

# Cree® XLamp® CXA3590 LED



## PRODUCT DESCRIPTION

The XLamp CXA3590 LED array expands Cree’s family of high-flux, multi-die integrated arrays, offering high performance in an easy-to-use platform. With XLamp lighting-class reliability, the CXA3590’s uniform emitting surface enables both directional and non-directional lighting applications and luminaire and lamp designs. Available in 2-step and 4-step color consistency, and featuring a 30-mm optical source, the CXA3590 brings new levels of flux and efficacy to this form factor.

The CXA LED Design Guide provides basic information on the requirements to use the CXA3590 LED successfully in luminaire designs.<sup>1</sup>

## FEATURES

- Available in 4-step and 2-step EasyWhite® bins at 2700 K, 3000 K, 3500 K, 4000 K and 5000 K CCT
- Available in ANSI white bins at 4000 K and 5000 K CCT
- Available in 70-, 80-, 90- and 93-minimum CRI options
- Forward voltage: 77 V
- 85 °C binning and characterization
- Maximum drive current: 1800 mA
- 115° viewing angle, uniform chromaticity profile
- Top-side solder connections
- Thermocouple attach point
- NEMA SSL-3 2011 standard flux bins
- UL-recognized component (E349212)

## TABLE OF CONTENTS

Characteristics .....	2
Operating Limits.....	2
Flux Characteristics, EasyWhite	
Order Codes and Bins .....	3
Flux Characteristics, ANSI White	
Order Codes and Bins .....	5
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 CIE 1931 Color Space .....	10
Cree ANSI White Bins Plotted on the CIE 1931 Color Space.....	11
Bin and Order Code Formats .....	12
Mechanical Dimensions.....	12
Thermal Design.....	13
Notes.....	14
Packaging.....	15



<sup>1</sup> Cree XLamp CXA LED Design Guide, Design Guide DG02, [www.cree.com/xlamp\\_app\\_notes/cxa\\_design\\_guide](http://www.cree.com/xlamp_app_notes/cxa_design_guide)

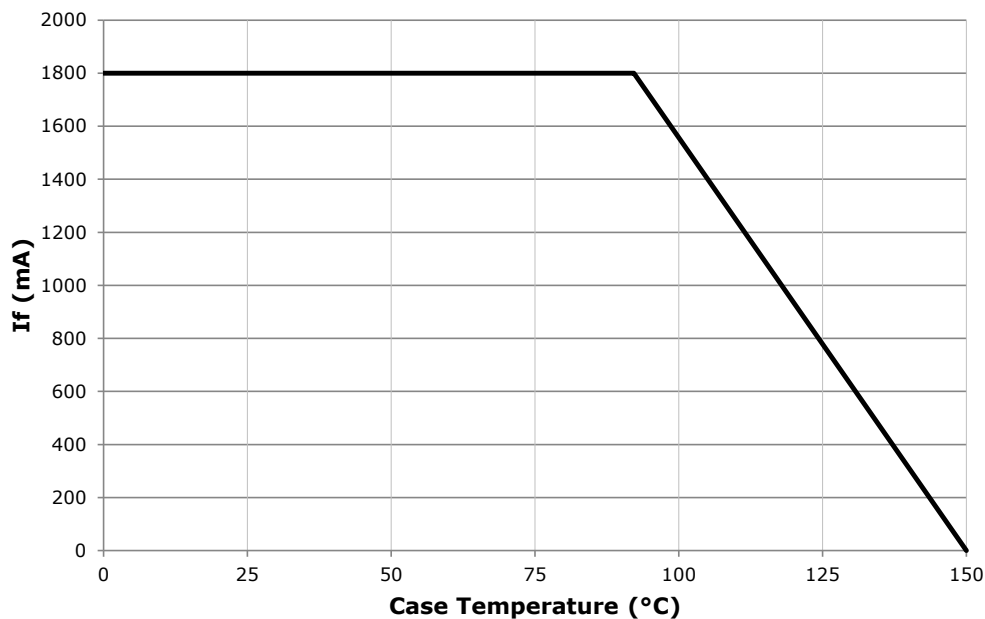
## CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			1800*
Reverse current	mA			0.1
Forward voltage (@ 1200 mA, $T_j = 85\text{ }^\circ\text{C}$ )	V		77	
Forward voltage (@ 1200 mA, $T_j = 25\text{ }^\circ\text{C}$ )	V			84

\* Refer to the Operating Limits section.

## OPERATING LIMITS

The maximum current rating of the CXA3590 is dependent on the case temperature ( $T_c$ ) when the LED has reached thermal equilibrium under steady-state operation. Please refer to the Mechanical Drawings section on page 12 for the location of the  $T_c$  measurement point.



**FLUX CHARACTERISTICS, EASYWHITE ORDER CODES AND BINS ( $I_f = 1200 \text{ mA}$ ,  $T_j = 85 \text{ °C}$ )**

The following tables provide order codes for XLamp CXA3590 LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 12).

CCT Range	CRI		Base Order Codes Min. Luminous Flux @ 1200 mA			2-Step Order Code		4-Step Order Code	
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region		Chromaticity Region	
5000 K	70	75	BD	10,000	11,100	50H	CXA3590-0000-000R00BD50H	50F	CXA3590-0000-000R00BD50F
			CB	11,000	12,210		CXA3590-0000-000R00CB50H		CXA3590-0000-000R00CB50F
			CD	12,000	13,320		CXA3590-0000-000R00CD50H		CXA3590-0000-000R00CD50F
	80	---	BB	9,500	10,545	50H	CXA3590-0000-000R0HBB50H	50F	CXA3590-0000-000R0HBB50F
			BD	10,000	11,100		CXA3590-0000-000R0HBD50H		CXA3590-0000-000R0HBD50F
			CB	11,000	12,210		CXA3590-0000-000R0HCB50H		CXA3590-0000-000R0HCB50F
	90	95	AB	8,500	9,435	50H	CXA3590-0000-000R0UAB50H	50F	CXA3590-0000-000R0UAB50F
			AD	9,000	9,990		CXA3590-0000-000R0UAD50H		CXA3590-0000-000R0UAD50F
	4000 K	70	75	BB	9,500	10,545	40H	CXA3590-0000-000R00BB40H	40F
BD				10,000	11,100	CXA3590-0000-000R00BD40H		CXA3590-0000-000R00BD40F	
CB				11,000	12,210	CXA3590-0000-000R00CB40H		CXA3590-0000-000R00CB40F	
80		---	AD	9,000	9,435	40H	CXA3590-0000-000R0HAD40H	40F	CXA3590-0000-000R0HAD40F
			BB	9,500	10,545		CXA3590-0000-000R0HBB40H		CXA3590-0000-000R0HBB40F
			BD	10,000	11,100		CXA3590-0000-000R0HBD40H		CXA3590-0000-000R0HBD40F
90		95	Z4	7,945	8,819	40H	CXA3590-0000-000R0UZ440H	40F	CXA3590-0000-000R0UZ440F
			AB	8,500	9,435		CXA3590-0000-000R0UAB40H		CXA3590-0000-000R0UAB40F
3500 K		80	---	AD	9,000	9,990	35H	CXA3590-0000-000R00AD35H	35F
	BB			9,500	10,545	CXA3590-0000-000R00BB35H		CXA3590-0000-000R00BB35F	
	BD			10,000	11,100	CXA3590-0000-000R00BD35H		CXA3590-0000-000R00BD35F	
	93	95	Z2	7,390	8,203	35H	CXA3590-0000-000R0YZ235H	35F	CXA3590-0000-000R0YZ235F
			Z4	7,945	8,819		CXA3590-0000-000R0YZ435H		CXA3590-0000-000R0YZ435F
3000 K	80	---	AD	9,000	9,990	30H	CXA3590-0000-000R00AD30H	30F	CXA3590-0000-000R00AD30F
			BB	9,500	10,545		CXA3590-0000-000R00BB30H		CXA3590-0000-000R00BB30F
			BD	10,000	11,100		CXA3590-0000-000R00BD30H		CXA3590-0000-000R00BD30F
	93	95	Z2	7,390	8,203	30H	CXA3590-0000-000R0YZ230H	30F	CXA3590-0000-000R0YZ230F
			Z4	7,945	8,819		CXA3590-0000-000R0YZ430H		CXA3590-0000-000R0YZ430F

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

**FLUX CHARACTERISTICS, EASYWHITE ORDER CODES AND BINS ( $I_f = 1200 \text{ mA}$ ,  $T_j = 85 \text{ °C}$ ) - CONTINUED**

CCT Range	CRI		Base Order Codes Min. Luminous Flux @ 1200 mA			2-Step Order Code		4-Step Order Code	
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region		Chromaticity Region	
2700 K	80	---	AB	8,500	9,435	27H	CXA3590-0000-000R00AB27H	27F	CXA3590-0000-000R00AB27F
			AD	9,000	9,990		CXA3590-0000-000R00AD27H		CXA3590-0000-000R00AD27F
			BB	9,500	10,545		CXA3590-0000-000R00BB27H		CXA3590-0000-000R00BB27F
	93	95	Y4	6,910	7,670	27H	CXA3590-0000-000R0YY427H	27F	CXA3590-0000-000R0YY427F
			Z2	7,390	8,203		CXA3590-0000-000R0YZ227H		CXA3590-0000-000R0YZ227F

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

**FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS ( $I_F = 1200 \text{ mA}$ ,  $T_j = 85 \text{ }^\circ\text{C}$ )**

The following tables provide order codes for XLamp CXA3590 LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 12).

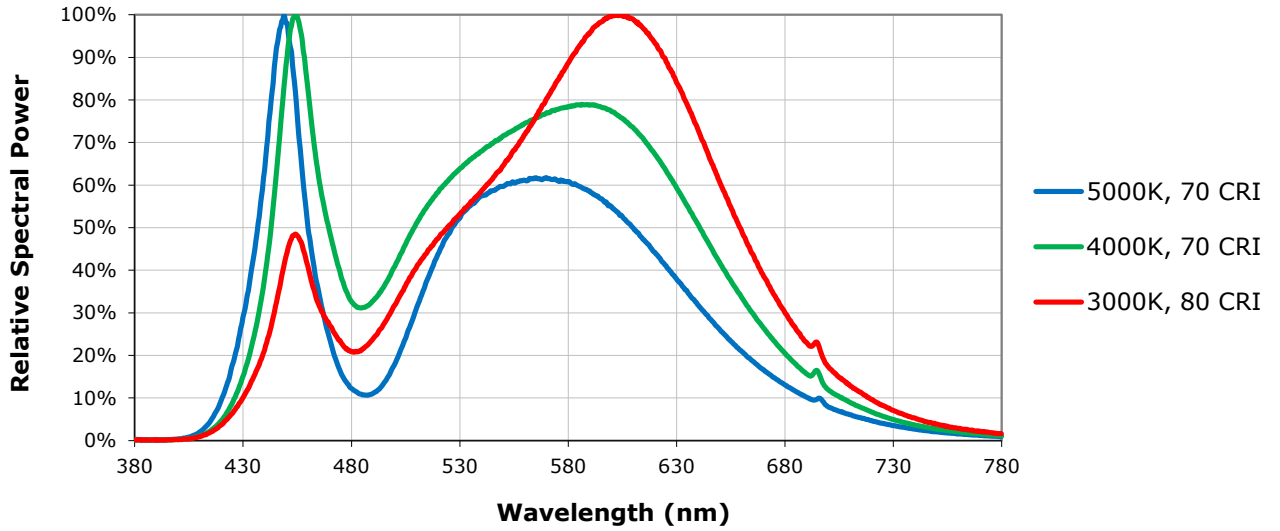
CCT Range	CRI		Base Order Codes Min Luminous Flux @ 1200 mA			Chromaticity Regions	Order Code
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*		
5000 K	70	75	BD	10,000	11,100	3A0, 3B0, 3C0, 3D0	CXA3590-0000-000R00BD0E3
			CB	11,000	12,210		CXA3590-0000-000R00CB0E3
			CD	12,000	13,320		CXA3590-0000-000R00CD0E3
	80	---	BB	9,500	10,545	3A0, 3B0, 3C0, 3D0	CXA3590-0000-000R0HBB0E3
			BD	10,000	11,100		CXA3590-0000-000R0HBD0E3
			CB	11,000	12,210		CXA3590-0000-000R0HCB0E3
	90	95	AB	8,500	9,435	3A0, 3B0, 3C0, 3D0	CXA3590-0000-000R0UAB0E3
			AD	9,000	9,990		CXA3590-0000-000R0UAD0E3
	4000 K	70	75	BB	9,500	10,545	5A0, 5B0, 5C0, 5D0
BD				10,000	11,100	CXA3590-0000-000R00BD0E5	
CB				11,000	12,210	CXA3590-0000-000R00CB0E5	
80		---	AD	9,000	9,435	5A0, 5B0, 5C0, 5D0	CXA3590-0000-000R0HAD0E5
			BB	9,500	10,545		CXA3590-0000-000R0HBB0E5
			BD	10,000	11,100		CXA3590-0000-000R0HBD0E5
90		95	Z4	7,945	8,819	5A0, 5B0, 5C0, 5D0	CXA3590-0000-000R0UZA0E5
			AB	8,500	9,435		CXA3590-0000-000R0UAB0E5

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

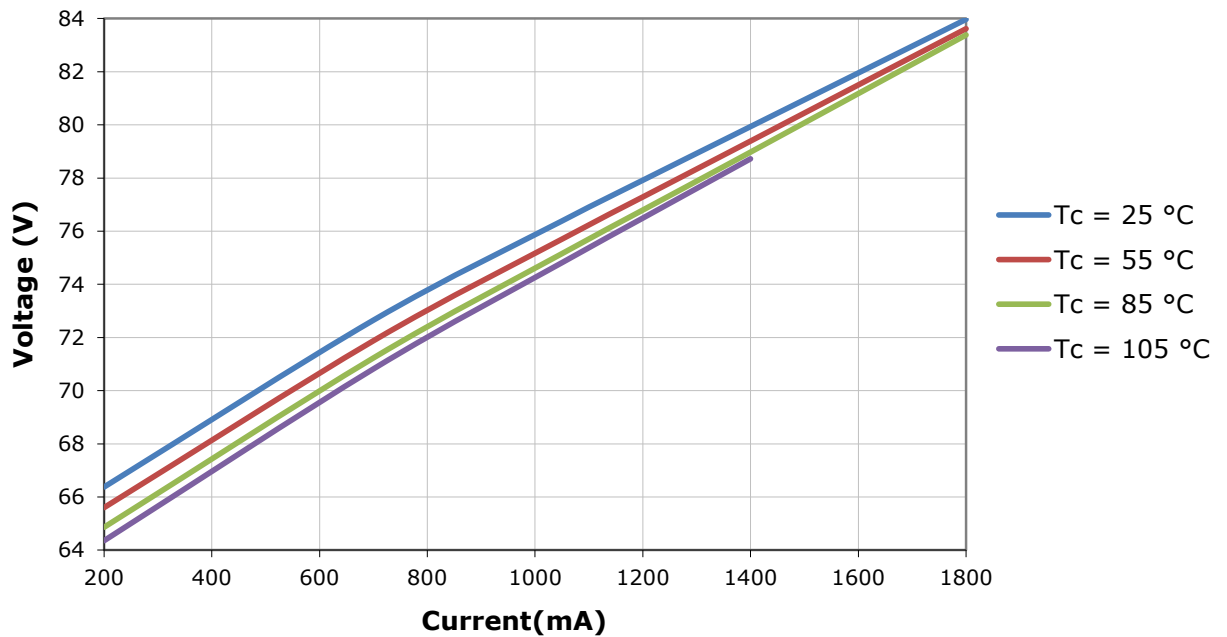
### RELATIVE SPECTRAL POWER DISTRIBUTION ( $I_f = 1200 \text{ mA}$ , $T_j = 85 \text{ }^\circ\text{C}$ )

The following graph is the result of a series of pulsed measurements at 1200 mA and  $T_j = 85 \text{ }^\circ\text{C}$ .



### ELECTRICAL CHARACTERISTICS

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

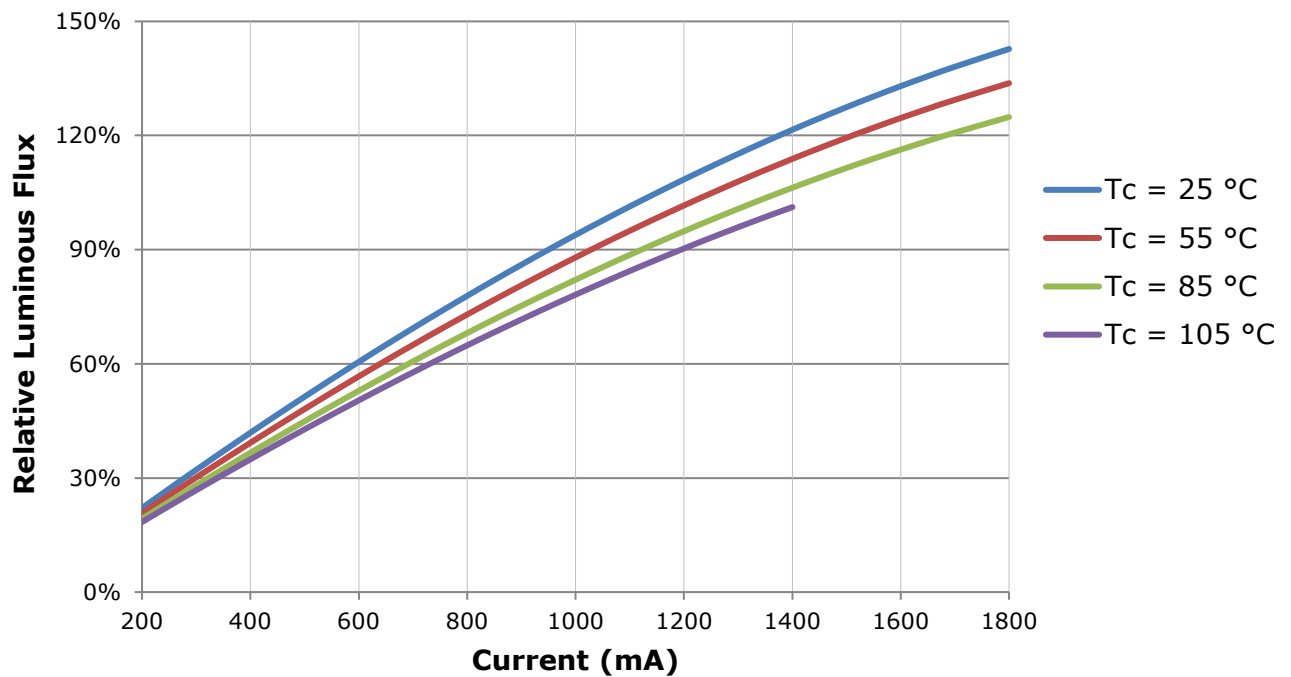


## RELATIVE LUMINOUS FLUX

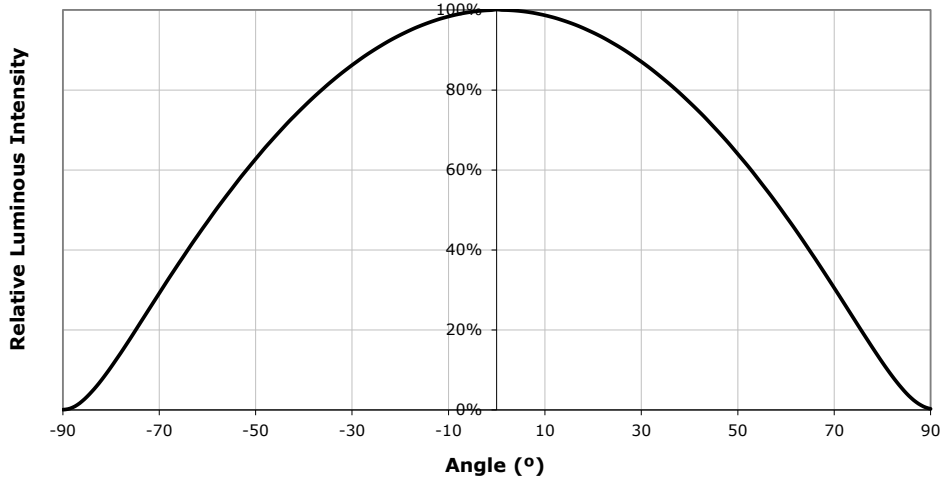
The relative luminous flux values provided below are the ratio of:

- Measurements of CXA3590 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 1200 mA at  $T_j = 85\text{ }^\circ\text{C}$ .

For example, at steady-state operation of  $T_c = 105\text{ }^\circ\text{C}$ ,  $I_f = 1200\text{ mA}$ , the relative luminous flux ratio is 90% in the chart below. A CXA3590 LED that measures 11,000 lm during binning will deliver 9,900 lm ( $11,000 \times 0.9$ ) at steady-state operation of  $T_c = 105\text{ }^\circ\text{C}$ ,  $I_f = 1200\text{ mA}$ .



**TYPICAL SPATIAL DISTRIBUTION**



**PERFORMANCE GROUPS - BRIGHTNESS ( $I_f = 1200\text{ mA}$ ,  $T_j = 85\text{ °C}$ )**

XLamp CXA3590 LEDs are tested for luminous flux and placed into one of the following bins.

Group Code	Min. Luminous Flux @ 1200 mA	Max. Luminous Flux @ 1200 mA
Y4	6,910	7,390
Z2	7,390	7,945
Z4	7,945	8,500
AB	8,500	9,000
AD	9,000	9,500
BB	9,500	10,000
BD	10,000	11,000
CB	11,000	12,000
CD	12,000	13,000



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

XLamp CXA3590 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

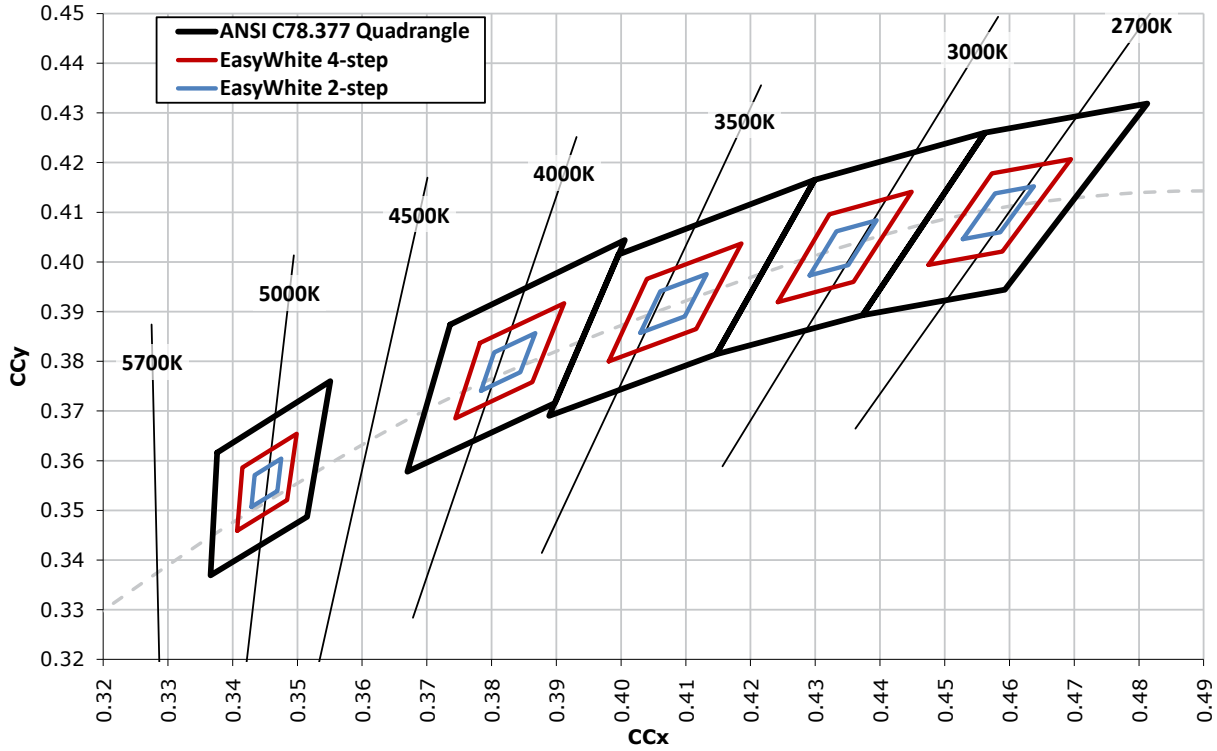
EasyWhite Color Temperatures – 4-Step			
Code	CCT	x	y
50F	5000 K	0.3407	0.3459
		0.3415	0.3586
		0.3499	0.3654
		0.3484	0.3521
40F	4000 K	0.3744	0.3685
		0.3782	0.3837
		0.3912	0.3917
		0.3863	0.3758
35F	3500 K	0.3981	0.3800
		0.4040	0.3966
		0.4186	0.4037
		0.4116	0.3865
30F	3000 K	0.4242	0.3919
		0.4322	0.4096
		0.4449	0.4141
		0.4359	0.3960
27F	2700 K	0.4475	0.3994
		0.4573	0.4178
		0.4695	0.4207
		0.4589	0.4021

EasyWhite Color Temperatures – 2-Step			
Code	CCT	x	y
50H	5000 K	0.3429	0.3507
		0.3434	0.3571
		0.3475	0.3604
		0.3469	0.3539
		0.3784	0.3741
40H	4000 K	0.3804	0.3818
		0.3867	0.3857
		0.3844	0.3778
		0.4030	0.3857
35H	3500 K	0.4061	0.3941
		0.4132	0.3976
		0.4099	0.3890
		0.4291	0.3973
30H	3000 K	0.4333	0.4062
		0.4395	0.4084
		0.4351	0.3994
		0.4528	0.4046
27H	2700 K	0.4578	0.4138
		0.4638	0.4152
		0.4586	0.4060

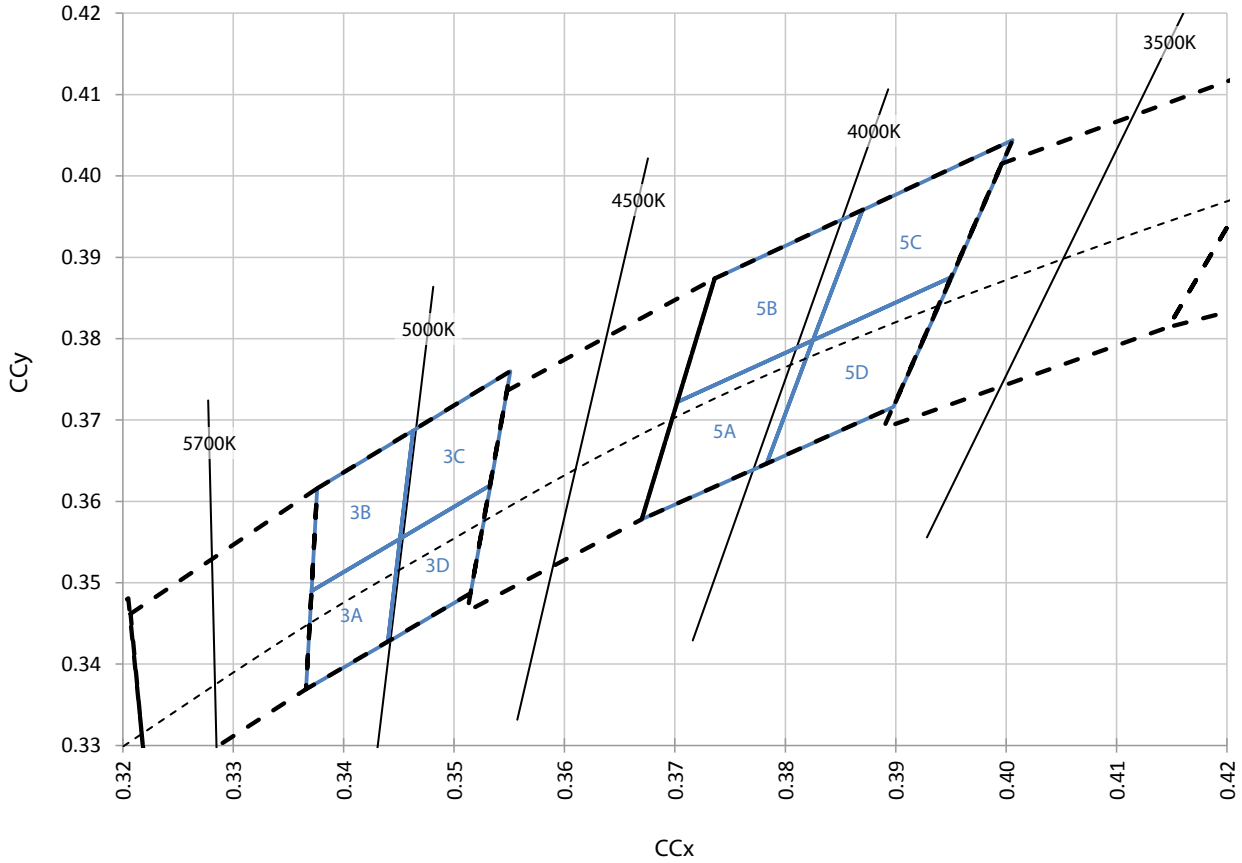
ANSI White Bins				
Code	CCT	Bin Code	x	y
0E3	5000 K	3A0	.3371	.3490
			.3451	.3554
			.3440	.3427
			.3366	.3369
		3B0	.3376	.3616
			.3463	.3687
			.3451	.3554
			.3371	.3490
		3C0	.3463	.3687
			.3551	.3760
			.3533	.3620
			.3451	.3554
		3D0	.3451	.3554
			.3533	.3620
			.3515	.3487
			.3440	.3427

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E5	4000 K	5A0	.3670	.3578
			.3702	.3722
			.3825	.3798
			.3783	.3646
		5B0	.3702	.3722
			.3736	.3874
			.3869	.3958
			.3825	.3798
		5C0	.3825	.3798
			.3869	.3958
			.4006	.4044
			.3950	.3875
		5D0	.3783	.3646
			.3825	.3798
			.3950	.3875
			.3898	.3716

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

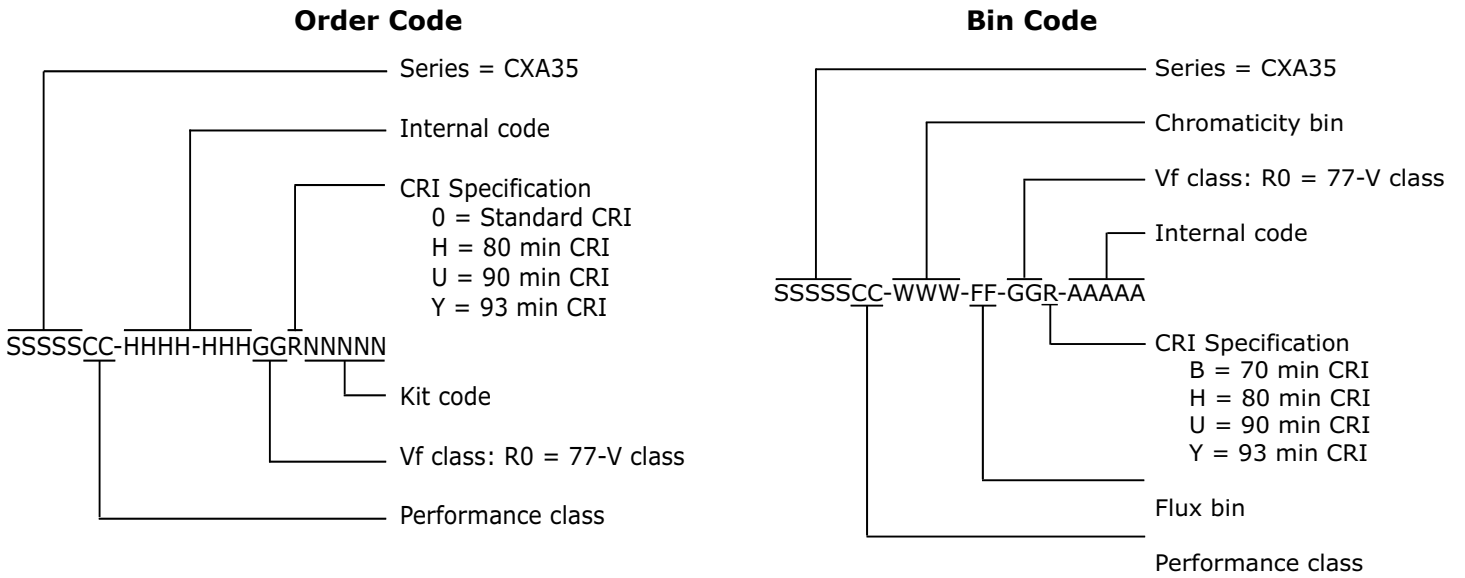


**CREE ANSI WHITE BINS PLOTTED ON THE CIE 1931 COLOR SPACE ( $T_j = 85^\circ\text{C}$ )**



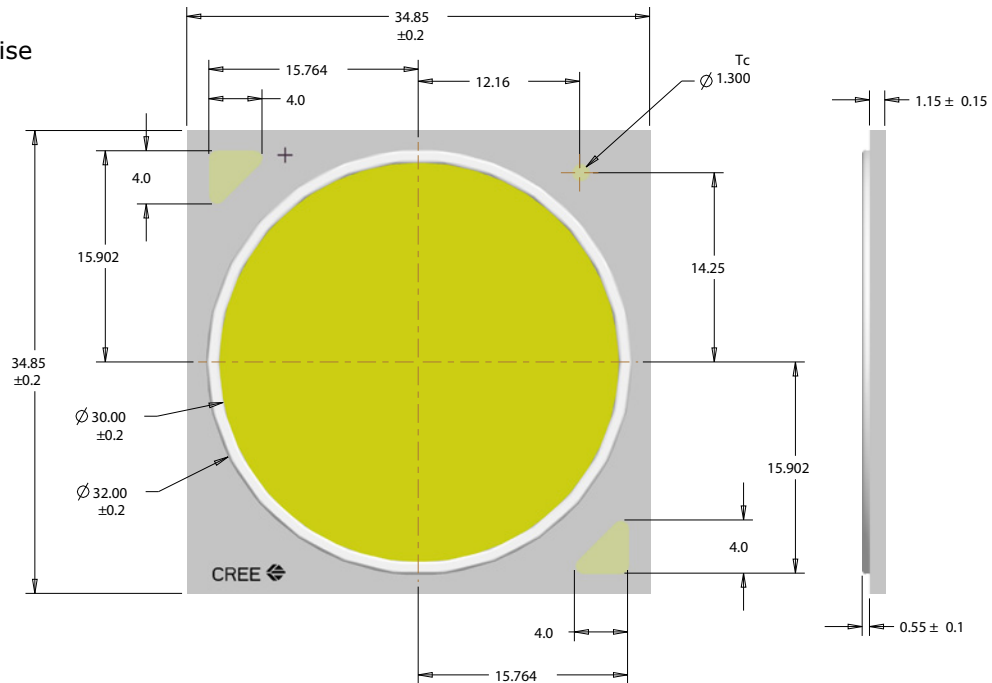
### BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows:



### MECHANICAL DIMENSIONS

Dimensions are in mm.  
 Tolerances unless otherwise specified:  
 .x ± .10  
 .xx ± .03  
 .xxx ± .010  
 x° ± 1°



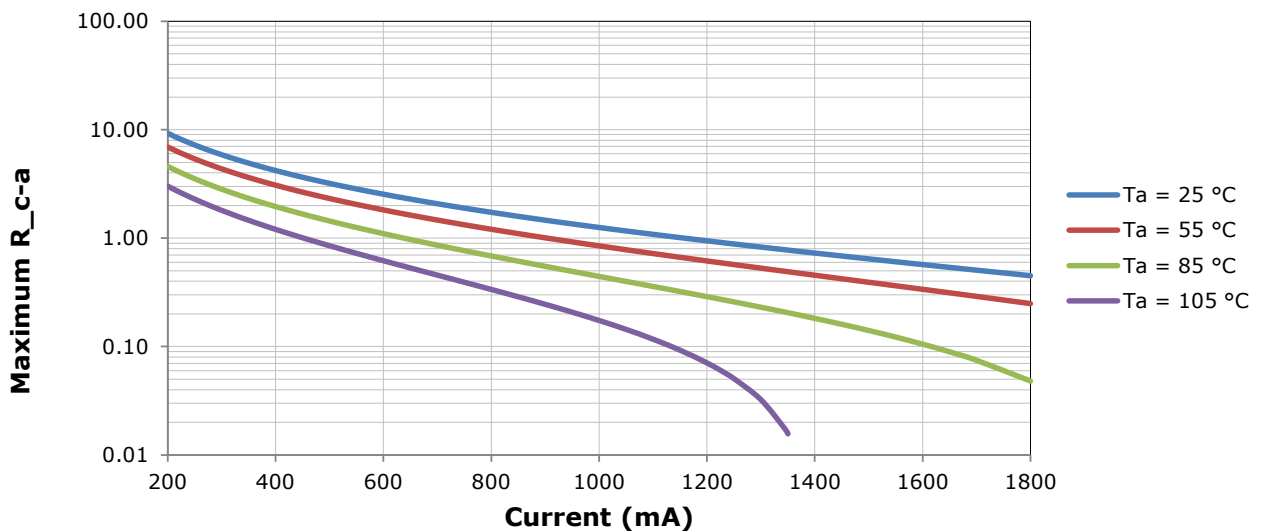
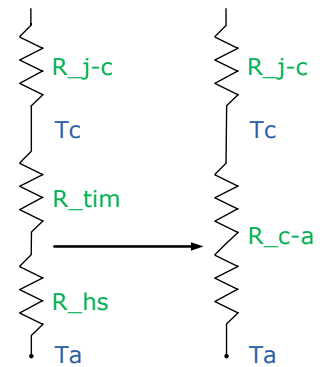
## THERMAL DESIGN

The CXA 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 the CXA LED is being operated within its designed limits. Please refer to page 2 for the Operating Limit specification.

Cree has measured the temperature at the bottom of the package, commonly referred to as the solder point ( $T_{sp}$ ), and found this value to be equivalent to the temperature at the  $T_c$  location at the top of the package once the LED has reached thermal equilibrium. 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 XLamp Thermal Management application note at [www.cree.com/xlamp\\_app\\_notes/thermal\\_management](http://www.cree.com/xlamp_app_notes/thermal_management). For CXA soldering recommendations and more information on thermal interface materials (TIM) and connection methods, please refer to the Cree XLamp CXA Family LEDs soldering and handling document at [www.cree.com/xlamp\\_app\\_notes/CXA\\_SH](http://www.cree.com/xlamp_app_notes/CXA_SH).

To keep the CXA3590 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

---

### **Lumen Maintenance Projections**

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 at [www.cree.com/xlamp\\_app\\_notes/LM80\\_results](http://www.cree.com/xlamp_app_notes/LM80_results).

Please read the XLamp Long-Term Lumen Maintenance application note at [www.cree.com/xlamp\\_app\\_notes/lumen\\_maintenance](http://www.cree.com/xlamp_app_notes/lumen_maintenance) for more details on Cree's lumen maintenance testing and forecasting. Please read the XLamp Thermal Management application note at [www.cree.com/xlamp\\_app\\_notes/thermal\\_management](http://www.cree.com/xlamp_app_notes/thermal_management) for details on how thermal design, ambient temperature, and drive current affect the LED junction temperature.

### **UL Recognized Component**

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 Claim**

Users should be cautioned not to stare at the light of this LED product. The bright light can damage the eye.

**PACKAGING**

Cree CXA3590 LEDs are packaged in trays of 10. Five trays are sealed in an anti-static bag and placed inside a carton, for a total of 50 LEDs per carton. Each carton contains 50 LEDs from the same performance bin.

Dimensions are in inches.

Tolerances:

.x ± .1

.xx ± .05

.xxx ± .005

x° ± 1°

