

Cree® XLamp® CXA2590 LED



PRODUCT DESCRIPTION

The XLamp CXA2590 expands Cree's family of High Density (HD) LED arrays, featuring a 19-mm optical source and enabling lighting manufacturers to create a new generation of products that delivers the same intensity and light quality as up to 150-W ceramic metal halide (CMH) at up to 50 percent lower power. The new HD class of CXA arrays provide unrivaled lumen density that can reduce system cost for the next generation of LED spotlights.

The CXA LED Design Guide provides basic information on the requirements to use the CXA2590 LED successfully in luminaire designs.¹

FEATURES

- Available in 4-step and 2-step EasyWhite® bins at 2700 K, 3000 K, 3500 K, 4000 K, 5000 K, 5700 K and 6500 K CCT
- Available in ANSI white bins at 4000 K, 5000 K, 5700 K and 6500 K CCT
- Available in 70-, 80- and 93-minimum CRI options
- Forward voltage: 69 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

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¹ Cree XLamp CXA LED Design Guide, Design Guide DG02, www.cree.com/xlamp_app_notes/cxa_design_guide

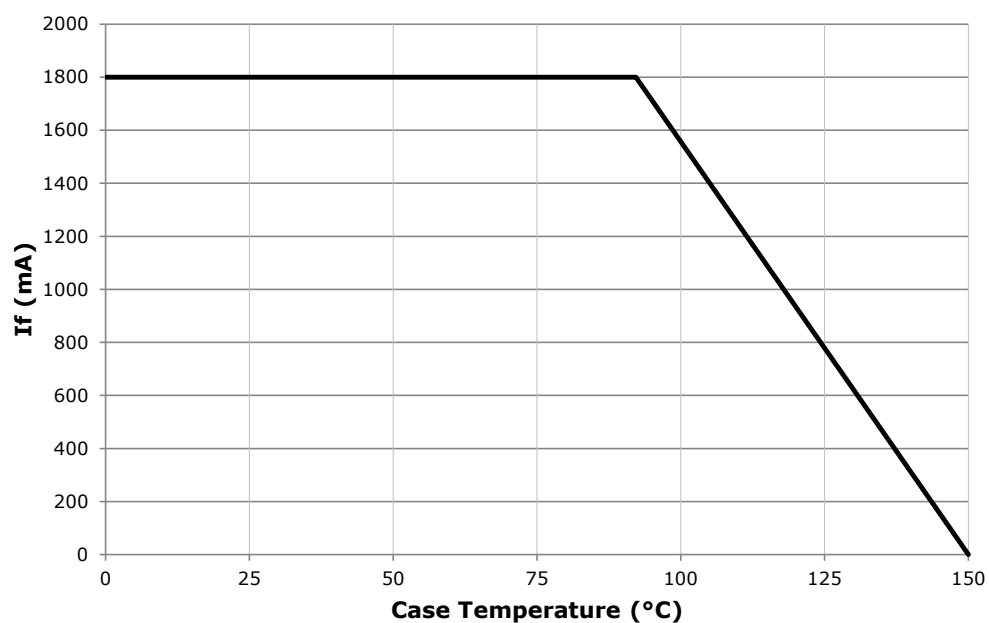
CHARACTERISTICS

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		69	
Forward voltage (@ 1200 mA, $T_j = 25\text{ }^{\circ}\text{C}$)	V			80

* Refer to the Operating Limits section.

OPERATING LIMITS

The maximum current rating of the CXA2590 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 13 for the location of the T_c measurement point.



FLUX CHARACTERISTICS, EASYWHITE ORDER CODES AND BINS ($I_F = 1200 \text{ mA}$, $T_J = 85 \text{ }^\circ\text{C}$)

The following tables provide order codes for XLamp CXA2590 LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 13).

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	
6500 K	70	75	AD	9000	9767			65F	CXA2590-0000-000R00AD65F
			BB	9500	10,310				CXA2590-0000-000R00BB65F
	80	---	AB	8500	9225			65F	CXA2590-0000-000R0HAB65F
			AD	9000	9767				CXA2590-0000-000R0HAD65F
5700 K	70	75	AD	9000	9767			57F	CXA2590-0000-000R00AD57F
			BB	9500	10,310				CXA2590-0000-000R00BB57F
	80	---	AB	8500	9225			57F	CXA2590-0000-000R0HAB57F
			AD	9000	9767				CXA2590-0000-000R0HAD57F
5000 K	70	75	AD	9000	9767	50H	CXA2590-0000-000R00AD50H	50F	CXA2590-0000-000R00AD50F
			BB	9500	10,310		CXA2590-0000-000R00BB50H		CXA2590-0000-000R00BB50F
	80	---	AB	8500	9225	50H	CXA2590-0000-000R0HAB50H	50F	CXA2590-0000-000R0HAB50F
			AD	9000	9767		CXA2590-0000-000R0HAD50H		CXA2590-0000-000R0HAD50F
4000 K	70	75	AD	9000	9767	40H	CXA2590-0000-000R00AD40H	40F	CXA2590-0000-000R00AD40F
			BB	9500	10,310		CXA2590-0000-000R00BB40H		CXA2590-0000-000R00BB40F
	80	---	Z4	7945	8020	40H	CXA2590-0000-000R0HZ440H	40F	CXA2590-0000-000R0HZ440F
			AB	8500	9225		CXA2590-0000-000R0HAB40H		CXA2590-0000-000R0HAB40F
3500 K	80	---	AD	9000	9767	40H	CXA2590-0000-000R0HAD40H	40F	CXA2590-0000-000R0HAD40F
	93	95	Z4	7945	8020	35H	CXA2590-0000-000R00Z435H	35F	CXA2590-0000-000R00Z435F
			AB	8500	9225		CXA2590-0000-000R00AB35H		CXA2590-0000-000R00AB35F
3000 K	80	---	X4	6010	6522	35H	CXA2590-0000-000R0YX435H	35F	CXA2590-0000-000R0YX435F
			Y2	6430	6978		CXA2590-0000-000R0YY235H		CXA2590-0000-000R0YY235F
	93	95	Y4	6910	7499	30H	CXA2590-0000-000R00Y430H	30F	CXA2590-0000-000R00Y430F
			Z2	7390	8020		CXA2590-0000-000R00Z230H		CXA2590-0000-000R00Z230F
3000 K	80	---	Z4	7945	8622	30H	CXA2590-0000-000R00Z430H	30F	CXA2590-0000-000R00Z430F
	93	95	X2	5590	6067	30H	CXA2590-0000-000R0YX230H	30F	CXA2590-0000-000R0YX230F
			X4	6010	6522		CXA2590-0000-000R0YX430H		CXA2590-0000-000R0YX430F
3000 K	93	95	Y2	6430	6978	30H	CXA2590-0000-000R0YY230H	30F	CXA2590-0000-000R0YY230F

Notes

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ± 2 on CRI measurements.
- * Flux values @ 25 °C are calculated and for reference only.

FLUX CHARACTERISTICS, EASYWHITE ORDER CODES AND BINS ($I_f = 1200 \text{ mA}$, $T_j = 85 \text{ }^\circ\text{C}$) - 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	---	Y4	6910	7499	27H	CXA2590-0000-000R00Y427H	27F	CXA2590-0000-000R00Y427F
			Z2	7390	8020		CXA2590-0000-000R00Z227H		CXA2590-0000-000R00Z227F
			Z4	7945	8622		CXA2590-0000-000R00Z427H		CXA2590-0000-000R00Z427F
	93	95	X2	5590	6067	27H	CXA2590-0000-000R0YX227H	27F	CXA2590-0000-000R0YX227F
			X4	6010	6522		CXA2590-0000-000R0YX427H		CXA2590-0000-000R0YX427F

Notes

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ± 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 CXA2590 LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 13).

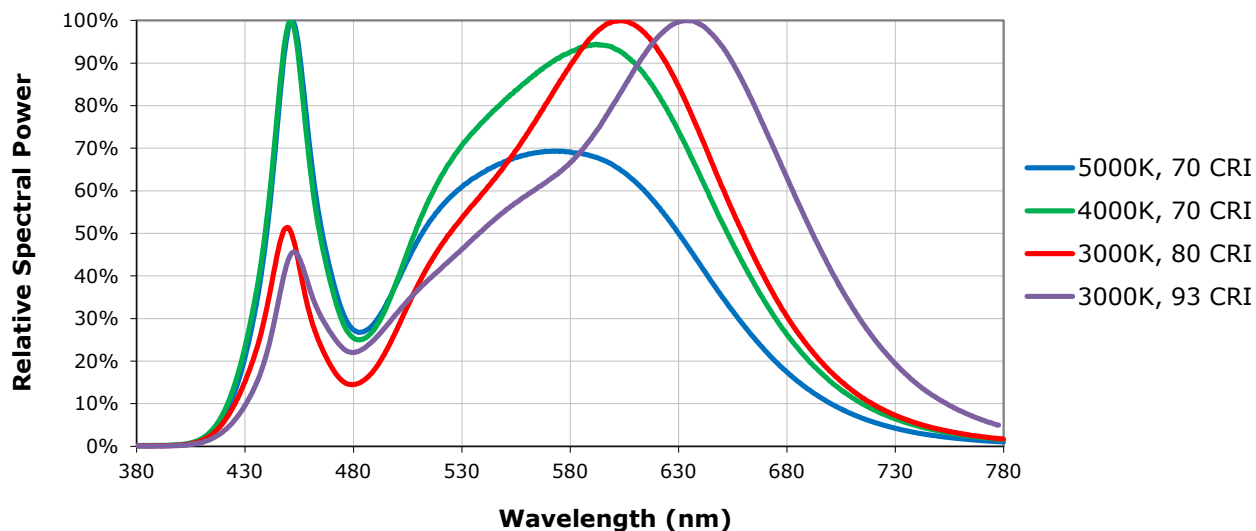
CCT Range	CRI		Base Order Codes Min. Luminous Flux @ 1200 mA			Chromaticity Regions	Order Code	
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*			
6500 K	70	75	AD	9000	9767	1A0, 1B0, 1C0, 1D0	CXA2590-0000-000R00AD0E1	
			BB	9500	10,310		CXA2590-0000-000R00BB0E1	
	80	---	AB	8500	9225	1A0, 1B0, 1C0, 1D0	CXA2590-0000-000R0HAB0E1	
			AD	9000	9767		CXA2590-0000-000R0HAD0E1	
5700 K	70	75	AD	9000	9767	2A0, 2B0, 2C0, 2D0	CXA2590-0000-000R00AD0E2	
			BB	9500	10,310		CXA2590-0000-000R00BB0E2	
	80	---	AB	8500	9225	2A0, 2B0, 2C0, 2D0	CXA2590-0000-000R0HAB0E2	
			AD	9000	9767		CXA2590-0000-000R0HAD0E2	
5000 K	70	75	AD	9000	9767	3A0, 3B0, 3C0, 3D0	CXA2590-0000-000R00AD0E3	
			BB	9500	10,310		CXA2590-0000-000R00BB0E3	
	80	---	AB	8500	9225	3A0, 3B0, 3C0, 3D0	CXA2590-0000-000R0HAB0E3	
			AD	9000	9767		CXA2590-0000-000R0HAD0E3	
4000 K	70	75	AD	9000	9767	5A0, 5B0, 5C0, 5D0	CXA2590-0000-000R00AD0E5	
			BB	9500	10,310		CXA2590-0000-000R00BB0E5	
	80	---	Z4	7945	8020	5A0, 5B0, 5C0, 5D0	CXA2590-0000-000R0HZ40E5	
			AB	8500	9225		CXA2590-0000-000R0HAB0E5	
			AD	9000	9767		CXA2590-0000-000R0HAD0E5	
							CXA2590-0000-000R0HAD0E5	

Notes

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ± 2 on CRI measurements.
- * Flux values @ 25 °C are calculated and for reference only.

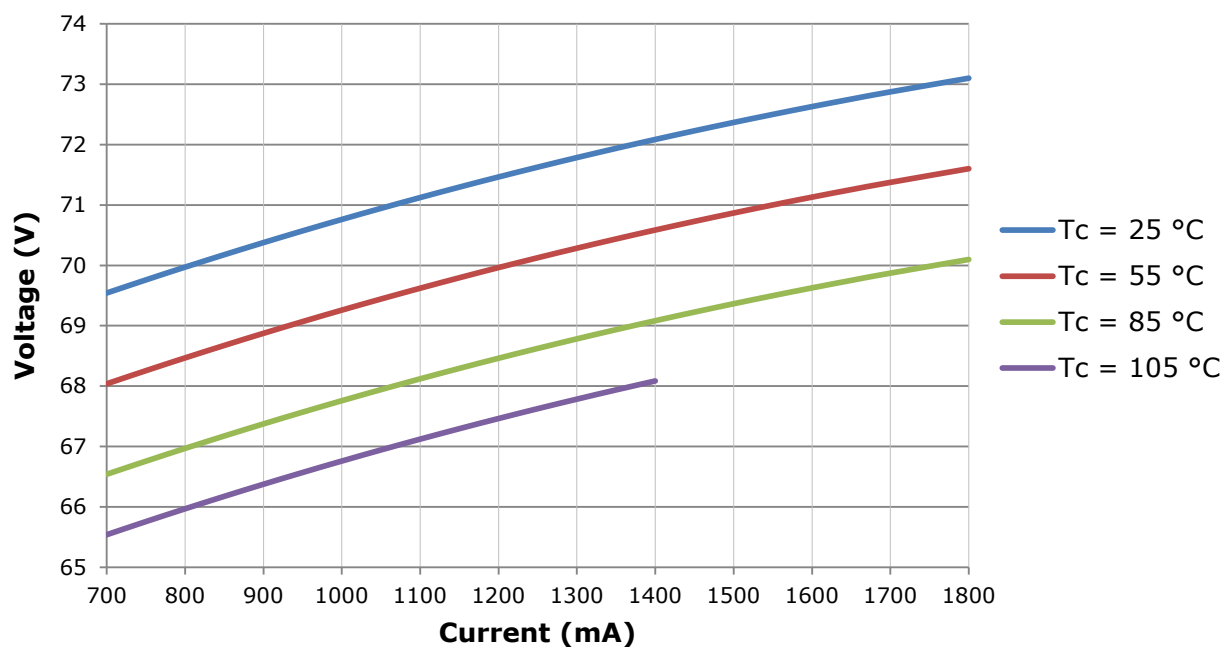
RELATIVE SPECTRAL POWER DISTRIBUTION ($I_F = 1200 \text{ mA}$, $T_J = 85^\circ\text{C}$)

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



ELECTRICAL CHARACTERISTICS

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

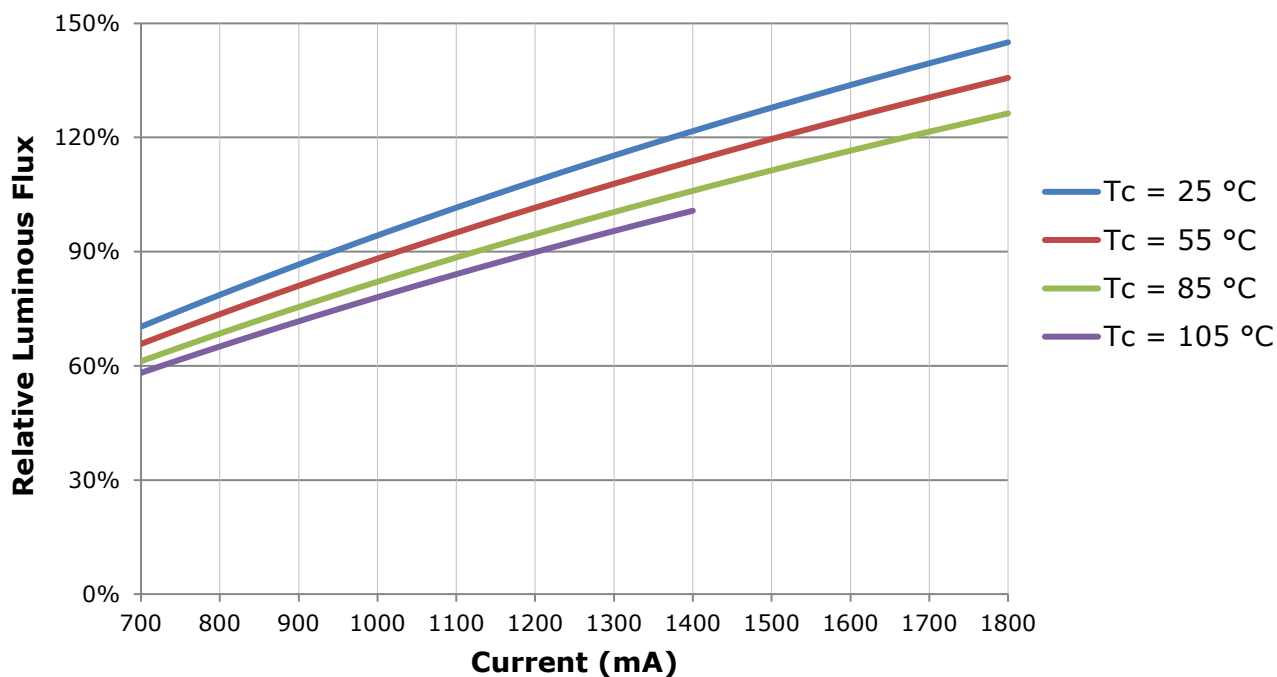


RELATIVE LUMINOUS FLUX

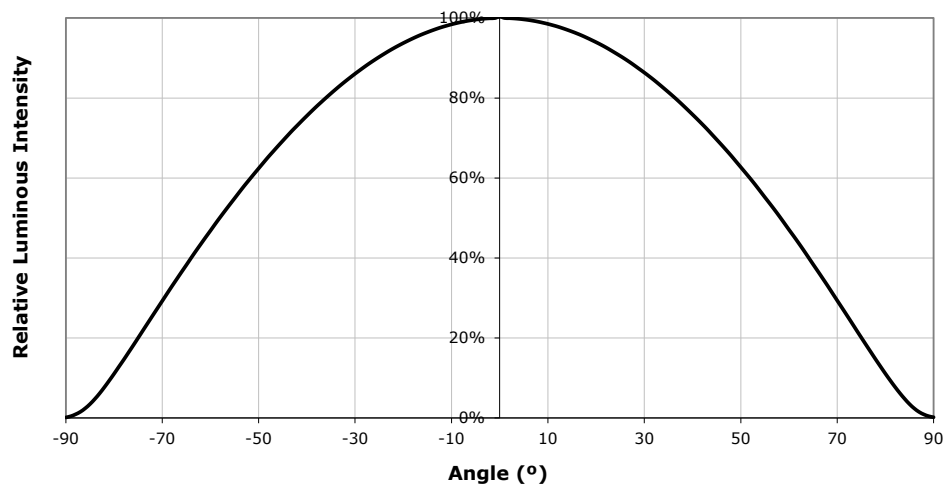
The relative luminous flux values provided below are the ratio of:

- Measurements of CXA2590 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 1200 mA at $T_j = 85^\circ\text{C}$.

For example, at steady-state operation of $T_c = 105^\circ\text{C}$, $I_f = 1200\text{ mA}$, the relative luminous flux ratio is 90% in the chart below. A CXA2590 LED that measures 11,000 lm during binning will deliver 9,900 lm ($11,000 \times 0.9$) at steady-state operation of $T_c = 105^\circ\text{C}$, $I_f = 1200\text{ mA}$.



TYPICAL SPATIAL DISTRIBUTION



PERFORMANCE GROUPS - BRIGHTNESS ($I_F = 1200\text{ mA}$, $T_J = 85\text{ °C}$)

XLamp CXA2590 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
X2	5,590	6,010
X4	6,010	6,430
Y2	6,430	6,910
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

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

XLamp CXA2590 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
65F	6500 K	0.3253	0.3325
		0.3249	0.3439
		0.3331	0.3514
		0.3330	0.3393
57F	5700 K	0.3097	0.3196
		0.3079	0.3297
		0.3164	0.3382
		0.3176	0.3275
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
40H	4000 K	0.3784	0.3741
		0.3804	0.3818
		0.3867	0.3857
		0.3844	0.3778
35H	3500 K	0.4030	0.3857
		0.4061	0.3941
		0.4132	0.3976
		0.4099	0.3890
30H	3000 K	0.4291	0.3973
		0.4333	0.4062
		0.4395	0.4084
		0.4351	0.3994
27H	2700 K	0.4528	0.4046
		0.4578	0.4138
		0.4638	0.4152
		0.4586	0.4060

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

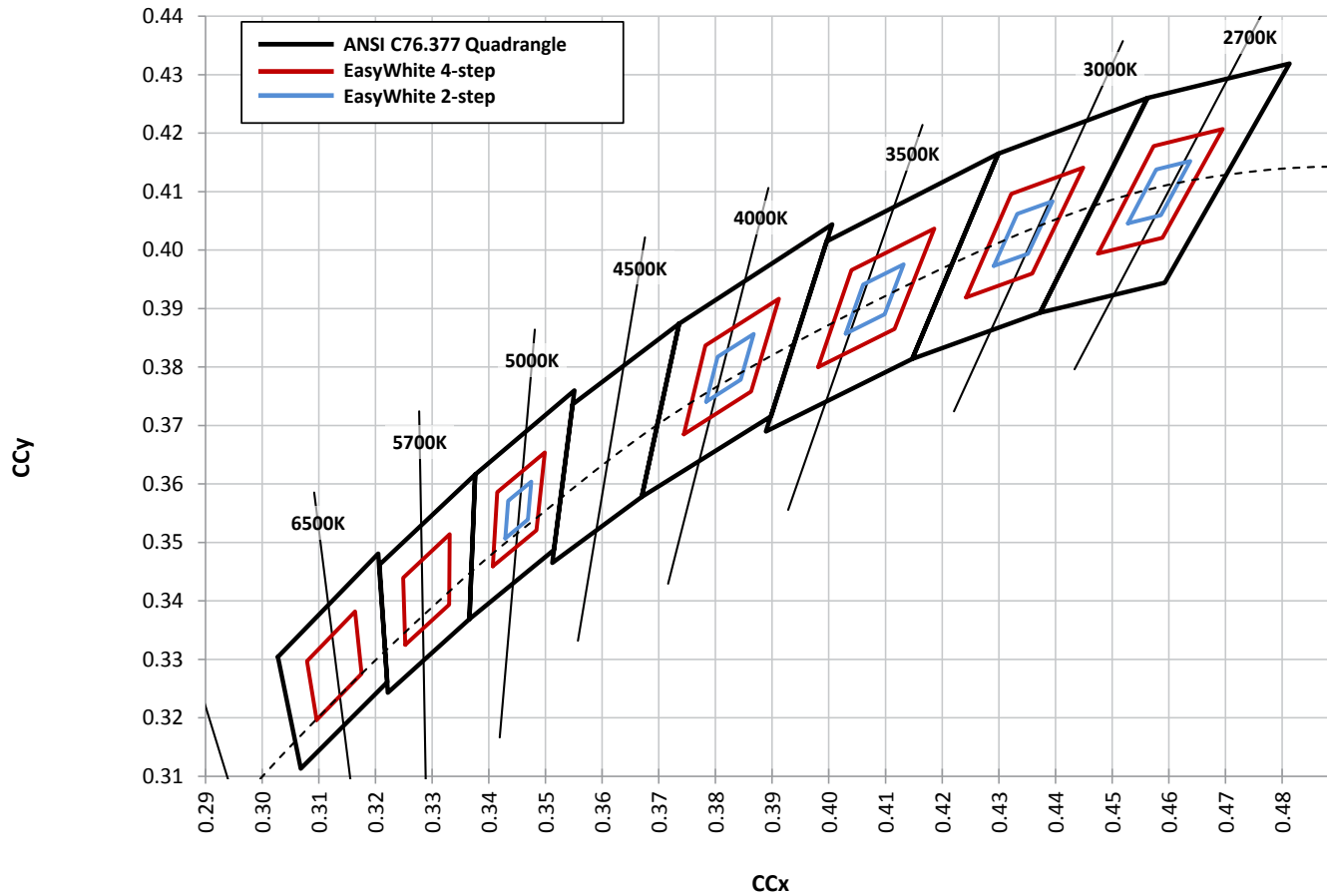
ANSI White Bins				
Code	CCT	Bin Code	x	y
0E1	6500 K	1A0	0.3048	0.3207
			0.3130	0.3290
			0.3144	0.3186
			0.3068	0.3113
		1B0	0.3028	0.3304
			0.3115	0.3391
			0.3130	0.3290
			0.3048	0.3207
		1C0	0.3115	0.3391
			0.3205	0.3481
			0.3213	0.3373
			0.3130	0.3290
		1D0	0.3130	0.3290
			0.3213	0.3373
			0.3221	0.3261
			0.3144	0.3186

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E2	5700 K	2A0	0.3215	0.3350
			0.3290	0.3417
			0.3290	0.3300
			0.3222	0.3243
		2B0	0.3207	0.3462
			0.3290	0.3538
			0.3290	0.3417
			0.3215	0.3350
		2C0	0.3290	0.3538
			0.3376	0.3616
			0.3371	0.3490
			0.3290	0.3417
		2D0	0.3290	0.3417
			0.3371	0.3490
			0.3366	0.3369
			0.3290	0.3300

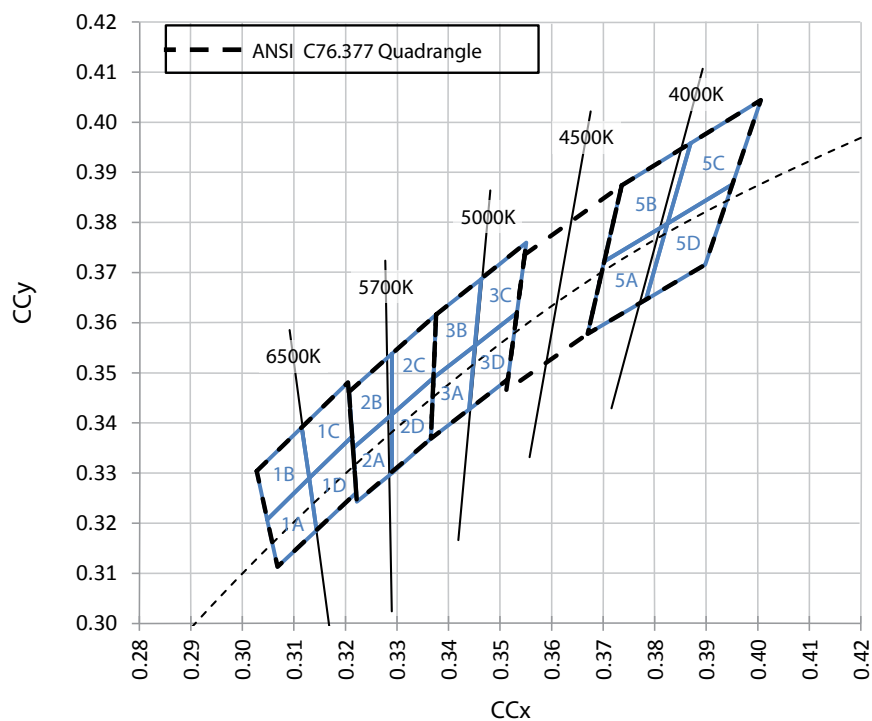
ANSI White Bins				
Code	CCT	Bin Code	x	y
0E3	5000 K	3A0	0.3371	0.3490
			0.3451	0.3554
			0.3440	0.3427
			0.3366	0.3369
		3B0	0.3376	0.3616
			0.3463	0.3687
			0.3451	0.3554
			0.3371	0.3490
		3C0	0.3463	0.3687
			0.3551	0.3760
			0.3533	0.3620
			0.3451	0.3554
		3D0	0.3451	0.3554
			0.3533	0.3620
			0.3515	0.3487
			0.3440	0.3427

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E5	4000 K	5A0	0.3670	0.3578
			0.3702	0.3722
			0.3825	0.3798
			0.3783	0.3646
		5B0	0.3702	0.3722
			0.3736	0.3874
			0.3869	0.3958
			0.3825	0.3798
		5C0	0.3825	0.3798
			0.3869	0.3958
			0.4006	0.4044
			0.3950	0.3875
		5D0	0.3783	0.3646
			0.3825	0.3798
			0.3950	0.3875
			0.3898	0.3716

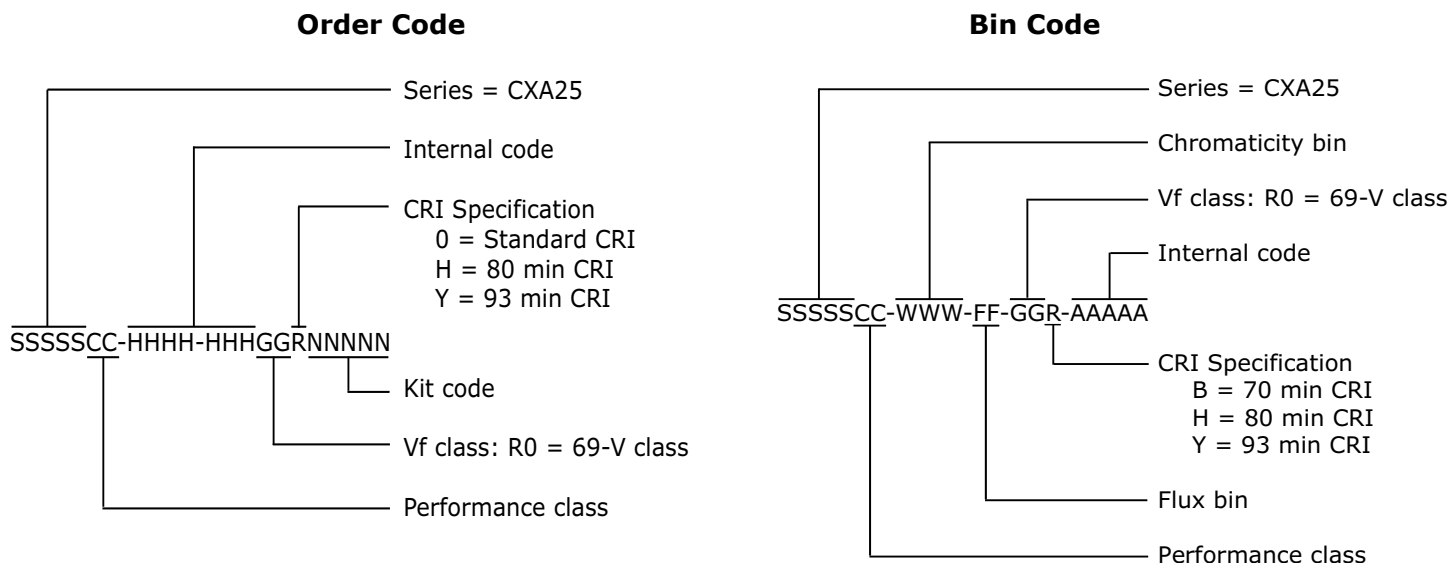
CREE EASYWHITE BINS PLOTTED ON THE CIE 1931 COLOR SPACE ($T_j = 85^\circ\text{C}$)



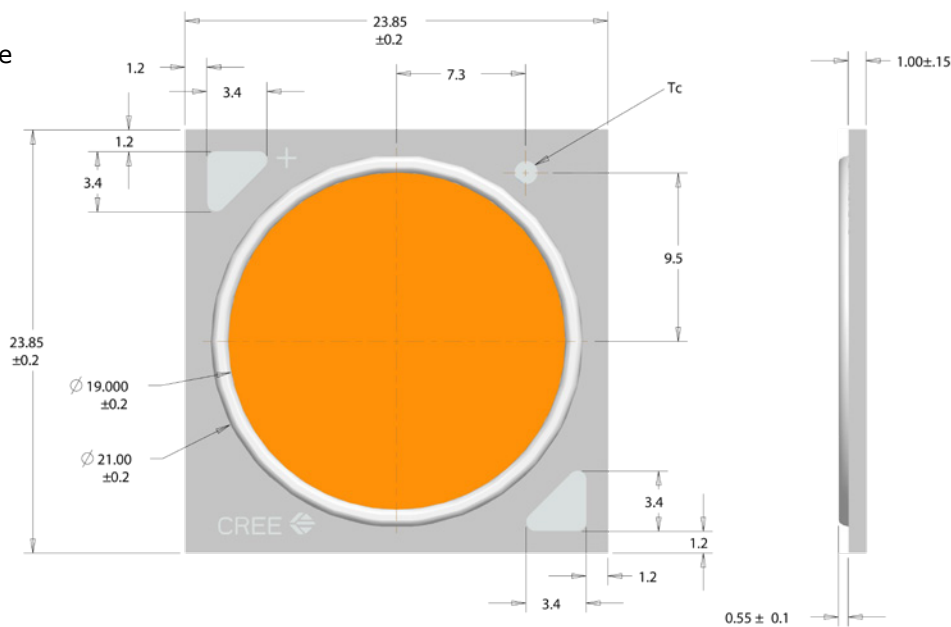
CREE ANSI WHITE BINS PLOTTED ON THE CIE 1931 COLOR SPACE ($T_j = 85\text{ }^{\circ}\text{C}$)



Bin codes and order codes are configured as follows:



Dimensions are in mm.
Tolerances unless otherwise specified:

$$\begin{aligned} &.x \pm .10 \\ &.xx \pm .03 \\ &.xxx \pm .010 \\ &x^\circ \pm 1^\circ \end{aligned}$$


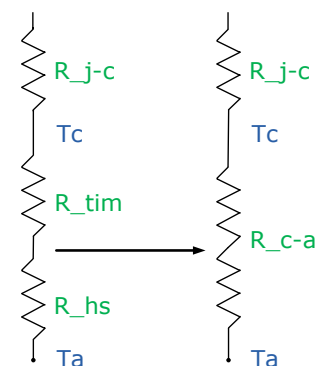
THERMAL DESIGN

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.

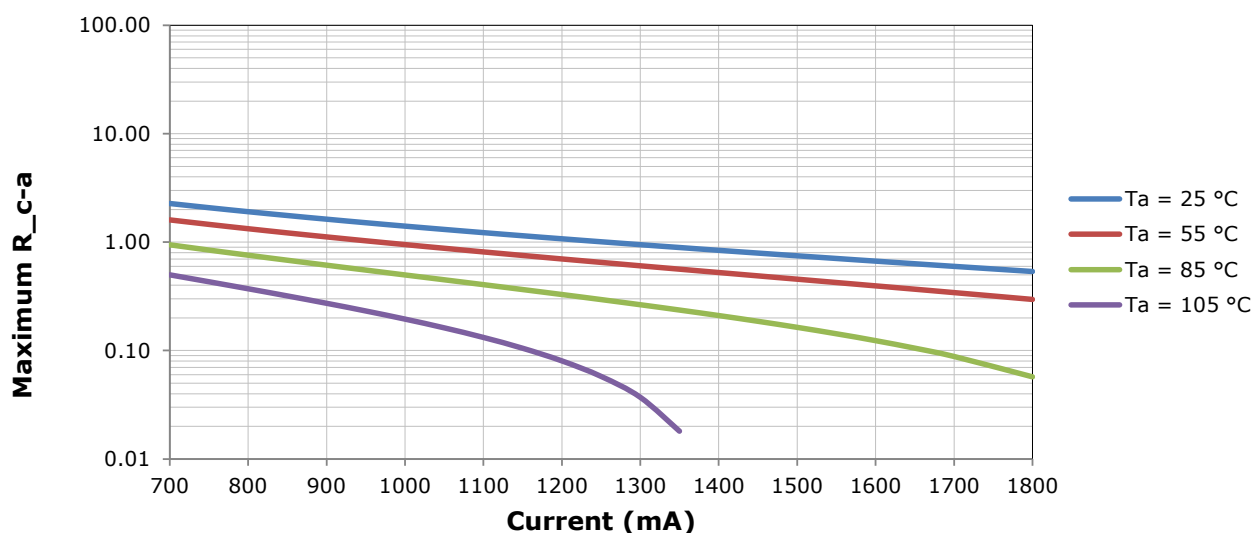
Cree has measured the temperature at the bottom of the package, commonly referred to as the solder point (T_{sp}), and found this value to be equivalent to the temperature at the T_c location at the top of the package once the LED has reached thermal equilibrium. There is no need to calculate for T_j 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. 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.

To keep the CXA2590 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}).



CXA2



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.

Please read the XLamp Long-Term Lumen Maintenance application note at 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 for details on how thermal design, ambient temperature, and drive current affect the LED junction temperature.

Vision Advisory Claim

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

Cree CXA2590 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.

