

# XLamp® CXB1816 LED



## PRODUCT DESCRIPTION

The XLamp® CXB1816 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 and 3-step Premium Color bins, the CXB1816 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 CXB1816 LED successfully in luminaire designs.

## FEATURES

- 12-mm optical source
- Mechanical and optical design consistent with other CXA18 and CXB18 LEDs with a 12-mm optical source
- Available in 70-, 80- and 90-minimum CRI options
- EasyWhite® 2-, 3- and 5-step binning
- Premium Color 3-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
Flux Characteristics, Premium Color Order Codes and Bins .....	6
Relative Spectral Power Distribution, EasyWhite® .....	7
Relative Spectral Power Distribution, Premium Color .....	7
Electrical Characteristics.....	8
Relative Luminous Flux.....	9
Typical Spatial Distribution.....	10
Performance Groups - Brightness .....	10
EasyWhite® Performance Groups - Chromaticity .....	11
Premium Color Performance Groups - Chromaticity .....	12
EasyWhite® Bins Plotted on the 1931 CIE Color Space .....	12
Premium Color Bins Plotted on the 1931 CIE Color Space.....	13
Bin and Order Code Formats.....	14
Mechanical Dimensions .....	14
Thermal Design .....	15
Notes .....	16
Packaging.....	17



Cree LED / 4400 Silicon Drive / Durham, NC 27703 USA / +1.919.313.5330 / [www.cree-led.com](http://www.cree-led.com)

## CHARACTERISTICS

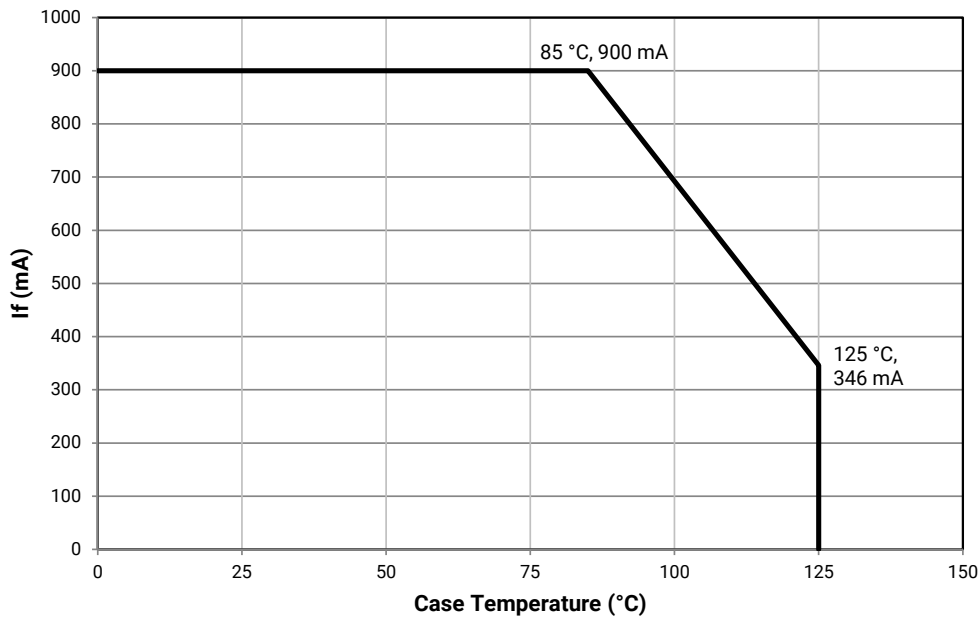
Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			900*
Reverse current	mA			0.1
Forward voltage (450 mA, 85 °C)	V		34.1	38

\* Refer to the Operating Limits section.

## OPERATING LIMITS

The maximum current rating of the CXB1816 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 LED 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, EASYWHITE® ORDER CODES AND BINS ( $I_F = 450 \text{ mA}$ ,  $T_J = 85 \text{ °C}$ )**

The following table provides order codes for XLamp CXB1816 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 13).

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	---	Q2	2100	2311					65E	CXB1816-0000-000N0BQ265E
			Q4	2260	2487						CXB1816-0000-000N0BQ465E
			R2	2420	2663						CXB1816-0000-000N0BR265E
	80	---	Q2	2100	2311					65E	CXB1816-0000-000N0HQ265E
			Q4	2260	2487						CXB1816-0000-000N0HQ465E
			R2	2420	2663						CXB1816-0000-000N0HR265E
5700 K	70	---	Q2	2100	2311					57E	CXB1816-0000-000N0BQ257E
			Q4	2260	2487						CXB1816-0000-000N0BQ457E
			R2	2420	2663						CXB1816-0000-000N0BR257E
	80	---	Q2	2100	2311					57E	CXB1816-0000-000N0HQ257E
			Q4	2260	2487						CXB1816-0000-000N0HQ457E
			R2	2420	2663						CXB1816-0000-000N0HR257E

- 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 16).
  - CXB1816 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, EASYWHITE® ORDER CODES AND BINS (I<sub>F</sub> = 450 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	---	Q2	2100	2311					50E	CXB1816-0000-000NOBQ250E
			Q4	2260	2487						CXB1816-0000-000NOBQ450E
			R2	2420	2663						CXB1816-0000-000NOBR250E
	80	---	Q2	2100	2311			50G	CXB1816-0000-000NOHQ250G	50E	CXB1816-0000-000NOHQ250E
			Q4	2260	2487				CXB1816-0000-000NOHQ450G		CXB1816-0000-000NOHQ450E
			R2	2420	2663				CXB1816-0000-000NOHR250G		
	90	92	P2	1830	2014			50G	CXB1816-0000-000NOUP250G		
			P4	1965	2162				CXB1816-0000-000NOUP450G		
			Q2	2100	2311				CXB1816-0000-000NOUQ250G		
4000 K	70	---	Q2	2100	2311					40E	CXB1816-0000-000NOBQ240E
			Q4	2260	2487						CXB1816-0000-000NOBQ440E
			R2	2420	2663						CXB1816-0000-000NOBR240E
	80	---	P4	1965	2162	40H		40G	CXB1816-0000-000NOHP440H		
			Q2	2100	2311				CXB1816-0000-000NOHQ240H		
			Q4	2260	2487				CXB1816-0000-000NOHQ440H		
	90	92	N4	1710	1882	40H		40G	CXB1816-0000-000NOUN440H		
			P2	1830	2014				CXB1816-0000-000NOUP240H		
			P4	1965	2162				CXB1816-0000-000NOUP440H		
			Q2	2100	2311				CXB1816-0000-000NOUQ240H		

- 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 16).
  - CXB1816 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<sub>F</sub> = 450 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	---	P4	1965	2162	35H	CXB1816-0000-000N0HP435H	35G	CXB1816-0000-000N0HP435G		
			Q2	2100	2311		CXB1816-0000-000N0HQ235H		CXB1816-0000-000N0HQ235G		
			Q4	2260	2487		CXB1816-0000-000N0HQ435H		CXB1816-0000-000N0HQ435G		
	90	92	N4	1710	1882	35H	CXB1816-0000-000N0UN435H	35G	CXB1816-0000-000N0UN435G		
			P2	1830	2014		CXB1816-0000-000N0UP235H		CXB1816-0000-000N0UP235G		
			P4	1965	2162		CXB1816-0000-000N0UP435H		CXB1816-0000-000N0UP435G		
3000 K	80	---	P4	1965	2162	30H	CXB1816-0000-000N0HP430H	30G	CXB1816-0000-000N0HP430G		
			Q2	2100	2311		CXB1816-0000-000N0HQ230H		CXB1816-0000-000N0HQ230G		
	90	92	N2	1590	1750	30H	CXB1816-0000-000N0UN230H	30G	CXB1816-0000-000N0UN230G		
			N4	1710	1882		CXB1816-0000-000N0UN430H		CXB1816-0000-000N0UN430G		
			P2	1830	2014		CXB1816-0000-000N0UP230H		CXB1816-0000-000N0UP230G		
2700 K	80	---	P2	1830	2014	27H	CXB1816-0000-000N0HP227H	27G	CXB1816-0000-000N0HP227G		
			P4	1965	2162		CXB1816-0000-000N0HP427H		CXB1816-0000-000N0HP427G		
			Q2	2100	2311		CXB1816-0000-000N0HQ227H		CXB1816-0000-000N0HQ227G		
	90	92	M4	1485	1634	27H	CXB1816-0000-000N0UM427H	27G	CXB1816-0000-000N0UM427G		
			N2	1590	1750		CXB1816-0000-000N0UN227H		CXB1816-0000-000N0UN227G		
			N4	1710	1882		CXB1816-0000-000N0UN427H		CXB1816-0000-000N0UN427G		
2200 K	80	---	N2	1590	1750			22G	CXB1816-0000-000N0HN222G		

- 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 16).
  - CXB1816 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, PREMIUM COLOR ORDER CODES AND BINS ( $I_f = 450 \text{ mA}$ ,  $T_j = 85 \text{ °C}$ )**
**Specialty**

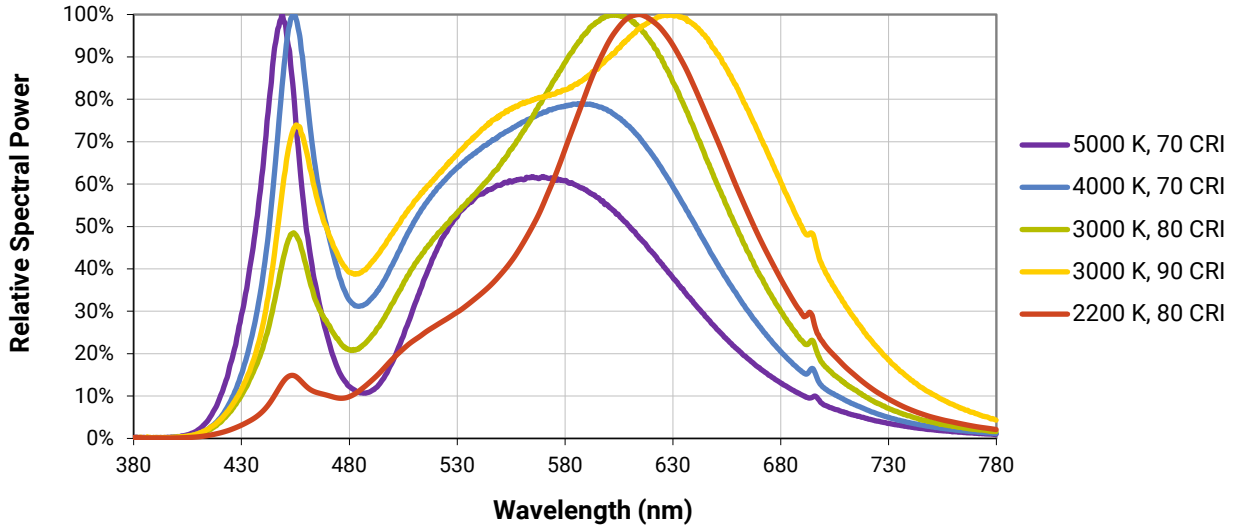
Nominal CCT	CRI		Minimum Luminous Flux			Typical Luminous Flux (lm) @ 85 °C	3-Step			
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**		Group	Order Code	Group	Order Code
3100 K	90	92	N2	1590	1750	1923	31Q	CXB1816-0000-000N0UN231Q		
3000 K	90	92	M4	1485	1634	1923	30Q			CXB1816-0000-000N0UM430U
			N2	1590	1750				30U	CXB1816-0000-000N0UN230U
			N4	1710	1882				30U	CXB1816-0000-000N0UN430U

**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 16).
- CXB1816 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®

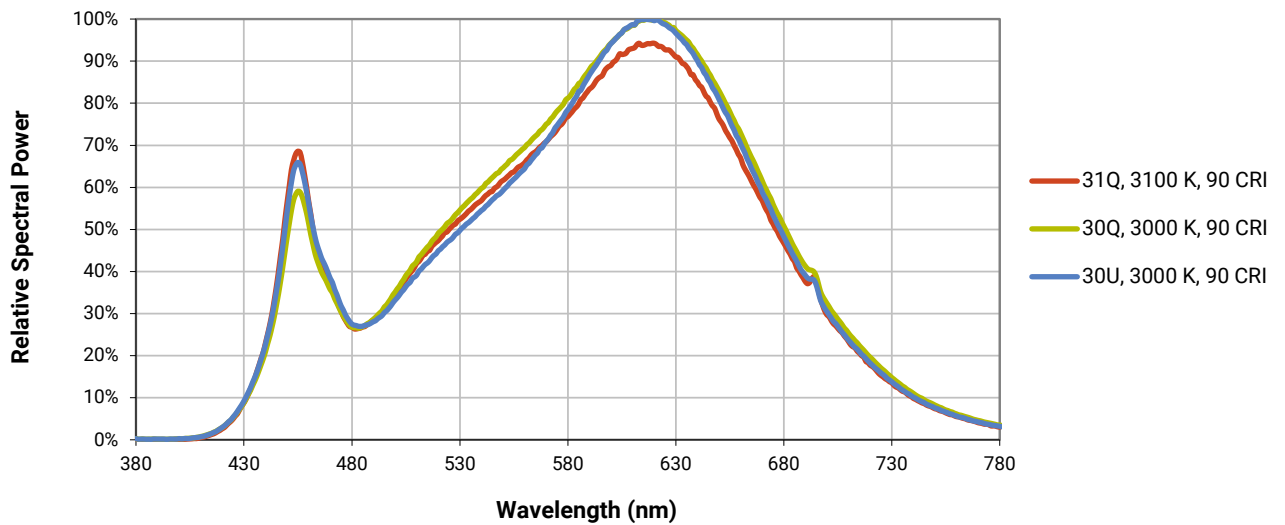
The following graph is the result of a series of pulsed measurements at 450 mA and  $T_j = 85\text{ }^\circ\text{C}$ .



### RELATIVE SPECTRAL POWER DISTRIBUTION, PREMIUM COLOR

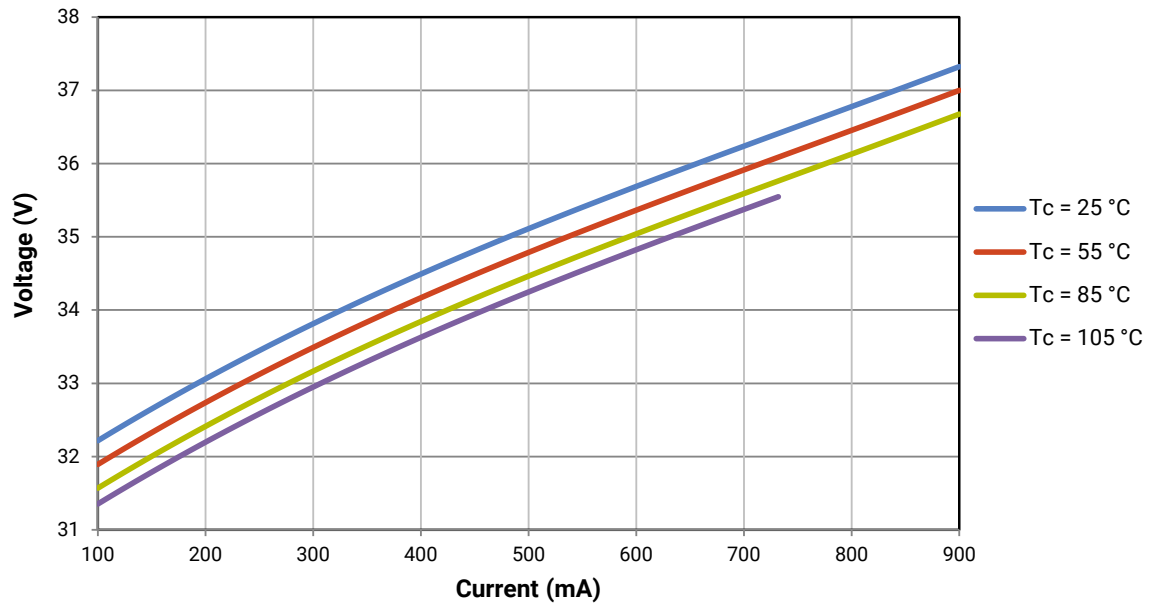
The following graph is the result of a series of pulsed measurements at 450 mA and  $T_j = 85\text{ }^\circ\text{C}$ .

#### Specialty



## ELECTRICAL CHARACTERISTICS

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

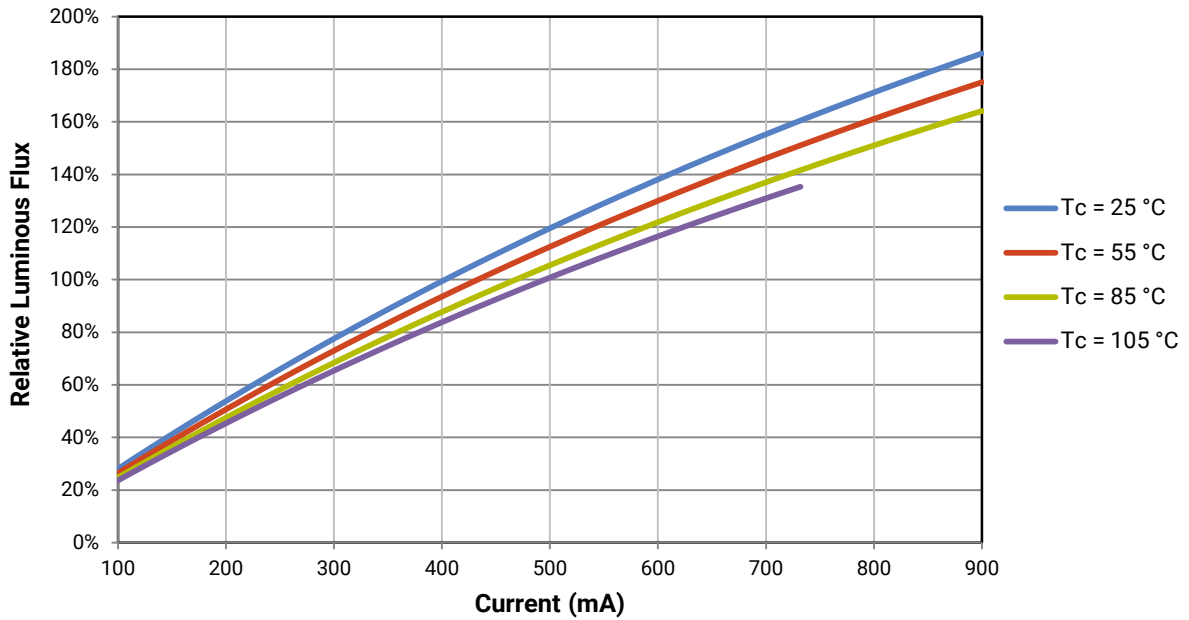




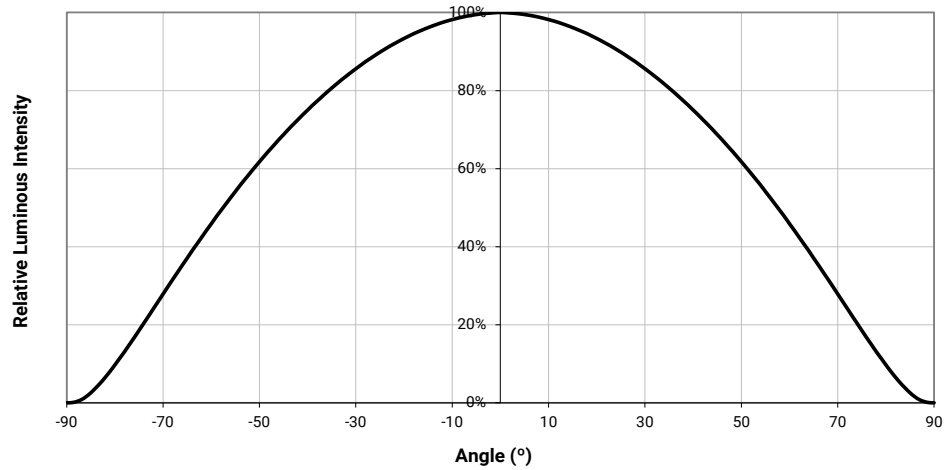
## RELATIVE LUMINOUS FLUX

The relative luminous flux values provided below are the ratio of measurements of the CXB1816 LED at steady-state operation at the given conditions, divided by flux measured during binning, which is a pulsed measurement at 450 mA at  $T_j = 85^\circ\text{C}$ .

For example, at steady-state operation of  $T_c = 25^\circ\text{C}$ ,  $I_f = 500\text{ mA}$ , the relative luminous flux ratio is 120% in the chart below. A CXB1816 LED that measures 2100 lm during binning will deliver 2520 lm ( $2100 \times 1.2$ ) at steady-state operation of  $T_c = 25^\circ\text{C}$ ,  $I_f = 500\text{ mA}$ .



## TYPICAL SPATIAL DISTRIBUTION



## PERFORMANCE GROUPS - BRIGHTNESS ( $I_f = 450 \text{ mA}$ , $T_j = 85 \text{ °C}$ )

XLamp CXB1816 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

**EASYWHITE® PERFORMANCE GROUPS - CHROMATICITY (T<sub>j</sub> = 85 °C)**

XLamp CXB1816 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

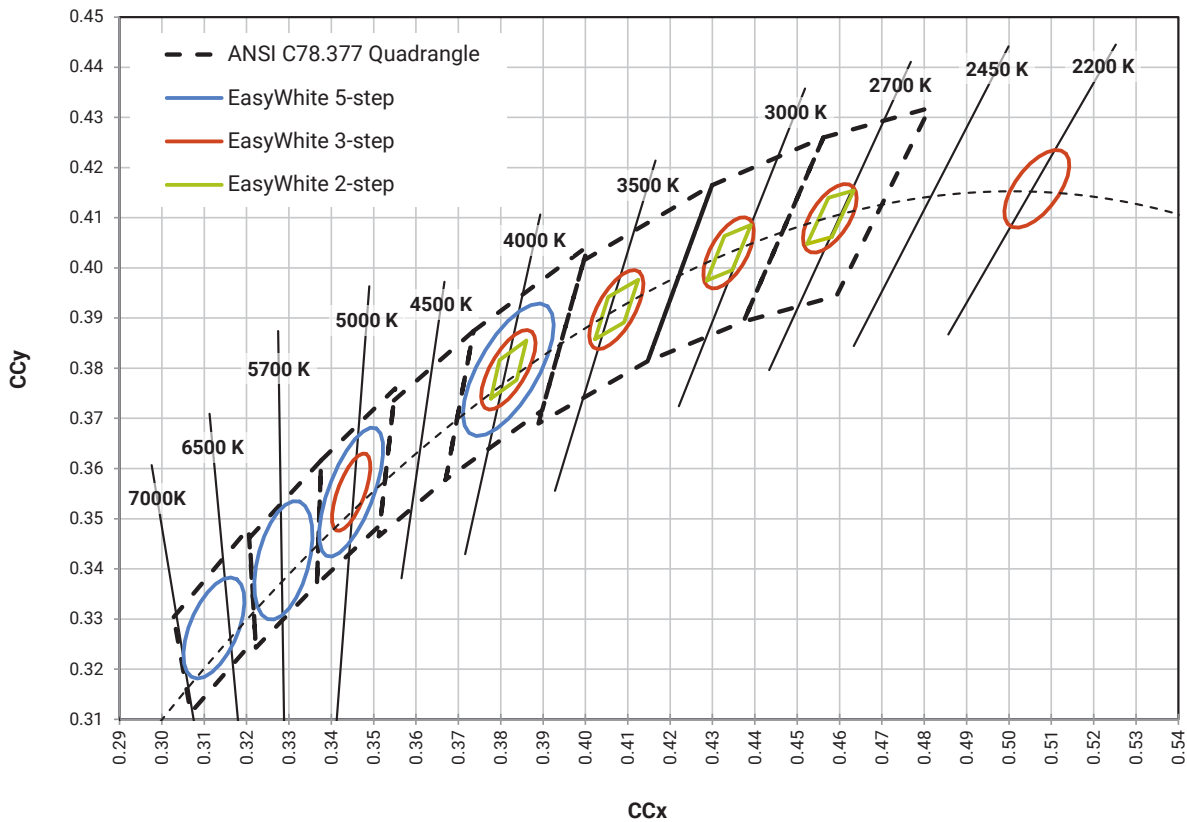
PREMIUM COLOR PERFORMANCE GROUPS - CHROMATICITY ( $T_j = 85\text{ }^\circ\text{C}$ )

XLamp CXB1816 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

Specialty

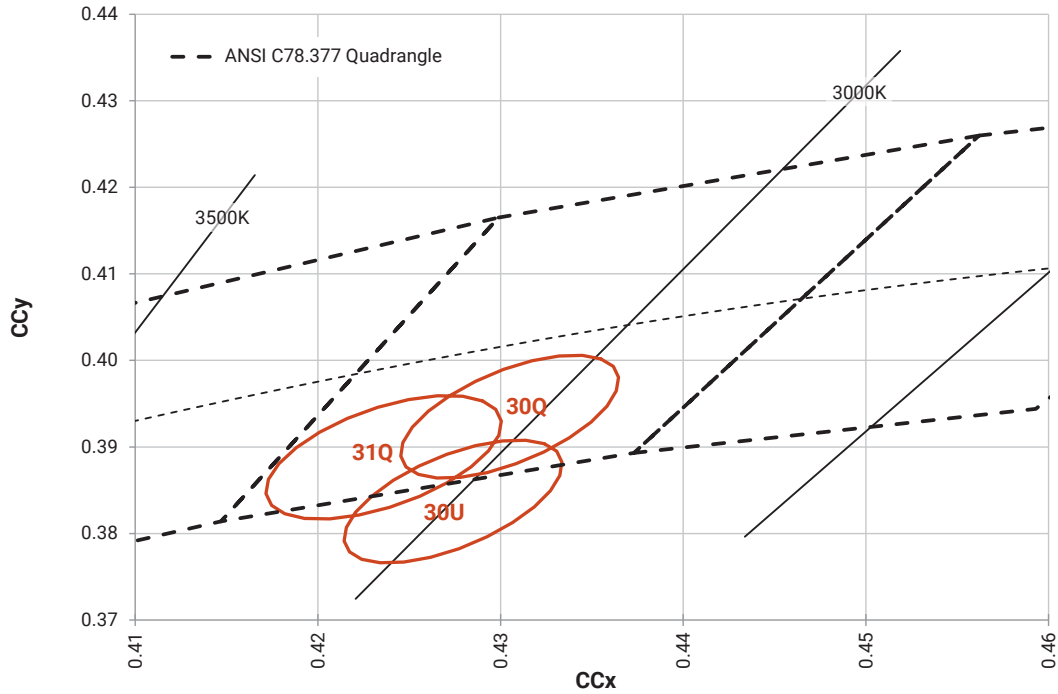
EasyWhite Color Temperatures – 3-Step Ellipse						
Bin Code	CCT	Center Point		Major Axis	Minor Axis	Rotation Angle (°)
		x	y	a	b	
31Q	3100 K	0.4236	0.3888	0.00848	0.00455	50.3
30Q	3000 K	0.4305	0.3935	0.00834	0.00408	53.2
30U	3000 K	0.4274	0.3837	0.00834	0.00408	53.2

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



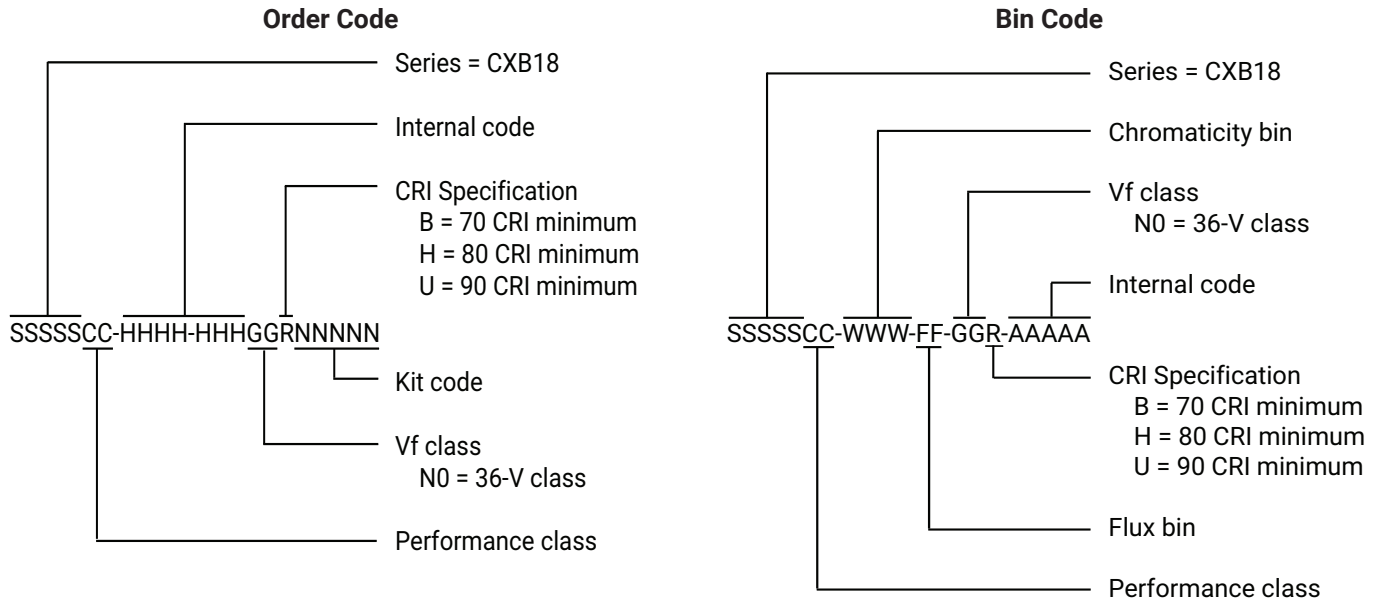
PREMIUM COLOR BINS PLOTTED ON THE 1931 CIE COLOR SPACE ( $T_j = 85\text{ }^\circ\text{C}$ )

Speciality (3-step)



## BIN AND ORDER CODE FORMATS

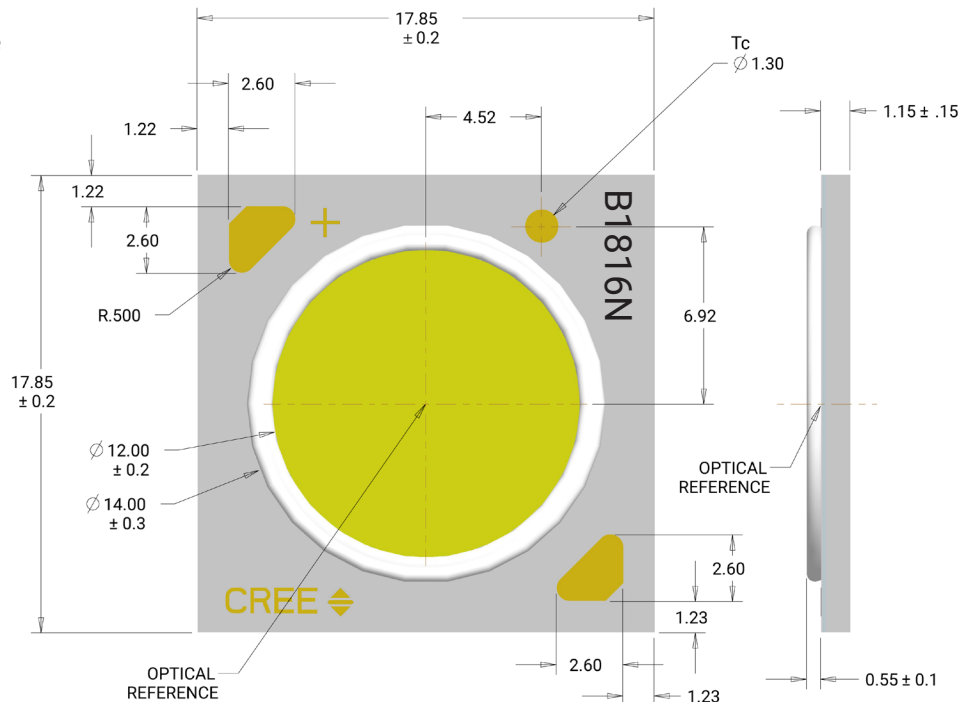
Bin codes and order codes are configured as follows:



## MECHANICAL DIMENSIONS

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

**Meaning of B1816N**  
 B1816N = 36-V CXB1816



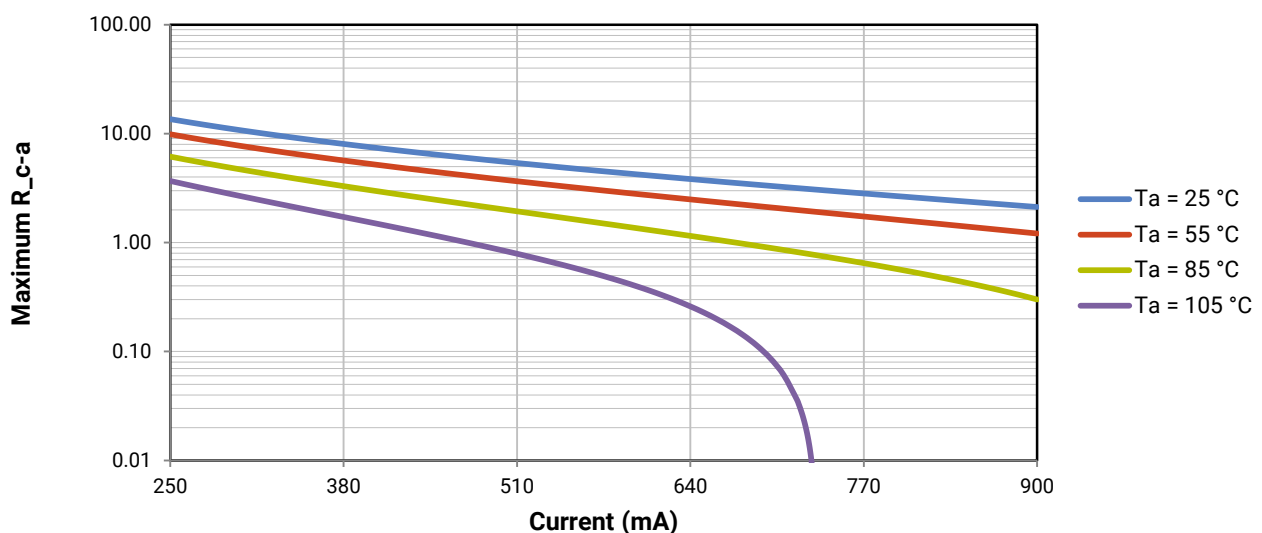
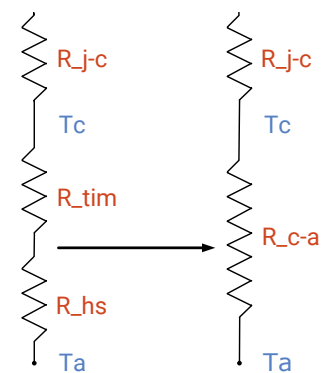
## THERMAL DESIGN

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 CXB1816 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

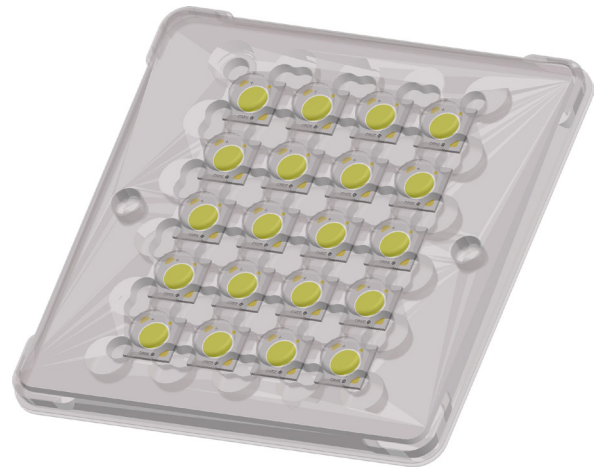
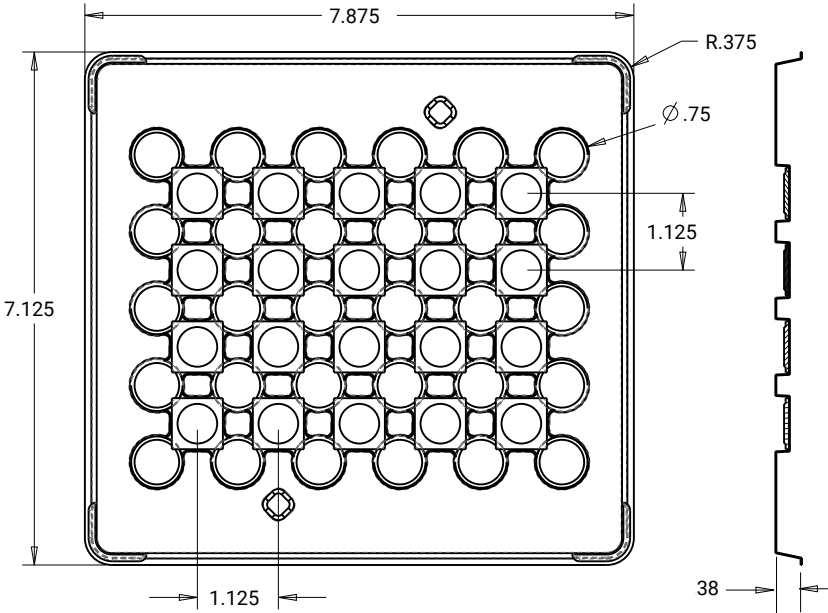
**WARNING:** Do not look at an exposed lamp in operation. Eye injury can result. For more information about LEDs and eye safety, please refer to the [LED Eye Safety application note](#).



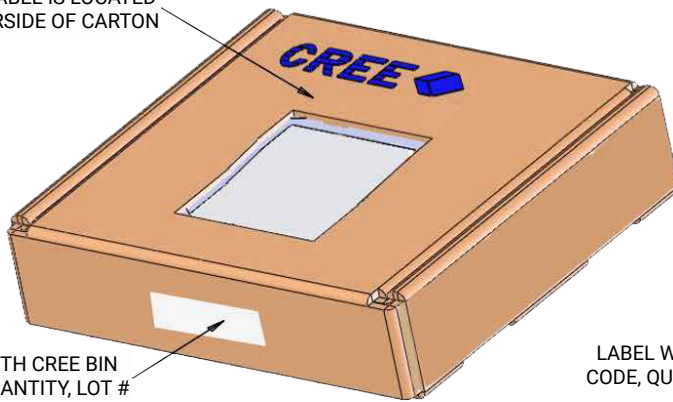
PACKAGING

CXB1816 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.

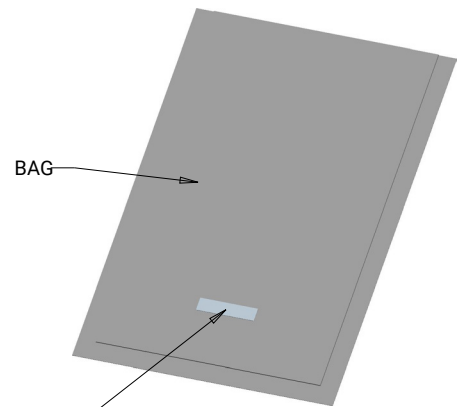
Dimensions are in inches.  
Tolerances:  $\pm .13$   
 $x^\circ \pm 1^\circ$



PATENT LABEL IS LOCATED ON UNDERSIDE OF CARTON



LABEL WITH CREE BIN CODE, QUANTITY, LOT #



BAG

LABEL WITH CREE BIN CODE, QUANTITY, LOT #

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