PRELIMINARY

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-, 90- and 93-minimum CRI options
- Forward voltage: 70 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

TABLE OF CONTENTS

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

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

PRELIMINARY

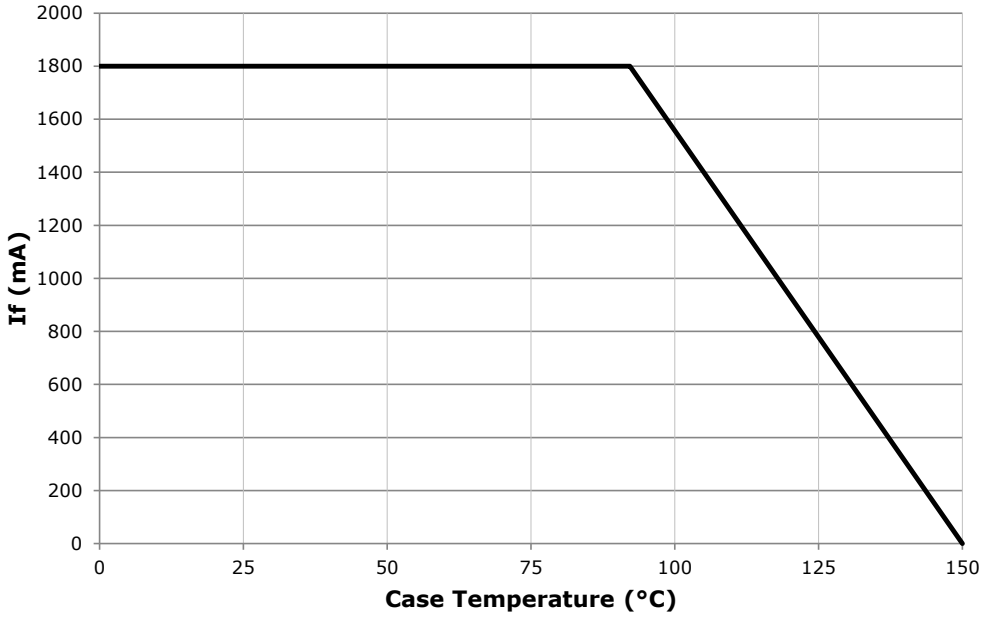
CHARACTERISTICS

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 °C)	V		70	
Forward voltage (@ 1200 mA, T_j = 25 °C)	V			84

* Refer to the Operating Limits section.

OPERATING LIMITS

The maximum current rating of the CXA2590 is dependent on the case temperature (Tc) 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 Tc measurement point.



PRELIMINARY

FLUX CHARACTERISTICS, EASYWHITE ORDER CODES AND BINS (I_F = 1200 mA, T_J = 85 °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 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	
6500 K	70	75	Z4	7945	8559			65F	CXA2590-0000-000R00Z465F
			AB	8500	9157				CXA2590-0000-000R00AB65F
	80	---	Z2	7390	7961			65F	CXA2590-0000-000R0HZ265F
			Z4	7945	8559				CXA2590-0000-000R0HZ465F
5700 K	70	75	Z4	7945	8559			57F	CXA2590-0000-000R00Z457F
			AB	8500	9157				CXA2590-0000-000R00AB57F
	80	---	Z2	7390	7961			57F	CXA2590-0000-000R0HZ257F
			Z4	7945	8559				CXA2590-0000-000R0HZ457F
5000 K	70	75	Z4	7945	8559	50H	CXA2590-0000-000R00Z450H	50F	CXA2590-0000-000R00Z450F
			AB	8500	9157		CXA2590-0000-000R00AB50H		CXA2590-0000-000R00AB50F
	80	---	Z2	7390	7961	50H	CXA2590-0000-000R0HZ250H	50F	CXA2590-0000-000R0HZ250F
			Z4	7945	8559		CXA2590-0000-000R0HZ450H		CXA2590-0000-000R0HZ450F
	90	95	X2	5590	6022	50H	CXA2590-0000-000R0UX250H	50F	CXA2590-0000-000R0UX250F
			X4	6010	6575		CXA2590-0000-000R0UX450H		CXA2590-0000-000R0UX450F
4000 K	70	75	Z4	7945	8559	40H	CXA2590-0000-000R00Z440H	40F	CXA2590-0000-000R00Z440F
			AB	8500	9157		CXA2590-0000-000R00AB40H		CXA2590-0000-000R00AB40F
	80	---	Z2	7390	7961	40H	CXA2590-0000-000R0HZ240H	40F	CXA2590-0000-000R0HZ240F
			Z4	7945	8559		CXA2590-0000-000R0HZ440H		CXA2590-0000-000R0HZ440F
			AB	8500	9157		CXA2590-0000-000R0HAB40H		CXA2590-0000-000R0HAB40F
	90	95	X2	5590	6022	40H	CXA2590-0000-000R0UX240H	40F	CXA2590-0000-000R0UX240F
			X4	6010	6475		CXA2590-0000-000R0UX440H		CXA2590-0000-000R0UX440F
3500 K	80	---	Y4	6910	7444	35H	CXA2590-0000-000R00Y435H	35F	CXA2590-0000-000R00Y435F
			Z2	7390	7961		CXA2590-0000-000R00Z235H		CXA2590-0000-000R00Z235F
			Z4	7945	8559		CXA2590-0000-000R00Z435H		CXA2590-0000-000R00Z435F
	93	95	W4	5225	5629	35H	CXA2590-0000-000R0YW435H	35F	CXA2590-0000-000R0YW435F
			X2	5590	6022		CXA2590-0000-000R0YX235H		CXA2590-0000-000R0YX235F

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.

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

PRELIMINARY

FLUX CHARACTERISTICS, EASYWHITE ORDER CODES AND BINS (I_F = 1200 mA, T_J = 85 °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	
3000 K	80	---	Y4	6910	7444	30H	CXA2590-0000-000R00Y430H	30F	CXA2590-0000-000R00Y430F
			Z2	7390	7961		CXA2590-0000-000R00Z230H		CXA2590-0000-000R00Z230F
			Z4	7945	8559		CXA2590-0000-000R00Z430H		CXA2590-0000-000R00Z430F
	93	95	W4	5225	5629	30H	CXA2590-0000-000R0YW430H	30F	CXA2590-0000-000R0YW430F
			X2	5590	6022		CXA2590-0000-000R0YX230H		CXA2590-0000-000R0YX230F
2700 K	80	---	Y2	6430	6927	27H	CXA2590-0000-000R00Y227H	27F	CXA2590-0000-000R00Y227F
			Y4	6910	7444		CXA2590-0000-000R00Y427H		CXA2590-0000-000R00Y427F
			Z2	7390	7961		CXA2590-0000-000R00Z227H		CXA2590-0000-000R00Z227F
	93	95	W2	4860	5236	27H	CXA2590-0000-000R0YW227H	27F	CXA2590-0000-000R0YW227F
			W4	5225	5629		CXA2590-0000-000R0YW427H		CXA2590-0000-000R0YW427F

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.

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

PRELIMINARY

FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS (I_F = 1200 mA, T_J = 85 °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 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*		
6500 K	70	75	Z4	7945	8559	1A0, 1B0, 1C0, 1D0	CXA2590-0000-000R00Z40E1
			AB	8500	9157		CXA2590-0000-000R00AB0E1
	80	---	Z2	7390	7961	1A0, 1B0, 1C0, 1D0	CXA2590-0000-000R00Z20E1
			Z4	7945	8559		CXA2590-0000-000R00Z40E1
5700 K	70	75	Z4	7945	8559	2A0, 2B0, 2C0, 2D0	CXA2590-0000-000R00Z40E2
			AB	8500	9157		CXA2590-0000-000R00AB0E2
	80	---	Z2	7390	7961	2A0, 2B0, 2C0, 2D0	CXA2590-0000-000R00Z20E2
			Z4	7945	8559		CXA2590-0000-000R00Z40E2
5000 K	70	75	Z4	7945	8559	3A0, 3B0, 3C0, 3D0	CXA2590-0000-000R00Z40E3
			AB	8500	9157		CXA2590-0000-000R00AB0E3
	80	---	Z2	7390	7961	3A0, 3B0, 3C0, 3D0	CXA2590-0000-000R0HZ20E3
			Z4	7945	8559		CXA2590-0000-000R0HZ40E3
	90	95	X2	5590	6022	3A0, 3B0, 3C0, 3D0	CXA2590-0000-000R0UX20E3
			X4	6010	6575		CXA2590-0000-000R0UX40E3
4000 K	70	75	Z4	7945	8559	5A0, 5B0, 5C0, 5D0	CXA2590-0000-000R00Z40E5
			AB	8500	9157		CXA2590-0000-000R00AB0E5
	80	---	Z2	7390	7961	5A0, 5B0, 5C0, 5D0	CXA2590-0000-000R0HZ20E5
			Z4	7945	8559		CXA2590-0000-000R0HZ40E5
			AB	8500	9157		CXA2590-0000-000R0HAB0E5
	90	95	X2	5590	6022	5A0, 5B0, 5C0, 5D0	CXA2590-0000-000R0UX20E5
			X4	6010	6475		CXA2590-0000-000R0UX40E5

Notes

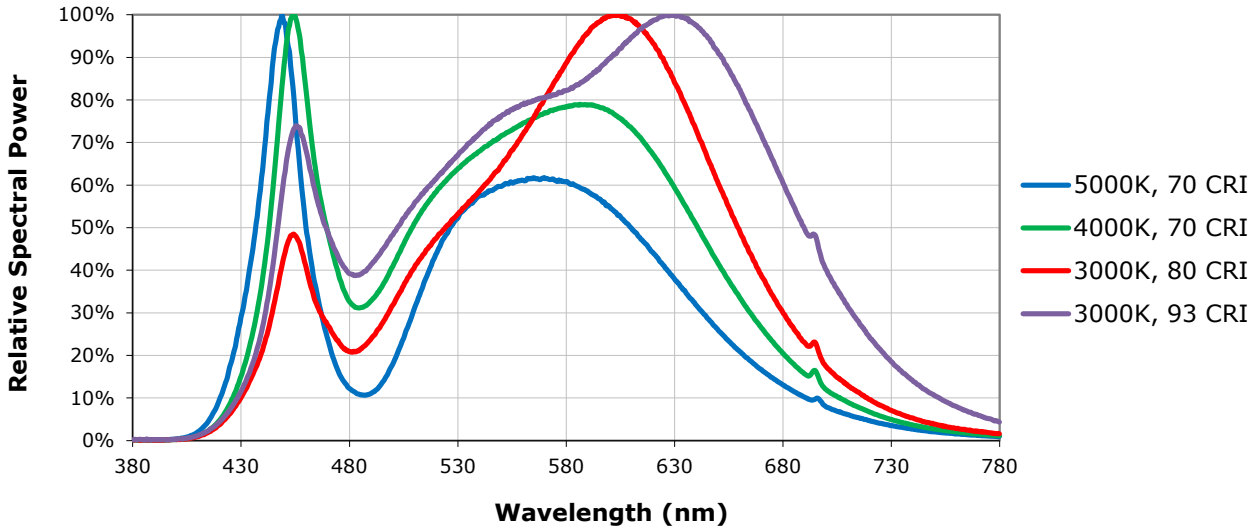
- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ±2 on CRI measurements.

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

PRELIMINARY

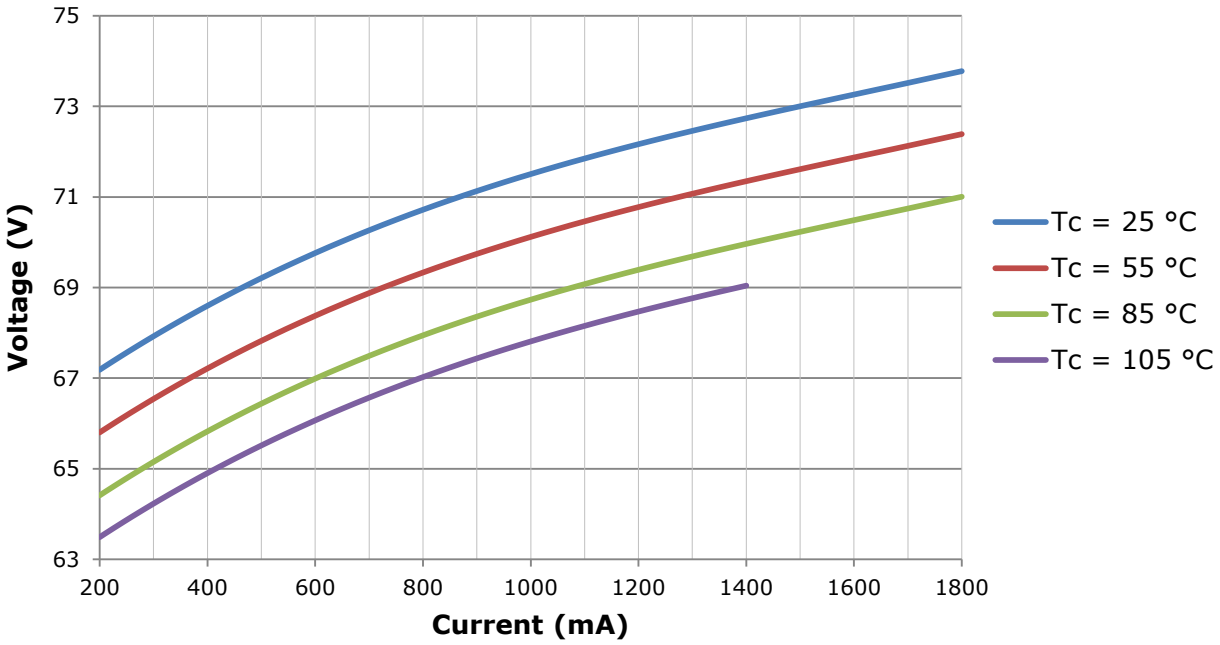
RELATIVE SPECTRAL POWER DISTRIBUTION (I_F = 1200 mA, T_J = 85 °C)

The following graph is the result of a series of pulsed measurements at 1200 mA and T_J = 85 °C.



ELECTRICAL CHARACTERISTICS

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



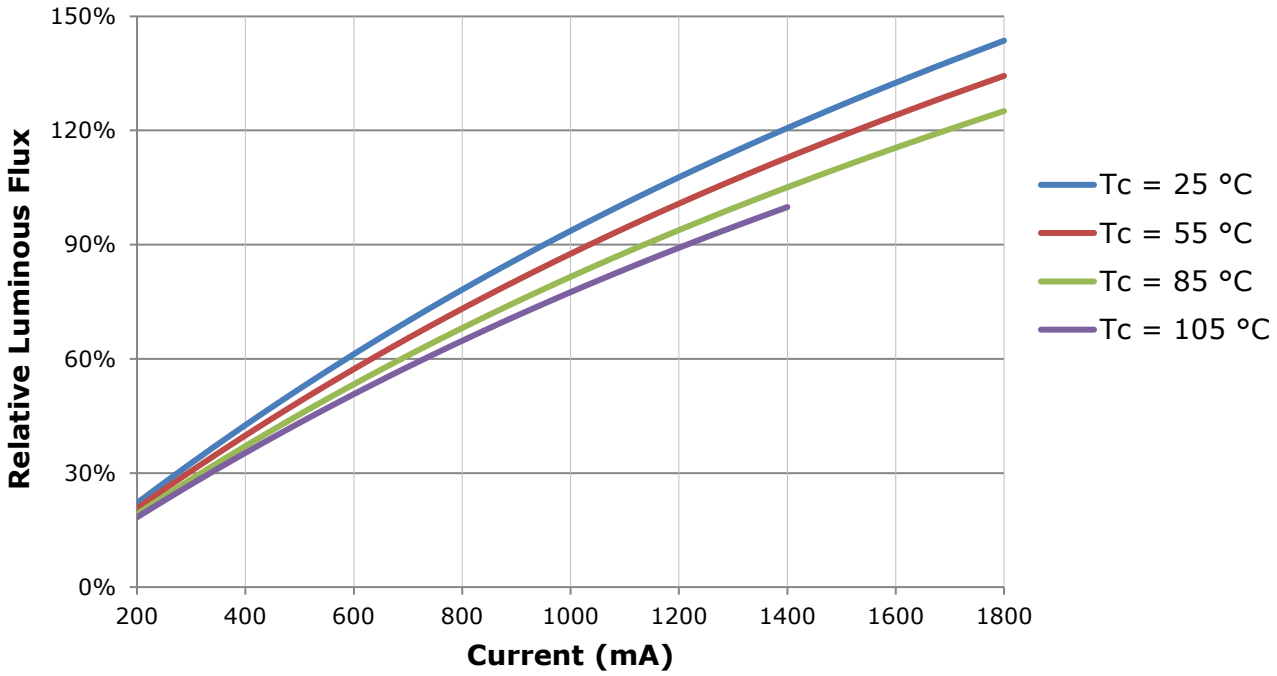
PRELIMINARY

RELATIVE LUMINOUS FLUX

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

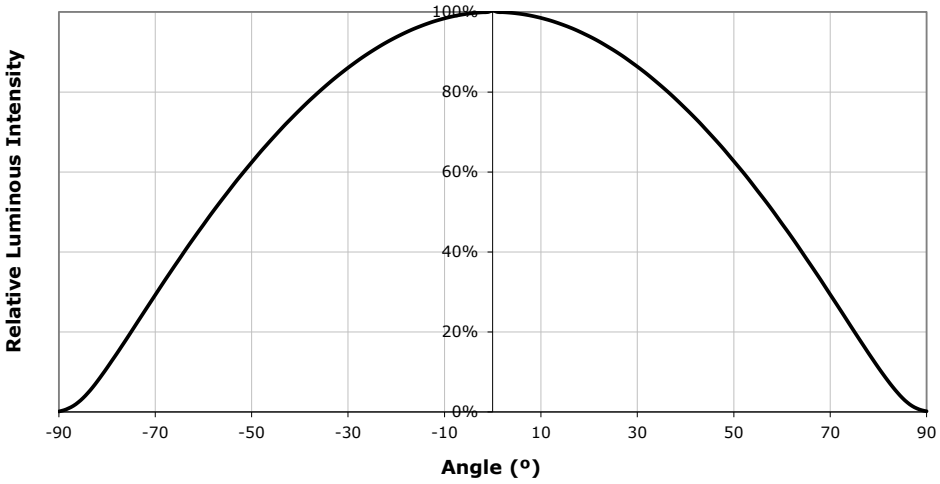
- Measurements of CXA2590 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 1200 mA at T_J = 85 °C.

For example, at steady-state operation of Tc = 105 °C, I_F = 1200 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 * 0.9) at steady-state operation of Tc = 105 °C, I_F = 1200 mA.



PRELIMINARY

TYPICAL SPATIAL DISTRIBUTION



PERFORMANCE GROUPS - BRIGHTNESS (I_F = 1200 mA, T_J = 85 °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
W2	4,860	5,225
W4	5,225	5,590
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

PRELIMINARY

PERFORMANCE GROUPS - CHROMATICITY (T_j = 85 °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**
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

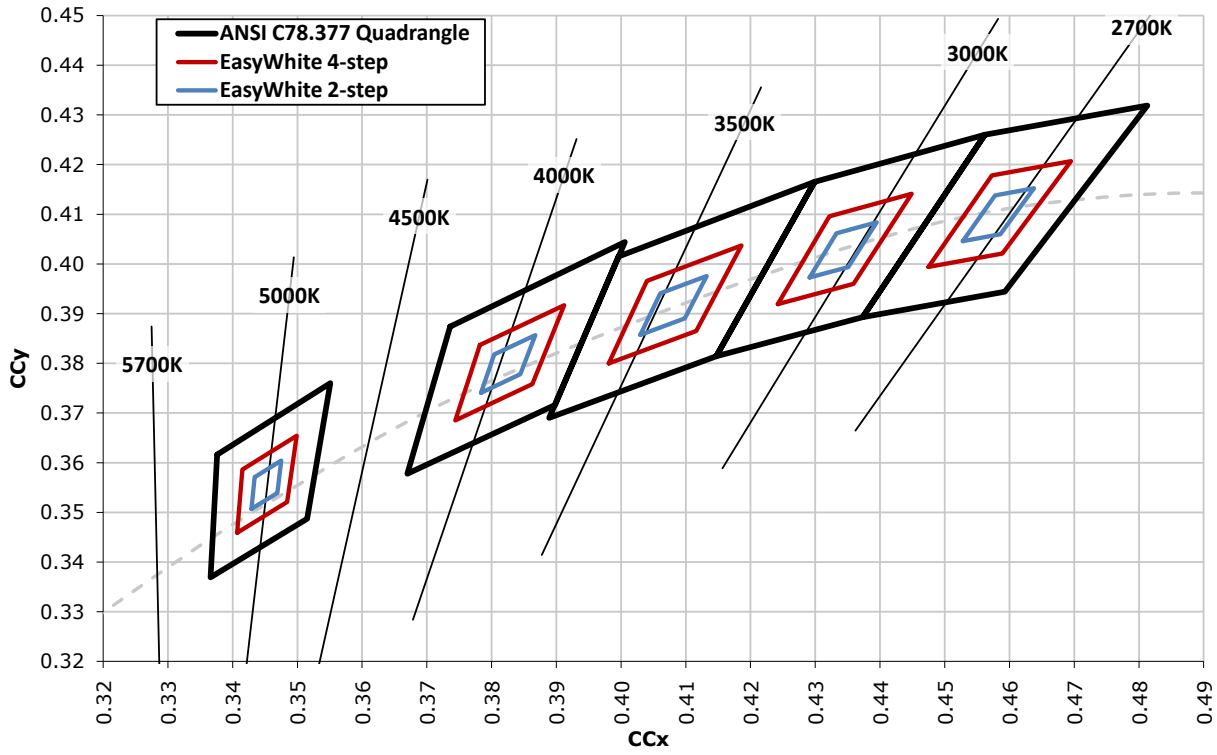
EasyWhite Color Temperatures – 2-Step			
Code	**CCT**	**x**	**y**
50H	5000 K	0.3429	0.3507
		0.3434	0.3571
		0.3475	0.3604
		0.3469	0.3539
40H	4000 K	0.3784	0.3741
		0.3804	0.3818
		0.3867	0.3857
		0.3844	0.3778
35H	3500 K	0.4030	0.3857
		0.4061	0.3941
		0.4132	0.3976
		0.4099	0.3890
30H	3000 K	0.4291	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

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

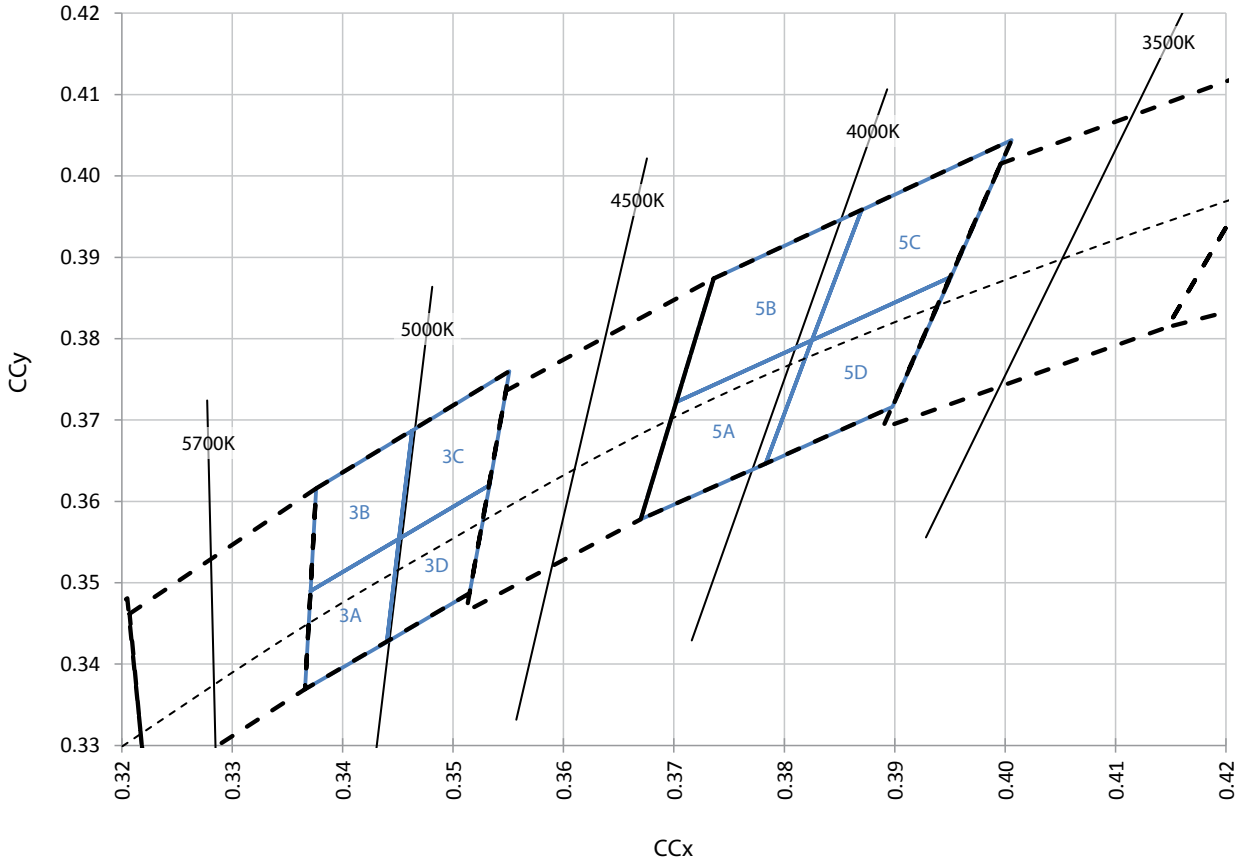
PRELIMINARY

CREE EASYWHITE BINS PLOTTED ON THE CIE 1931 COLOR SPACE (T_J = 85 °C)



PRELIMINARY

CREE ANSI WHITE BINS PLOTTED ON THE CIE 1931 COLOR SPACE (T_J = 85 °C)

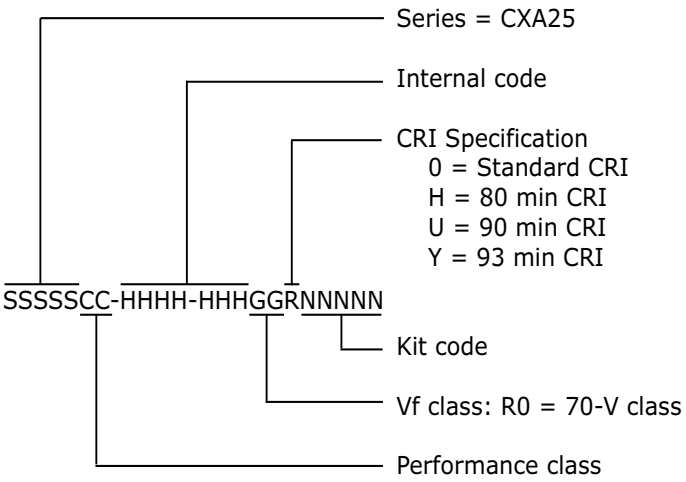


PRELIMINARY

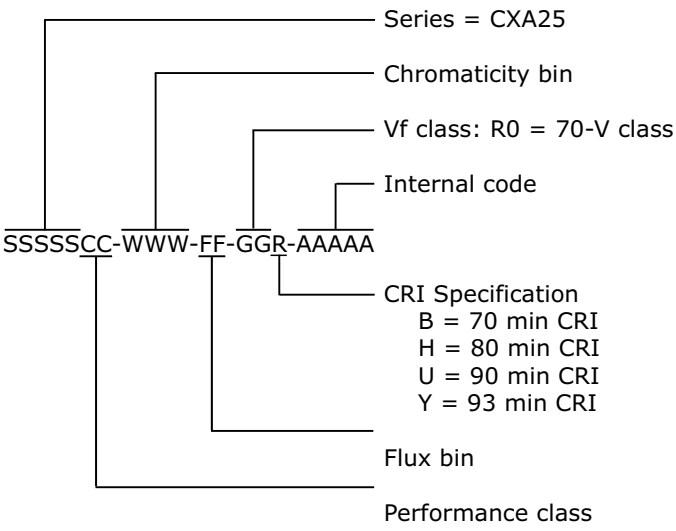
BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows:

Order Code



Bin Code



MECHANICAL DIMENSIONS

Dimensions are in mm.

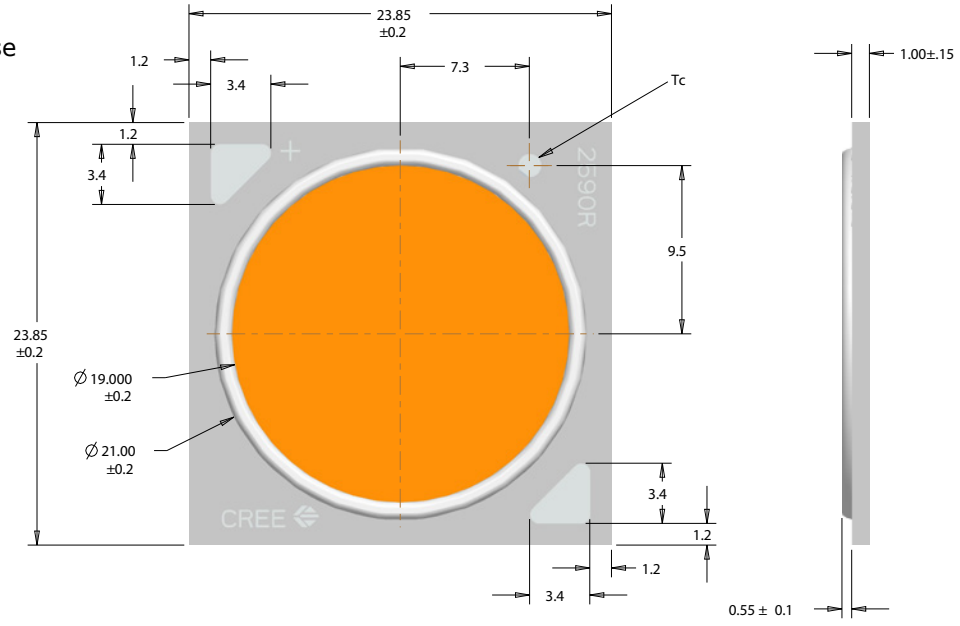
Tolerances unless otherwise specified:

.x ± .10

.xx ± .03

.xxx ± .010

x° ± 1°



PRELIMINARY

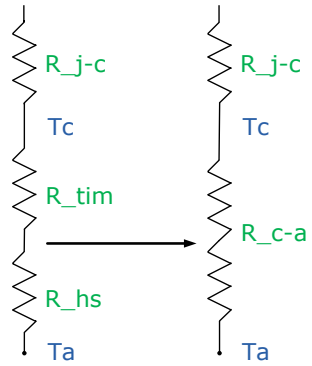
THERMAL DESIGN

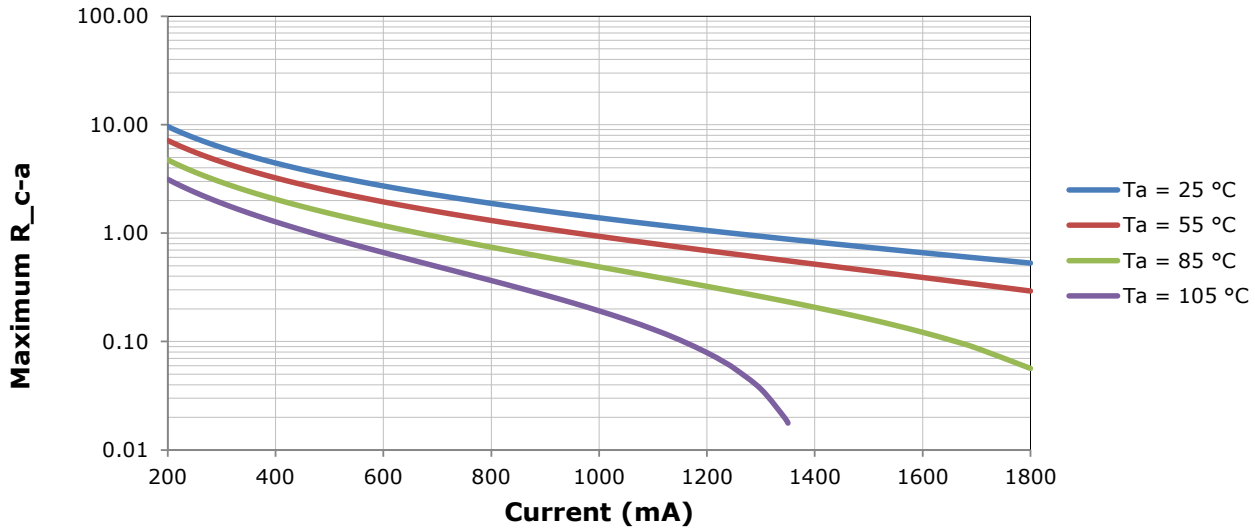
The CXA family of LED arrays can include over a hundred different LED die inside one package, and thus over a hundred different junction temperatures (T_J). Cree has intentionally removed junction-temperature-based operating limits and replaced the commonplace maximum T_J calculations with maximum ratings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





PRELIMINARY

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.

PRELIMINARY

PACKAGING

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.

Dimensions are in inches.
Tolerances:
.x ± .1
.xx ± .05
.xxx ± .005
x° ± 1°