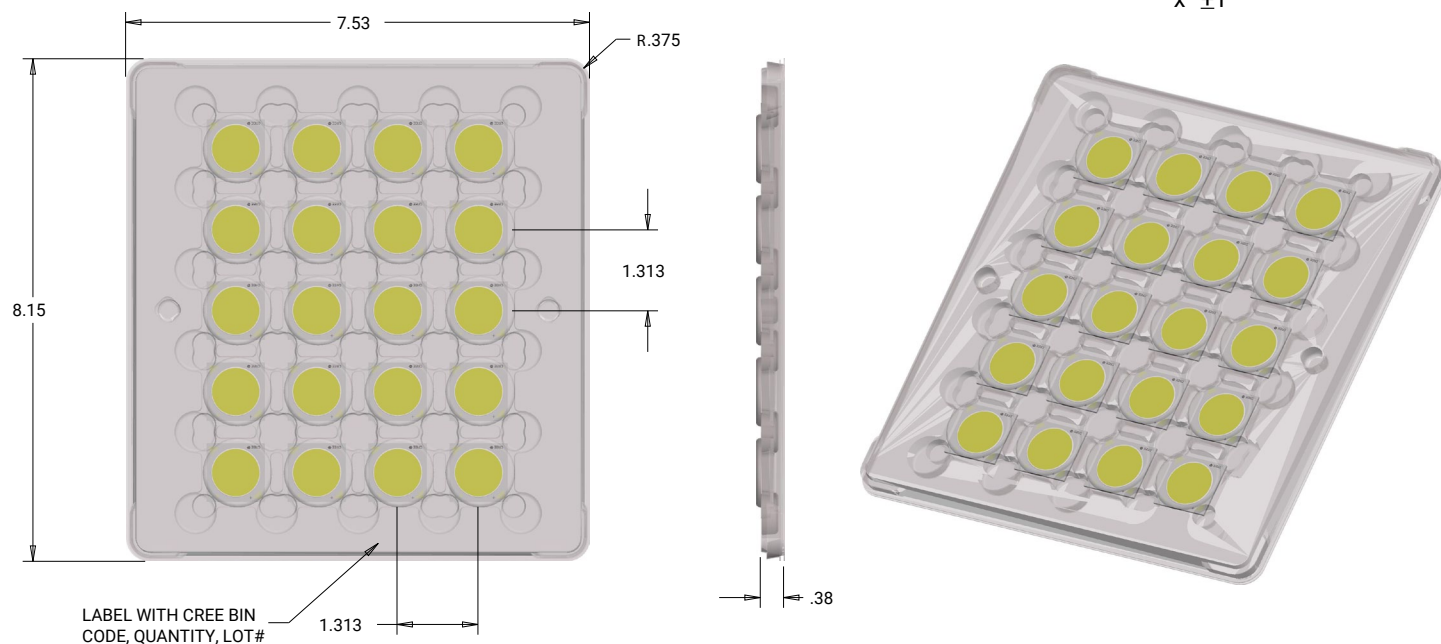
## PACKAGING

Cree CXB3050 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:  $\pm .13$

$x^{\circ} \pm 1^{\circ}$



PATENT LABEL IS LOCATED ON UNDERSIDE OF CARTON

LABEL WITH CREE BIN CODE, QUANTITY, LOT #

BAG

LABEL WITH CREE BIN CODE, QUANTITY, LOT #