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)

TABLE OF CONTENTS

Characteristics 2
Operating Limits 2
Flux Characteristics, EasyWhite® Order Codes and Bins 3
Relative Spectral Power Distribution 6
Electrical Characteristics 6
Relative Luminous Flux 7
Typical Spatial Distribution 8
Performance Groups - Brightness 8
Performance Groups - Chromaticity 9
Cree EasyWhite® Bins Plotted on the 1931 CIE Color Space 10
Bin and Order Code Formats 11
Mechanical Dimensions 11
Thermal Design 12
Notes 13
Packaging 14

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Cree, Inc.
4600 Silicon Drive
Durham, NC 27703
USA Tel: +1.919.313.5300

CHARACTERISTICS

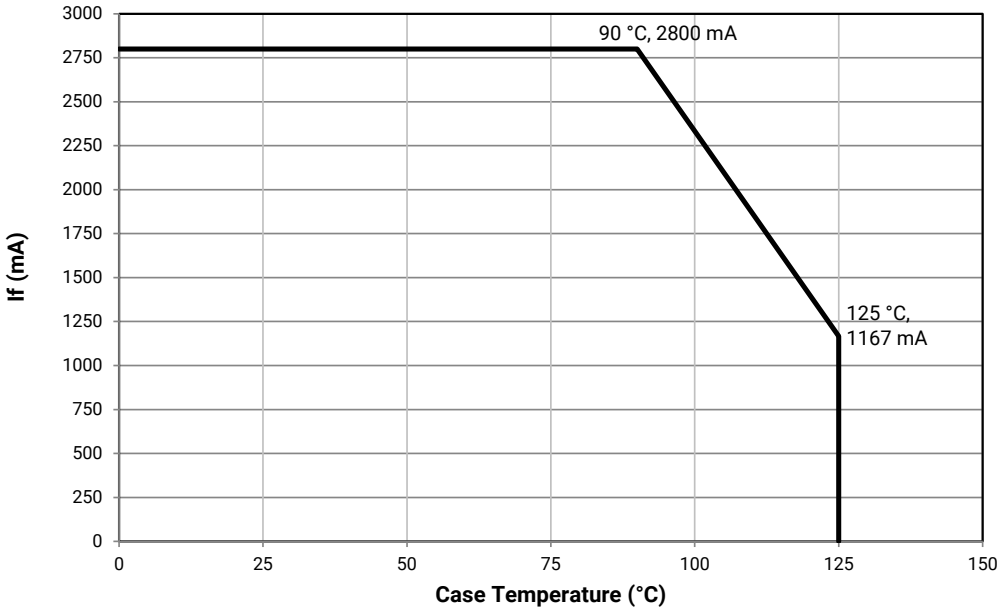
Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			2800*
Reverse current	mA			0.1
Forward voltage (@ 1900 mA, T_j = 85 °C)	V		36	39

* 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.

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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.

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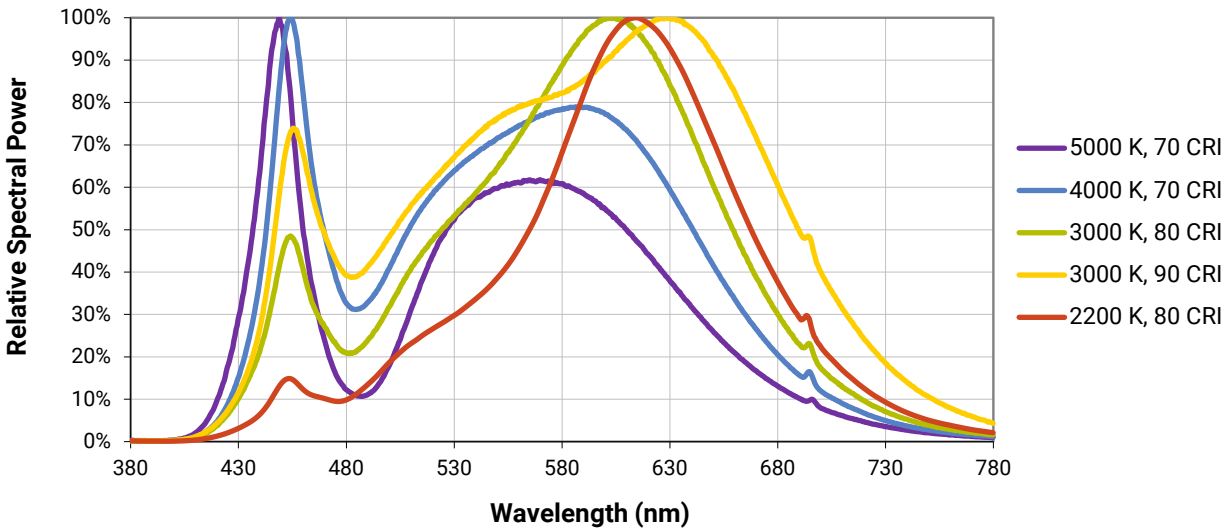
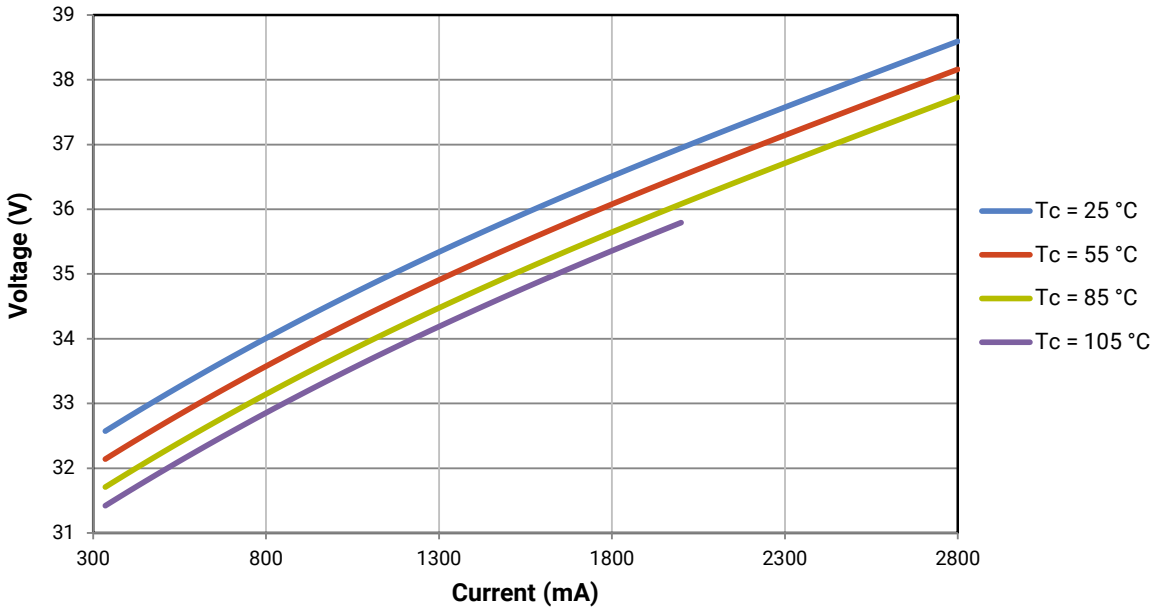
RELATIVE SPECTRAL POWER DISTRIBUTION

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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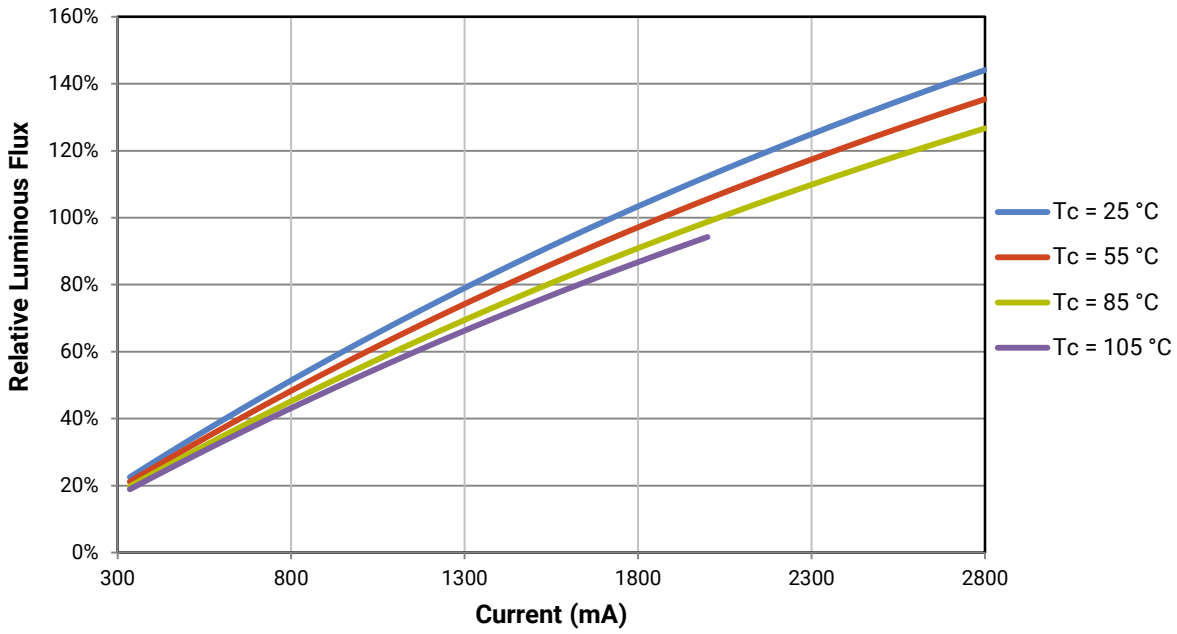
RELATIVE LUMINOUS FLUX

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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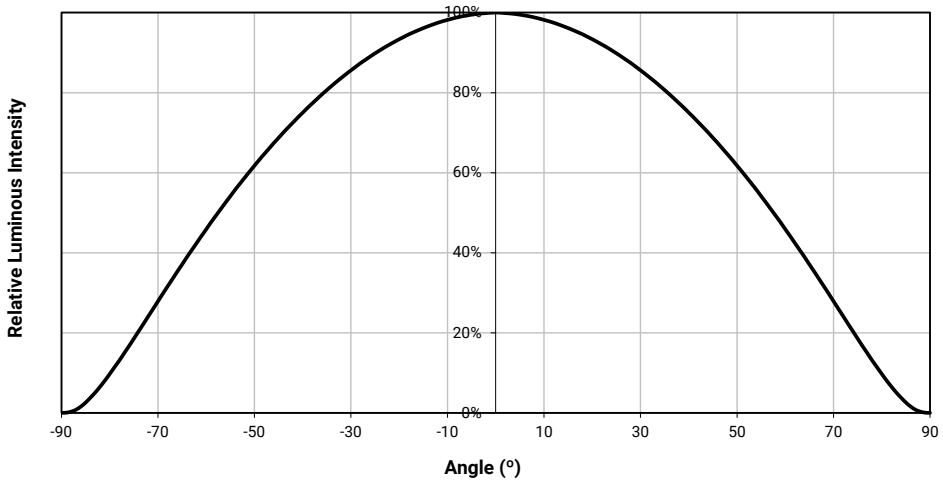
TYPICAL SPATIAL DISTRIBUTION



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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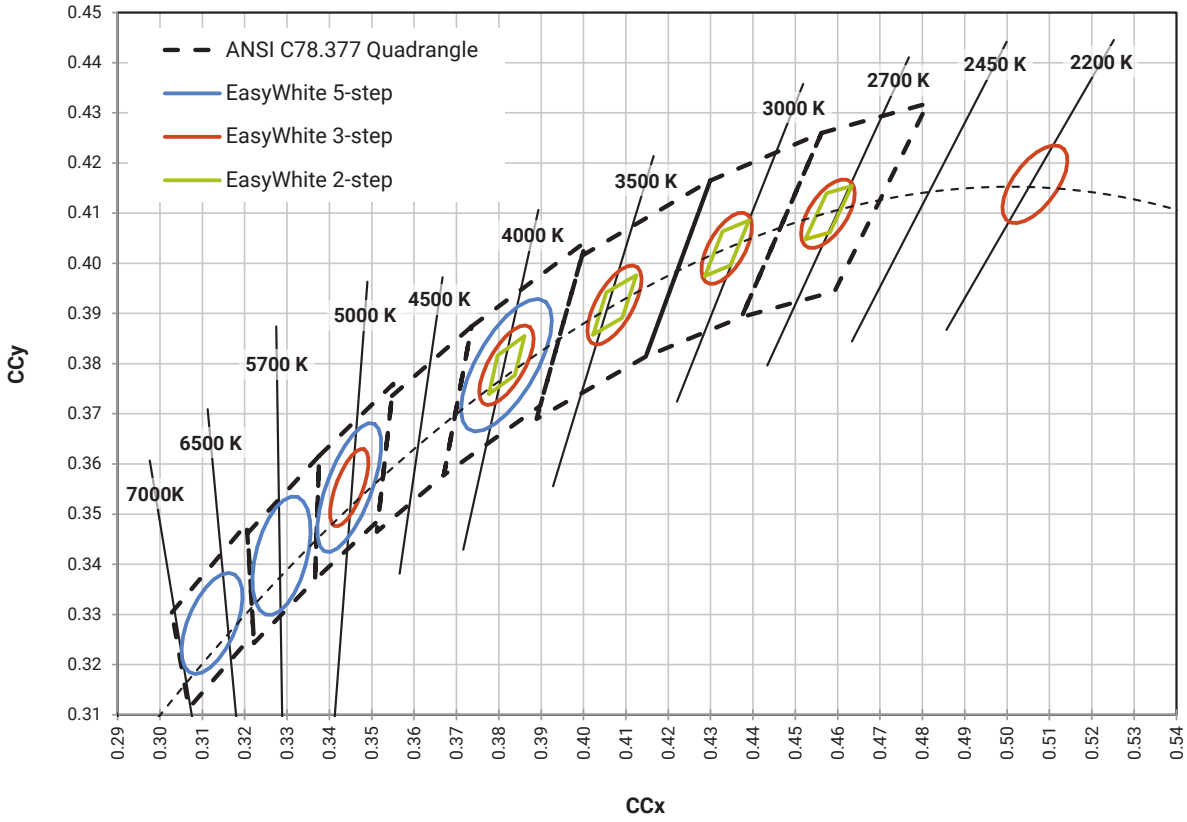
CREE EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE



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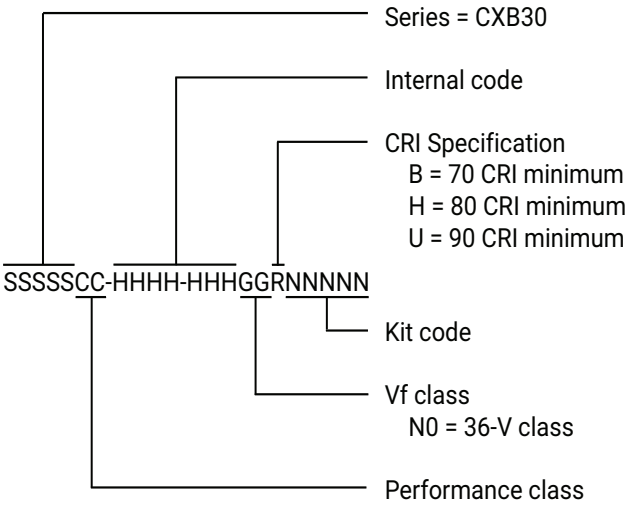
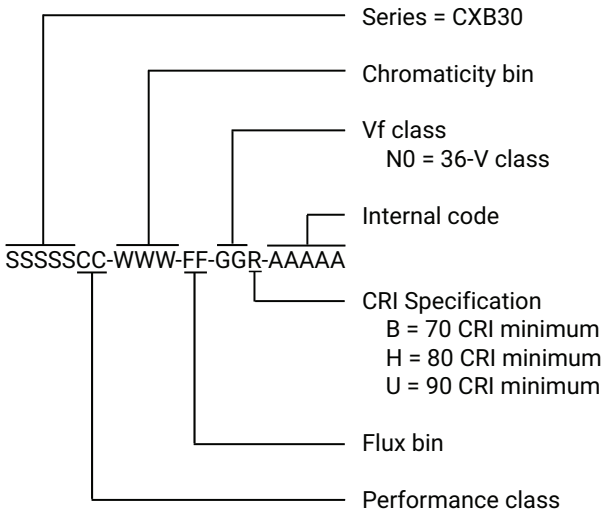
BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows:

Order Code



Bin Code



MECHANICAL DIMENSIONS

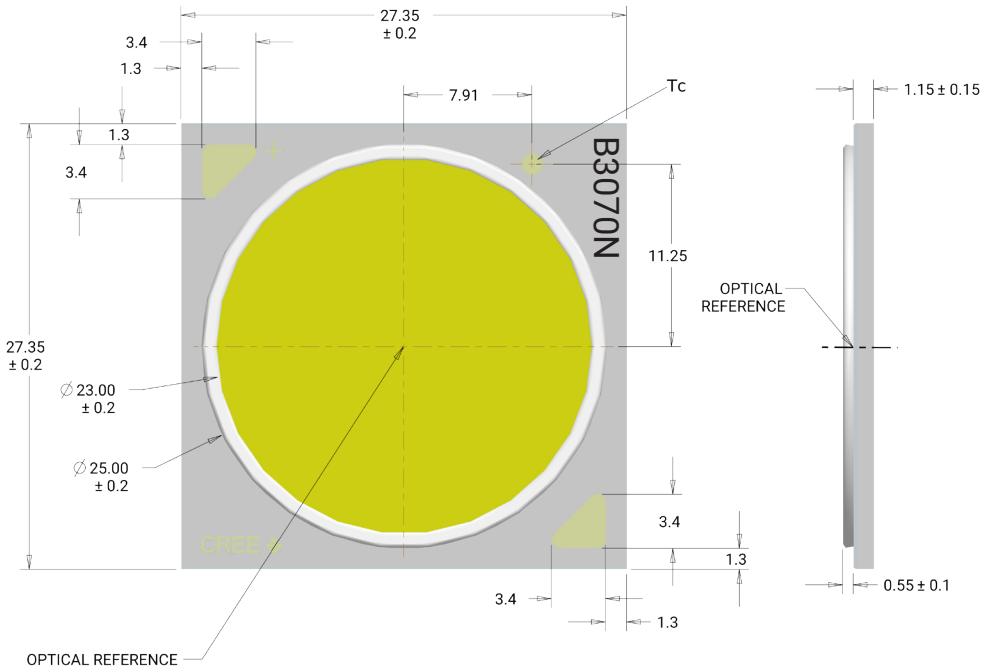
Dimensions are in mm.

Tolerances unless otherwise specified: ±.13

x° ±1°

Meaning of B3070N

B3070N = 36-V CXB3070



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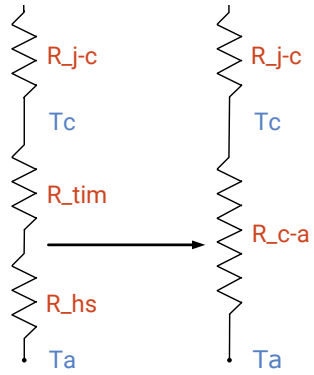
THERMAL DESIGN

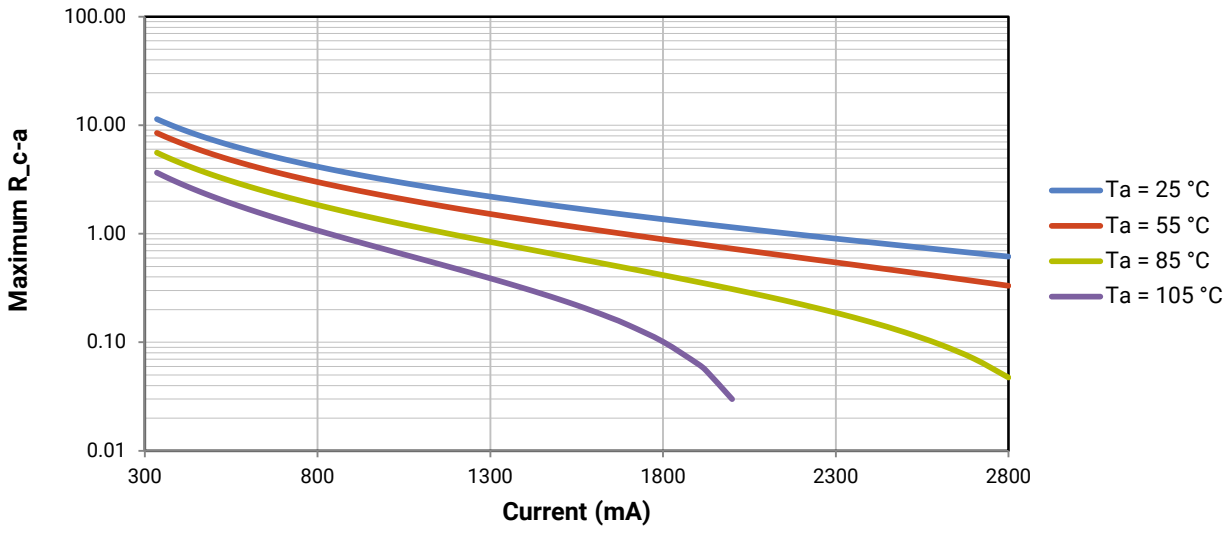
The CXB family of LED arrays can include over a hundred different LED die inside one package, and thus over a hundred different junction temperatures (T_J). Cree has intentionally removed junction-temperature-based operating limits and replaced the commonplace maximum T_J calculations with maximum ratings 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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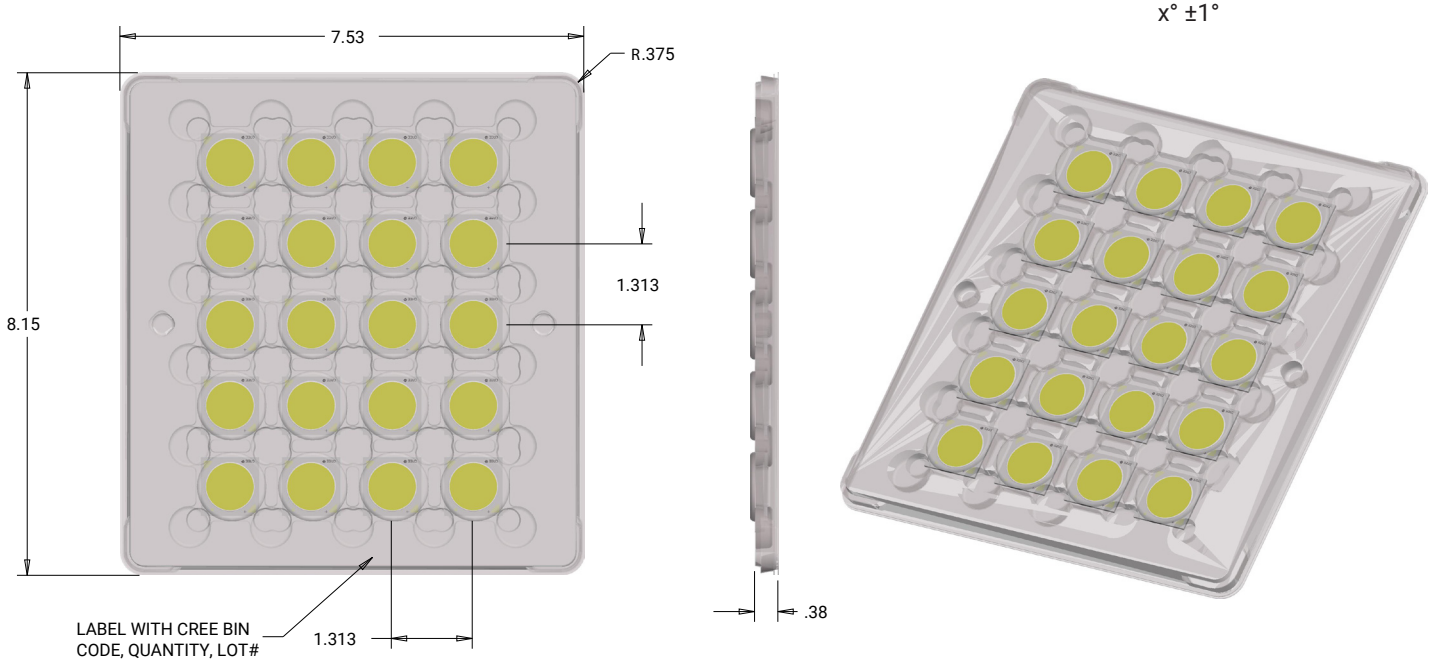
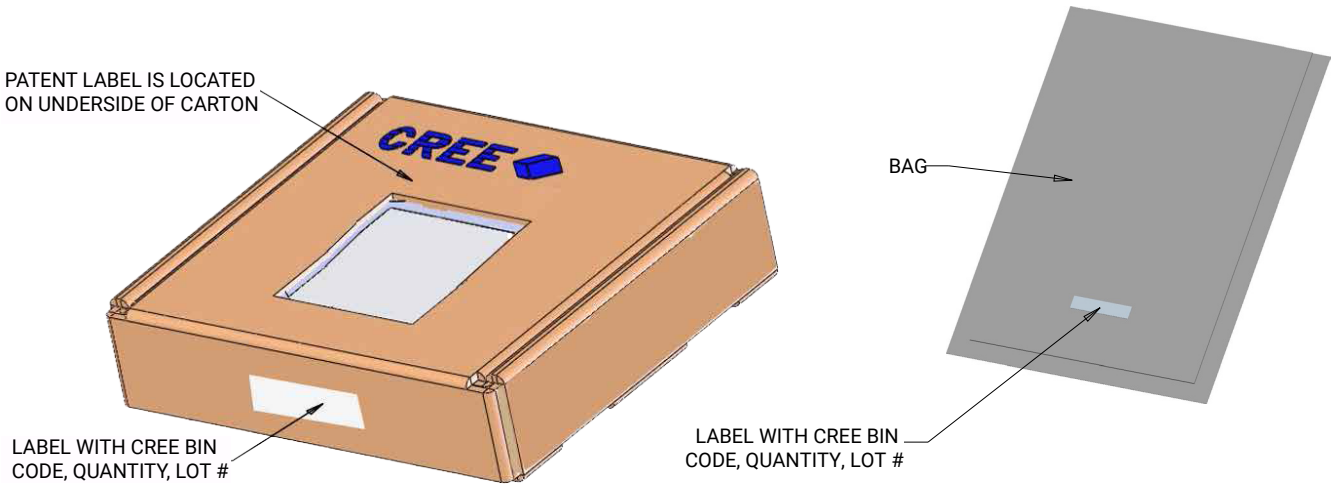
PACKAGING

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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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331