

# XLamp® CXB1520 LED



## PRODUCT DESCRIPTION

CXB1520 High Density (HD) LED arrays are the next generation of high lumen density LED arrays. Incorporating elements of Cree LED’s SC5 Technology® Platform, the CXB1520 HD LED arrays deliver the most lumens in the industry for their light-emitting surface (LES) size, enabling radically new and differentiated LED lighting form factors for applications like tracks, lamps and downlights. The CXB1520 HD LED array packs the performance of seven 60-watt-replacement lamps in an area significantly smaller than a dime, allowing lighting manufacturers to put more light where it is intended at a lower system cost.

The [CX Family LED Design Guide](#) provides basic information on the requirements to use the CXB1520 HD LED array successfully in luminaire designs.

## FEATURES

- EasyWhite® 2-, 3- and 5-step binning
- Premium Color 2- and 3-step binning
- Available in 70-, 80-, 90- and 95-minimum CRI options
- Forward voltage option: 36-V class
- 85 °C binning and characterization
- Maximum drive current: 1400 mA
- 115° viewing angle, uniform chromaticity profile
- 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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Cree LED / 4001 E. Hwy. 54, Suite 2000 / Durham, NC 27709 USA / +1.919.313.5330 / [www.cree-led.com](http://www.cree-led.com)

## CHARACTERISTICS

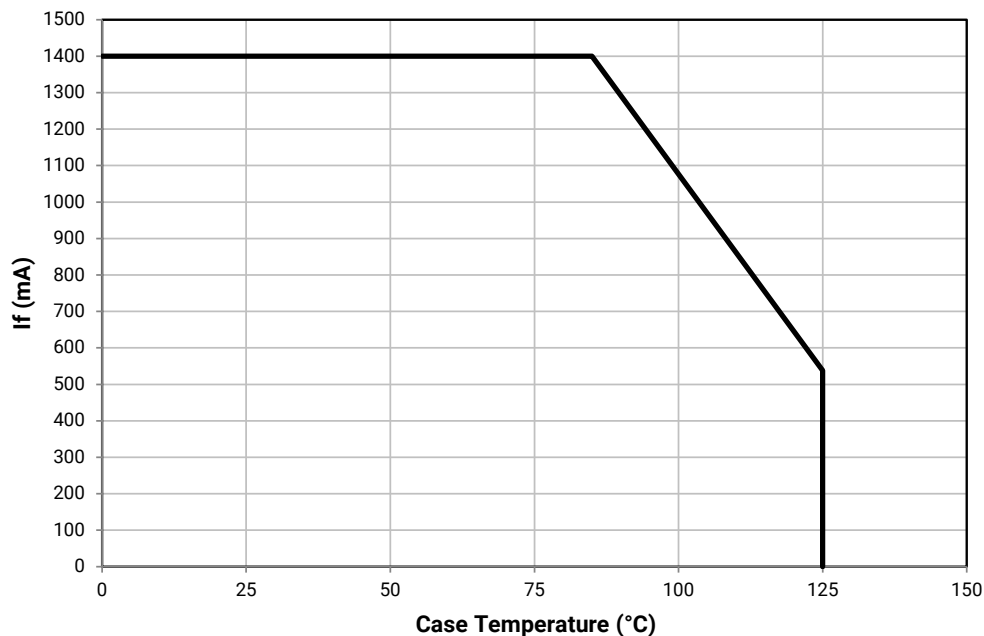
Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			1400*
Reverse current	mA			0.1
Forward voltage (@ 500 mA, 85 °C)	V		33	37

\* Refer to the Operating Limits section.

## OPERATING LIMITS

The maximum current rating of the CXB1520 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 15 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 LED recommends a maximum LES temperature of 135 °C to ensure optimal LED lifetime. Please refer to the Thermal Design section on page 16 for more information on LES temperature measurement.



**FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS (I<sub>F</sub> = 500 mA, T<sub>J</sub> = 85 °C)**

The following table provides order codes for XLamp CXB1520 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 15).

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	---	Q4	2260	2457					65E	CXB1520-0000-000N0BQ465E
			R2	2420	2631						CXB1520-0000-000N0BR265E
	80	---	Q4	2260	2457					65E	CXB1520-0000-000N0HQ465E
			R2	2420	2631						CXB1520-0000-000N0HR265E
5700 K	70	---	Q4	2260	2457					57E	CXB1520-0000-000N0BQ457E
			R2	2420	2631						CXB1520-0000-000N0BR257E
	80	---	Q4	2260	2457					57E	CXB1520-0000-000N0HQ457E
			R2	2420	2631						CXB1520-0000-000N0HR257E
5000 K	70	---	Q4	2260	2457					50E	CXB1520-0000-000N0BQ450E
			R2	2420	2631						CXB1520-0000-000N0BR250E
	80	---	Q4	2260	2457			50G	CXB1520-0000-000N0HQ450G		
			R2	2420	2631				CXB1520-0000-000N0HR250G		
	90	92	P4	1965	2137			50G	CXB1520-0000-000N0UP450G		
			Q2	2100	2283				CXB1520-0000-000N0UQ250G		
4000 K	70	---	Q4	2260	2457					40E	CXB1520-0000-000N0BQ440E
			R2	2420	2631						CXB1520-0000-000N0BR240E
	80	---	Q2	2100	2283	40H	CXB1520-0000-000N0HQ240H	40G	CXB1520-0000-000N0HQ240G		
			Q4	2260	2457	CXB1520-0000-000N0HQ440H	CXB1520-0000-000N0HQ440G				
	90	92	P2	1830	1990	40H	CXB1520-0000-000N0UP240H	40G	CXB1520-0000-000N0UP240G		
			P4	1965	2137		CXB1520-0000-000N0UP440H		CXB1520-0000-000N0UP440G		

- Notes**
- Cree LED 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 17).
  - CXB1520 LED order codes specify only a minimum flux bin and not a maximum. Cree LED 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, EASYWHITE® ORDER CODES AND BINS ( $I_F = 500 \text{ mA}$ ,  $T_J = 85 \text{ °C}$ ) - 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	---	Q2	2100	2283	35H	CXB1520-0000-000N0HQ235H	35G	CXB1520-0000-000N0HQ235G		
			Q4	2260	2457		CXB1520-0000-000N0HQ435H		CXB1520-0000-000N0HQ435G		
	90	92	P2	1830	1990	35H	CXB1520-0000-000N0UP235H	35G	CXB1520-0000-000N0UP235G		
			P4	1965	2137		CXB1520-0000-000N0UP435H		CXB1520-0000-000N0UP435G		
3000 K	80	---	Q2	2100	2283	30H	CXB1520-0000-000N0HQ230H	30G	CXB1520-0000-000N0HQ230G		
			Q4	2260	2457		CXB1520-0000-000N0HQ430H		CXB1520-0000-000N0HQ430G		
	90	92	N4	1710	1859	30H	CXB1520-0000-000N0UN430H	30G	CXB1520-0000-000N0UN430G		
			P2	1830	1990		CXB1520-0000-000N0UP230H		CXB1520-0000-000N0UP230G		
2700 K	80	---	P4	1965	2137	27H	CXB1520-0000-000N0HP427H	27G	CXB1520-0000-000N0HP427G		
			Q2	2100	2283		CXB1520-0000-000N0HQ227H		CXB1520-0000-000N0HQ227G		
	90	92	N2	1590	1729	27H	CXB1520-0000-000N0UN227H	27G	CXB1520-0000-000N0UN227G		
			N4	1710	1859		CXB1520-0000-000N0UN427H		CXB1520-0000-000N0UN427G		
2200 K	80	---	N4	1710	1859			22G	CXB1520-0000-000N0HN422G		

- Notes
- Cree LED 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 17).
  - CXB1520 LED order codes specify only a minimum flux bin and not a maximum. Cree LED 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, PREMIUM COLOR ORDER CODES AND BINS ( $I_f = 500 \text{ mA}$ ,  $T_j = 85 \text{ °C}$ )**

**Fidelity**

Nominal CCT	CRI*		Minimum Luminous Flux			Typical Luminous Flux (lm) @ 85 °C	2-Step	
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**		Group	Order Code
4000 K	95	98	N2	1590	1729	1800	L5A	CXB1520-0000-000N0ZN2L5A
3500 K	95	98	N2	1590	1729	1750	35H	CXB1520-0000-000N0ZN235H
3000 K	95	98	N2	1590	1729	1710	30H	CXB1520-0000-000N0ZN230H
2700 K	95	98	M4	1485	1615	1590	27H	CXB1520-0000-000N0ZM427H

**Specialty**

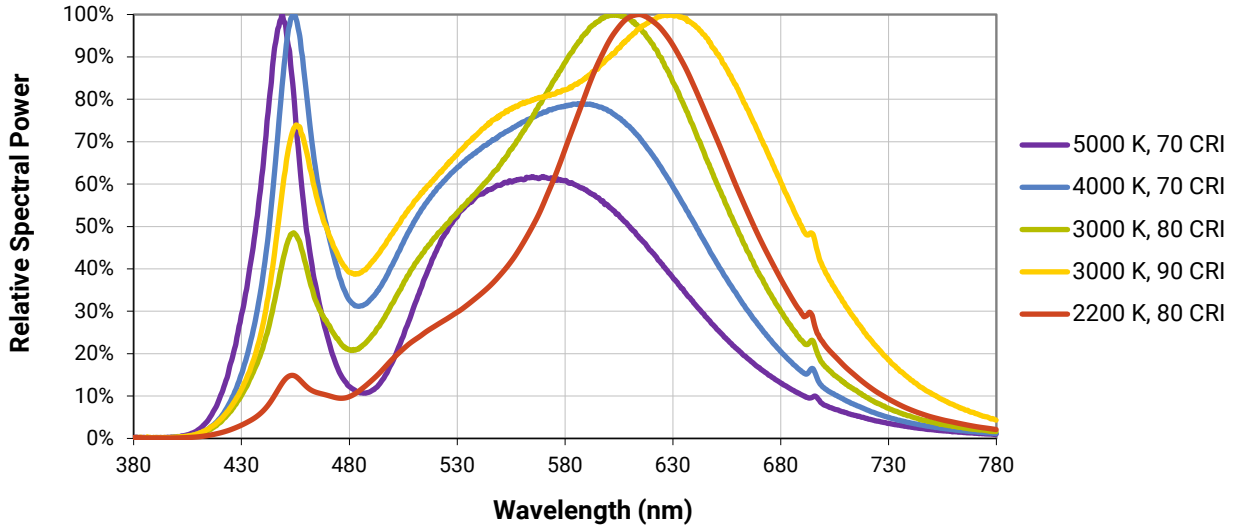
Nominal CCT	CRI		Minimum Luminous Flux			Typical Luminous Flux (lm) @ 85 °C	2-Step		3-Step				
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**		Group	Order Code	Group	Order Code	Group	Order Code	
3100 K	90	92	N4	1710	1859	1891			31Q		CXB1520-0000-000N0UN431Q		
			P2	1830	1990						CXB1520-0000-000N0UP231Q		
3000 K	80	---	P4	1965	2137	2240	L7B	CXB1520-0000-000N0HP4L7B					
	90	92	N4	1710	1859	1891			30Q		CXB1520-0000-000N0UN430Q	30U	CXB1520-0000-000N0UN430U
			P2	1830	1990						CXB1520-0000-000N0UP230Q		CXB1520-0000-000N0UP230U
95	98	M4	1485	1615	1620	L7C	CXB1520-0000-000N0ZM4L7C						

**Notes**

- Cree LED 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 17).
- CXB1520 LED order codes specify only a minimum flux bin and not a maximum. Cree LED 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.

### RELATIVE SPECTRAL POWER DISTRIBUTION, EASYWHITE®

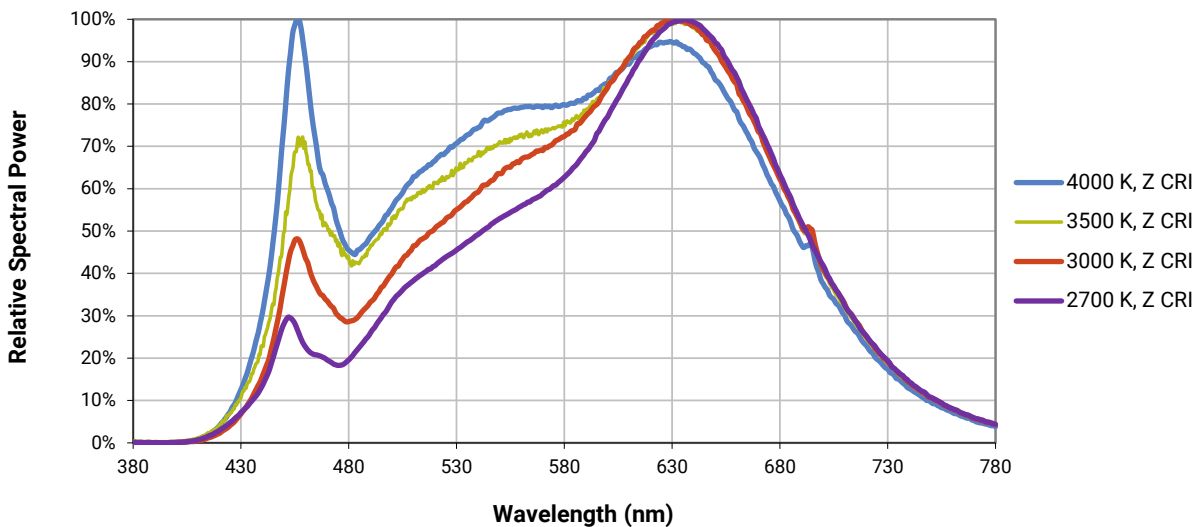
The following graphs are the result of a series of pulsed measurements at 500 mA and  $T_j = 85^\circ\text{C}$ .



### RELATIVE SPECTRAL POWER DISTRIBUTION, PREMIUM COLOR

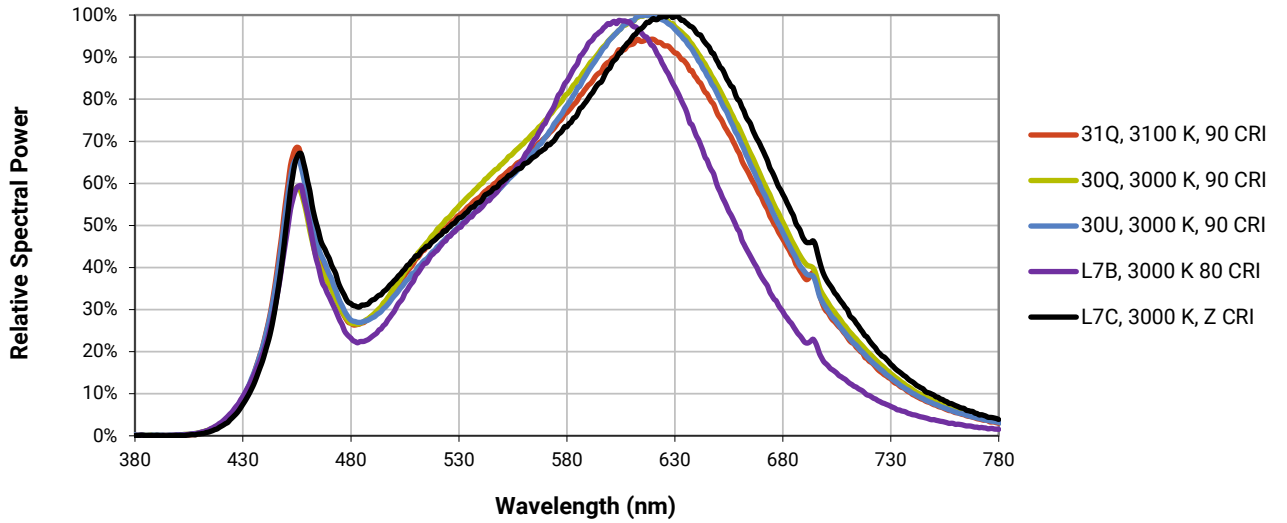
The following graphs are the result of a series of pulsed measurements at 500 mA and  $T_j = 85^\circ\text{C}$ .

#### Fidelity



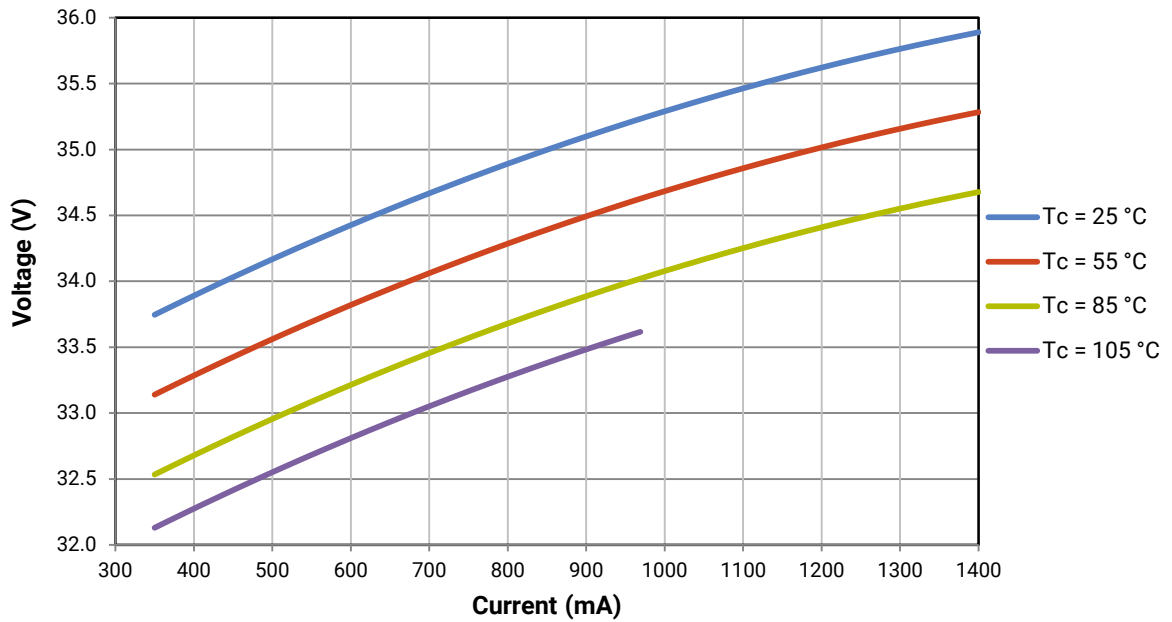
RELATIVE SPECTRAL POWER DISTRIBUTION, PREMIUM COLOR - CONTINUED

Specialty



ELECTRICAL CHARACTERISTICS

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

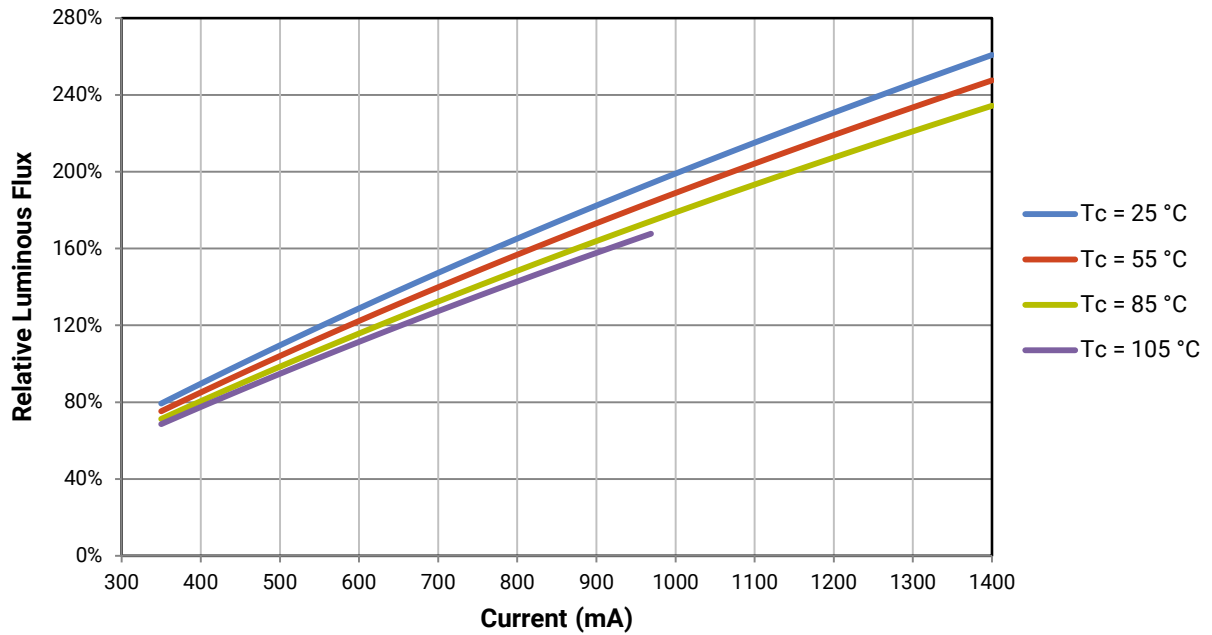


## RELATIVE LUMINOUS FLUX

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

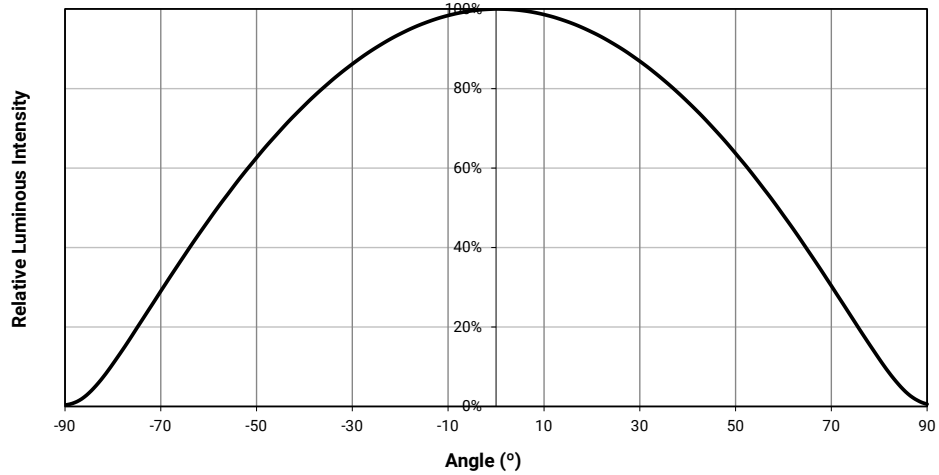
- Measurements of CXB1520 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 500 mA at  $T_j = 85\text{ }^\circ\text{C}$ .

For example, at steady-state operation of  $T_c = 25\text{ }^\circ\text{C}$ ,  $I_f = 1000\text{ mA}$ , the relative luminous flux ratio is 200% in the chart below. A CXB1520 LED that measures 2100 lm during binning will deliver 4200 lm ( $2100 \times 2$ ) at steady-state operation of  $T_c = 25\text{ }^\circ\text{C}$ ,  $I_f = 1000\text{ mA}$ .





## TYPICAL SPATIAL DISTRIBUTION



## PERFORMANCE GROUPS - BRIGHTNESS ( $I_F = 500\text{ mA}$ , $T_J = 85\text{ °C}$ )

XLamp CXB1520 LEDs are tested for luminous flux and placed into one of the following bins.

Group Code	Minimum Luminous Flux	Maximum Luminous Flux
M4	1485	1590
N2	1590	1710
N4	1710	1830
P2	1830	1965
P4	1965	2100
Q2	2100	2260
Q4	2260	2420
R2	2420	2600
R4	2600	2780

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

XLamp CXB1520 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

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

XLamp CXB1520 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

### Fidelity

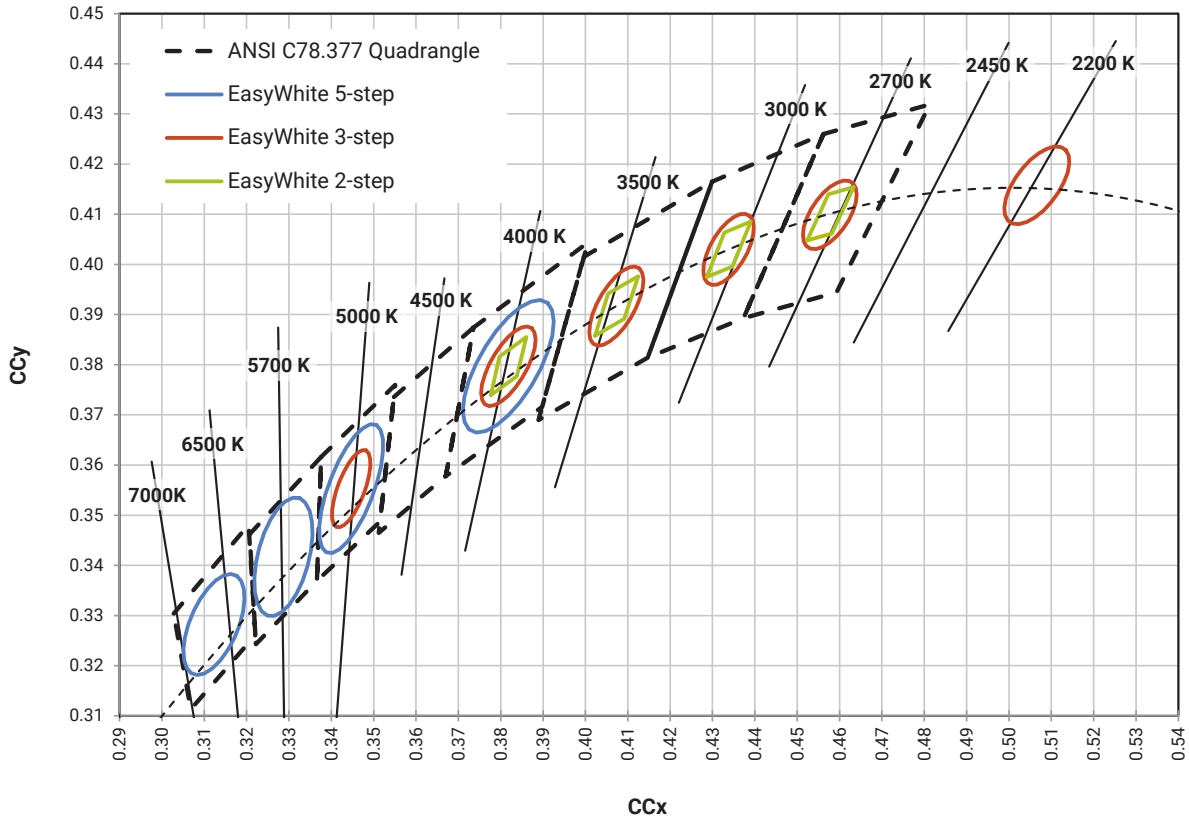
EasyWhite Color Temperatures – 2-Step			
Code	CCT	x	y
L5A	4000 K	0.3764	0.3711
		0.3784	0.3787
		0.3847	0.3826
		0.3825	0.3748
35H	3500 K	0.4022	0.3858
		0.4053	0.3942
		0.4125	0.3977
		0.4091	0.3891
30H	3000 K	0.4287	0.3975
		0.4328	0.4064
		0.4390	0.4086
		0.4347	0.3996
27H	2700 K	0.4524	0.4048
		0.4574	0.4140
		0.4633	0.4154
		0.4581	0.4062

### Specialty

EasyWhite Color Temperatures – 2-Step			
Code	CCT	x	y
L7B	3000 K	0.4263	0.3848
		0.4296	0.3916
		0.4361	0.3938
		0.4326	0.3868
L7C	3000 K	0.4192	0.3754
		0.4224	0.3823
		0.4291	0.3847
		0.4257	0.3777

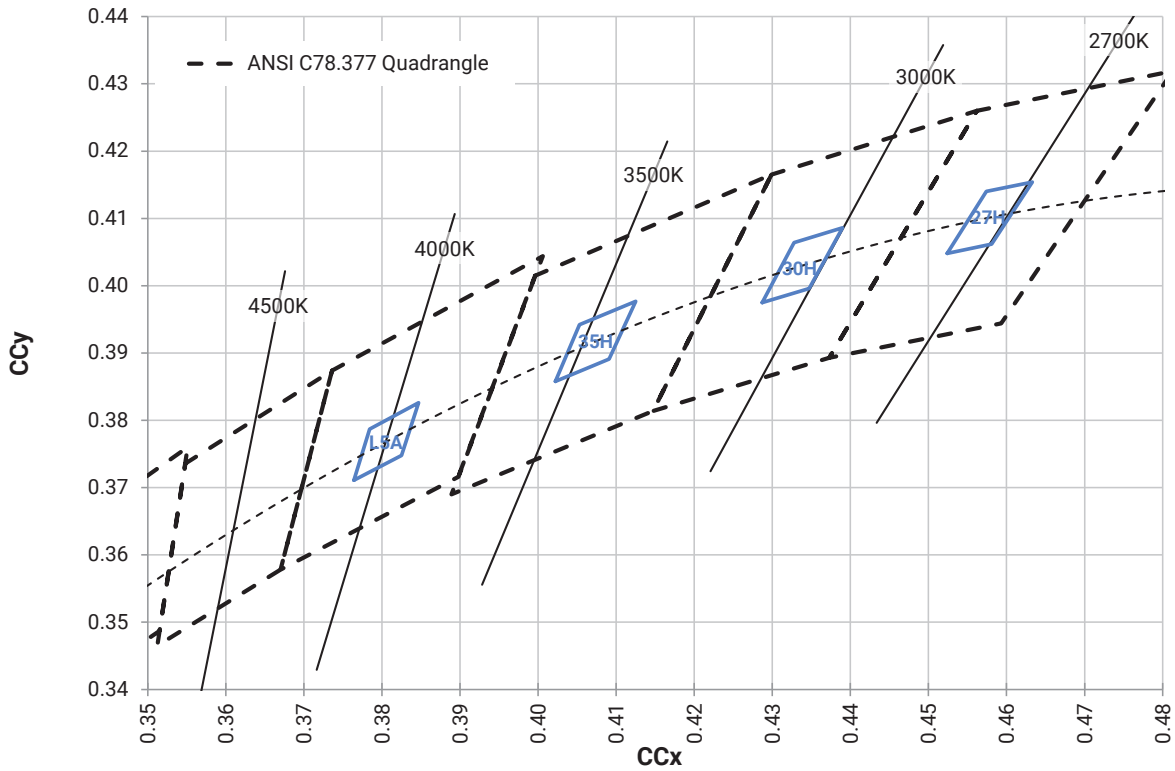
EasyWhite Color Temperatures – 3-Step Ellipse						
Bin Code	CCT	Center Point		Major Axis	Minor Axis	Rotation Angle (°)
		x	y	a	b	
31Q	3100 K	0.4236	0.3888	0.00848	0.00455	50.3
30Q	3000 K	0.4305	0.3935	0.00834	0.00408	53.2
30U	3000 K	0.4274	0.3837	0.00834	0.00408	53.2

EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE ( $T_j = 85\text{ }^\circ\text{C}$ )



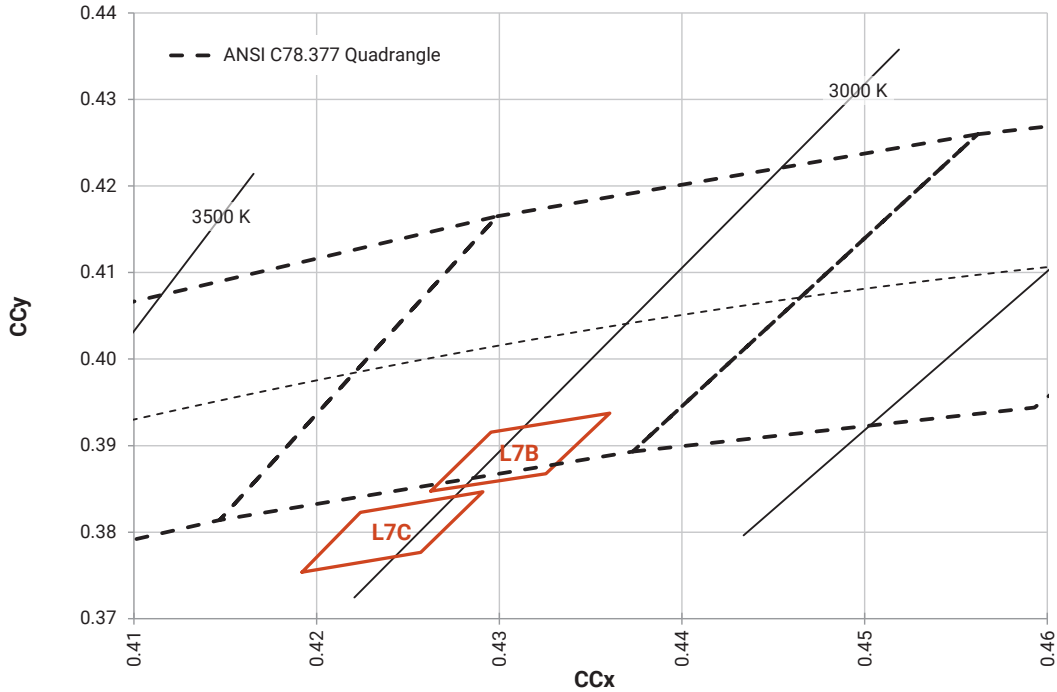
PREMIUM COLOR BINS PLOTTED ON THE 1931 CIE COLOR SPACE ( $T_j = 85\text{ }^\circ\text{C}$ )

Fidelity (2-step)

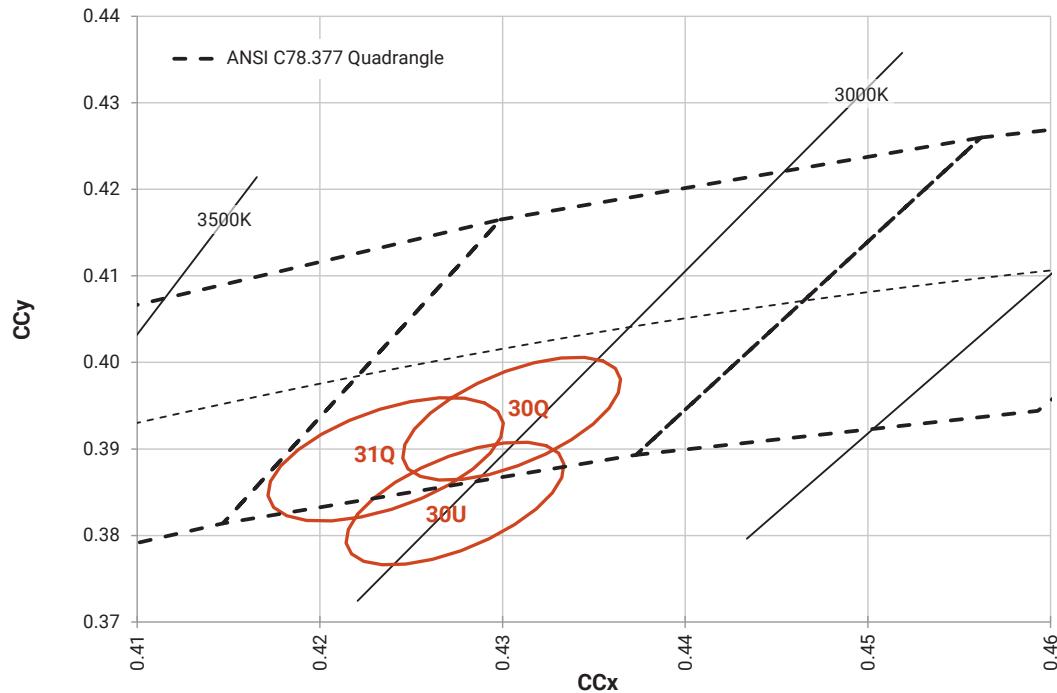


PREMIUM COLOR BINS PLOTTED ON THE 1931 CIE COLOR SPACE ( $T_j = 85\text{ }^\circ\text{C}$ ) - CONTINUED

Speciality (2-step)

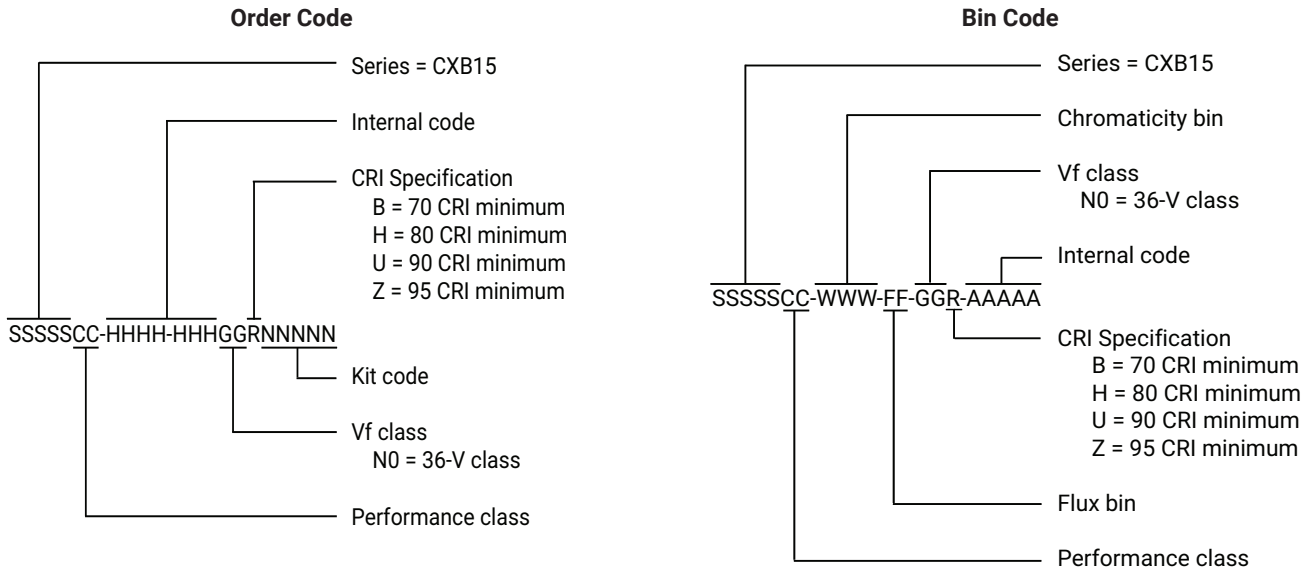


Speciality (3-step)



## BIN AND ORDER CODE FORMATS

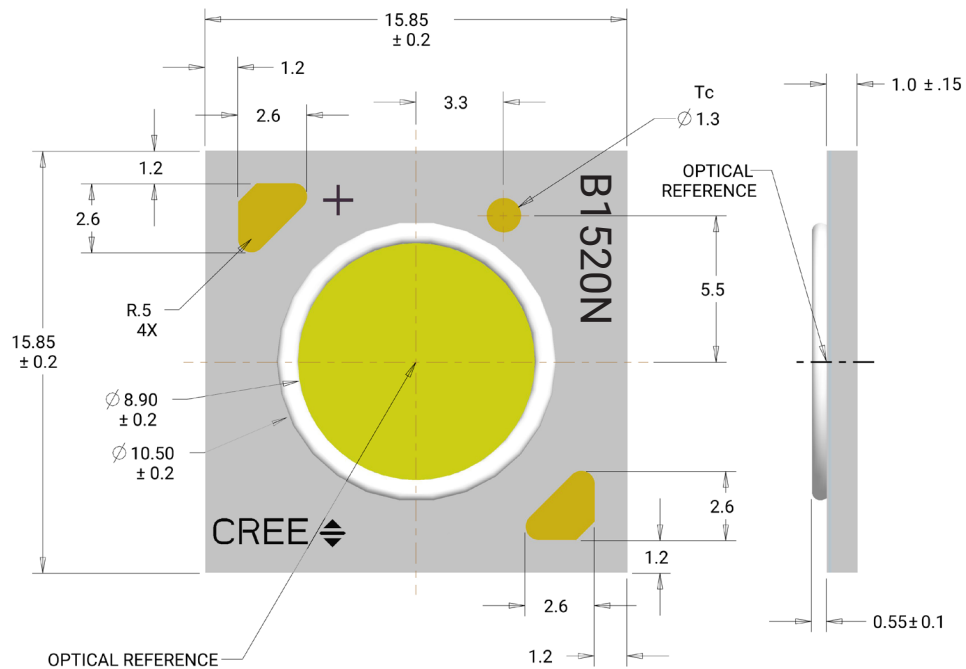
Bin codes and order codes are configured as follows:



## MECHANICAL DIMENSIONS

Dimensions are in mm.  
 Tolerances unless otherwise specified:  $\pm 0.13$   
 $\alpha^\circ \pm 1^\circ$

**Meaning of B1520N**  
 B1520N = 36-V CXB1520



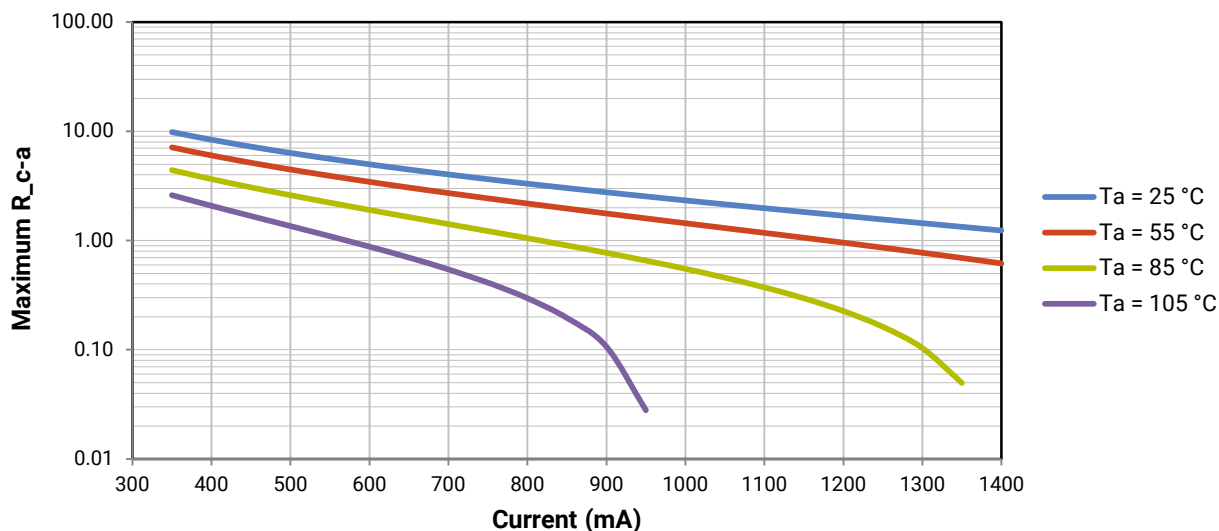
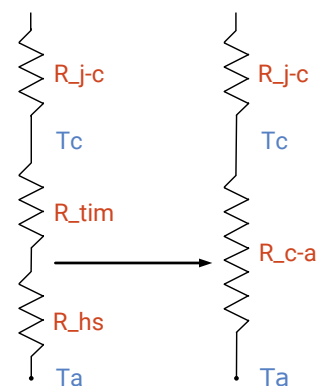
## THERMAL DESIGN

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 LED 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 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 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 [XLamp CX Family LEDs soldering and handling document](#). The [CX Family LED Design Guide](#) provides basic information on the requirements to use XLamp CXB LEDs successfully in luminaire designs.

To keep the CXB1520 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 LED'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 LED applies to ensure long-term reliability for XLamp LEDs and details of Cree LED's pre-release qualification testing for XLamp LEDs.

### Lumen Maintenance

Cree LED 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 LED'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 LED representative or from the [Product Ecology](#) section of the Cree LED 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 LED 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.

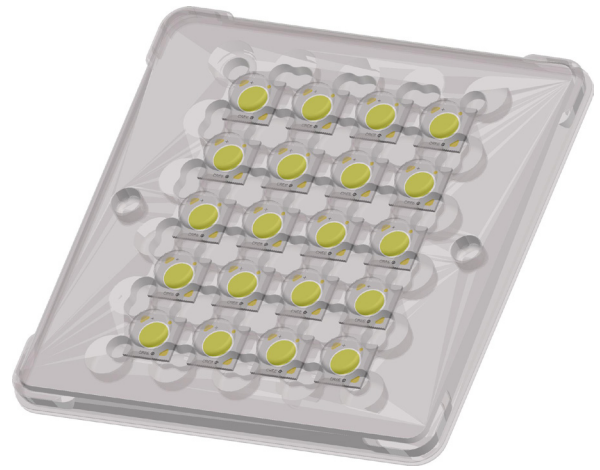
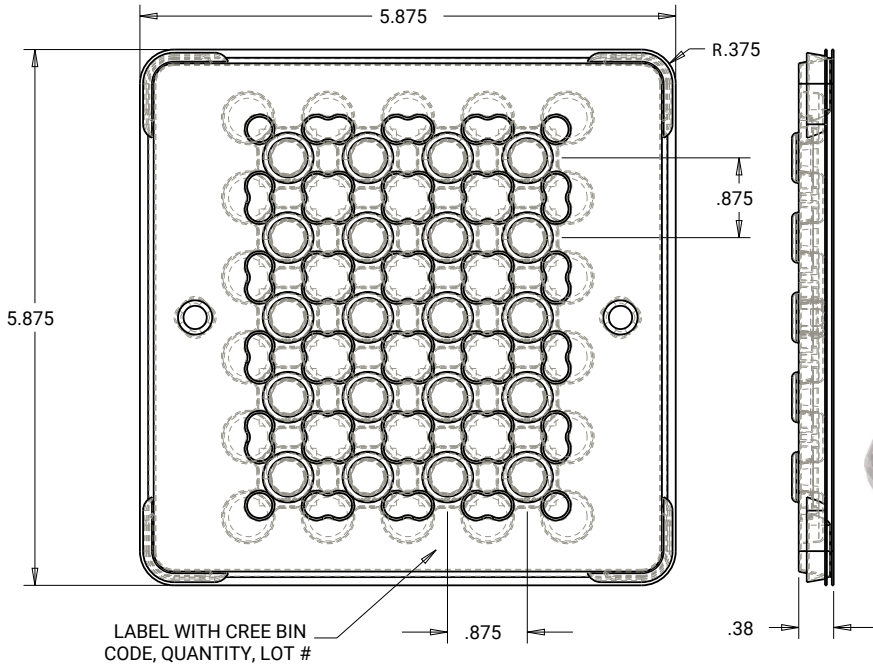
### Vision Advisory

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**

CXB1520 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

