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.

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

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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		77	
Forward voltage (@ 1200 mA, T_j = 25 °C)	V			84

* Refer to the Operating Limits section.

OPERATING LIMITS

The maximum current rating of the CXA3590 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.

FLUX CHARACTERISTICS, EASYWHITE ORDER CODES AND BINS (I_F = 1200 mA, T_J = 85 °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
	70	75	CB	11,000	12,210	50H	CXA3590-0000-000R00CB50H	50F	CXA3590-0000-000R00CB50F
	70	75	CD	12,000	13,320	50H	CXA3590-0000-000R00CD50H	50F	CXA3590-0000-000R00CD50F
	80	---	BB	9,500	10,545	50H	CXA3590-0000-000R0HBB50H	50F	CXA3590-0000-000R0HBB50F
	80	---	BD	10,000	11,100	50H	CXA3590-0000-000R0HBD50H	50F	CXA3590-0000-000R0HBD50F
	80	---	CB	11,000	12,210	50H	CXA3590-0000-000R0HCB50H	50F	CXA3590-0000-000R0HCB50F
	90	95	AB	8,500	9,435	50H	CXA3590-0000-000R0UAB50H	50F	CXA3590-0000-000R0UAB50F
	90	95	AD	9,000	9,990	50H	CXA3590-0000-000R0UAD50H	50F	CXA3590-0000-000R0UAD50F
4000 K	70	75	BB	9,500	10,545	40H	CXA3590-0000-000R00BB40H	40F	CXA3590-0000-000R00BB40F
	70	75	BD	10,000	11,100	40H	CXA3590-0000-000R00BD40H	40F	CXA3590-0000-000R00BD40F
	70	75	CB	11,000	12,210	40H	CXA3590-0000-000R00CB40H	40F	CXA3590-0000-000R00CB40F
	80	---	AD	9,000	9,435	40H	CXA3590-0000-000R0HAD40H	40F	CXA3590-0000-000R0HAD40F
	80	---	BB	9,500	10,545	40H	CXA3590-0000-000R0HBB40H	40F	CXA3590-0000-000R0HBB40F
	80	---	BD	10,000	11,100	40H	CXA3590-0000-000R0HBD40H	40F	CXA3590-0000-000R0HBD40F
	90	95	Z4	7,945	8,819	40H	CXA3590-0000-000R0UZ440H	40F	CXA3590-0000-000R0UZ440F
	90	95	AB	8,500	9,435	40H	CXA3590-0000-000R0UAB40H	40F	CXA3590-0000-000R0UAB40F
3500 K	80	---	AD	9,000	9,990	35H	CXA3590-0000-000R00AD35H	35F	CXA3590-0000-000R00AD35F
	80	---	BB	9,500	10,545	35H	CXA3590-0000-000R00BB35H	35F	CXA3590-0000-000R00BB35F
	80	---	BD	10,000	11,100	35H	CXA3590-0000-000R00BD35H	35F	CXA3590-0000-000R00BD35F
	93	95	Z2	7,390	8,203	35H	CXA3590-0000-000R0YZ235H	35F	CXA3590-0000-000R0YZ235F
	93	95	Z4	7,945	8,819	35H	CXA3590-0000-000R0YZ435H	35F	CXA3590-0000-000R0YZ435F
3000 K	80	---	AD	9,000	9,990	30H	CXA3590-0000-000R00AD30H	30F	CXA3590-0000-000R00AD30F
	80	---	BB	9,500	10,545	30H	CXA3590-0000-000R00BB30H	30F	CXA3590-0000-000R00BB30F
	80	---	BD	10,000	11,100	30H	CXA3590-0000-000R00BD30H	30F	CXA3590-0000-000R00BD30F
	93	95	Z2	7,390	8,203	30H	CXA3590-0000-000R0YZ230H	30F	CXA3590-0000-000R0YZ230F
	93	95	Z4	7,945	8,819	30H	CXA3590-0000-000R0YZ430H	30F	CXA3590-0000-000R0YZ430F

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.

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	
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 ±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 mA, T_J = 85 °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	CXA3590-0000-000R00BB0E5
			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 ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ±2 on CRI measurements.
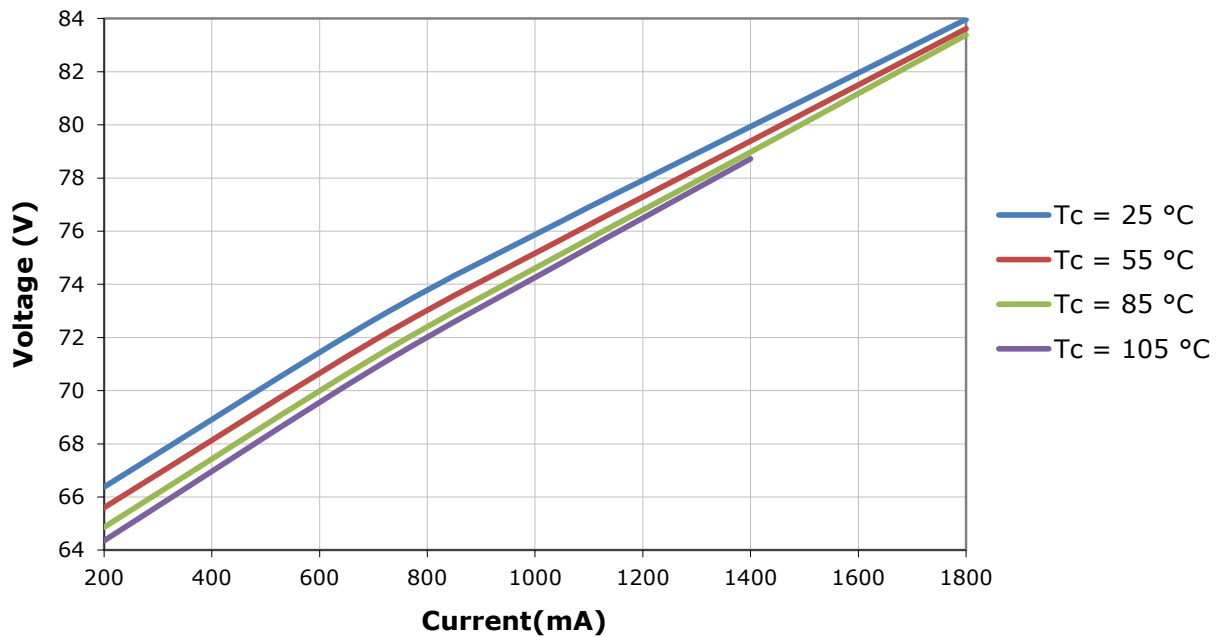- * Flux values @ 25 °C are calculated and for reference only.

RELATIVE SPECTRAL POWER DISTRIBUTION (I_F = 1200 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.
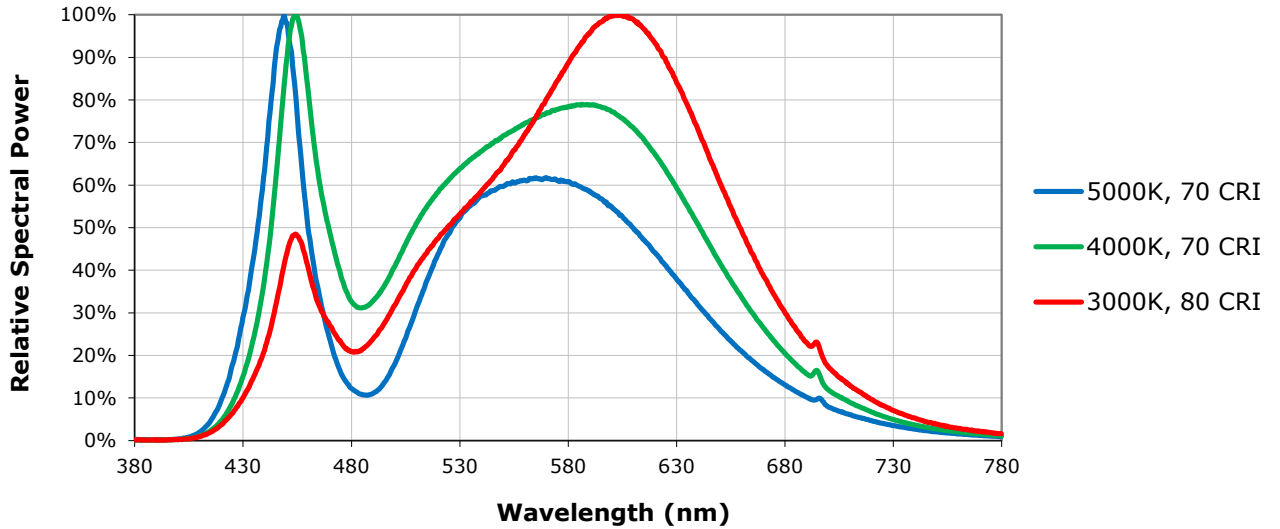
ELECTRICAL CHARACTERISTICS

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

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 °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 CXA3590 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.
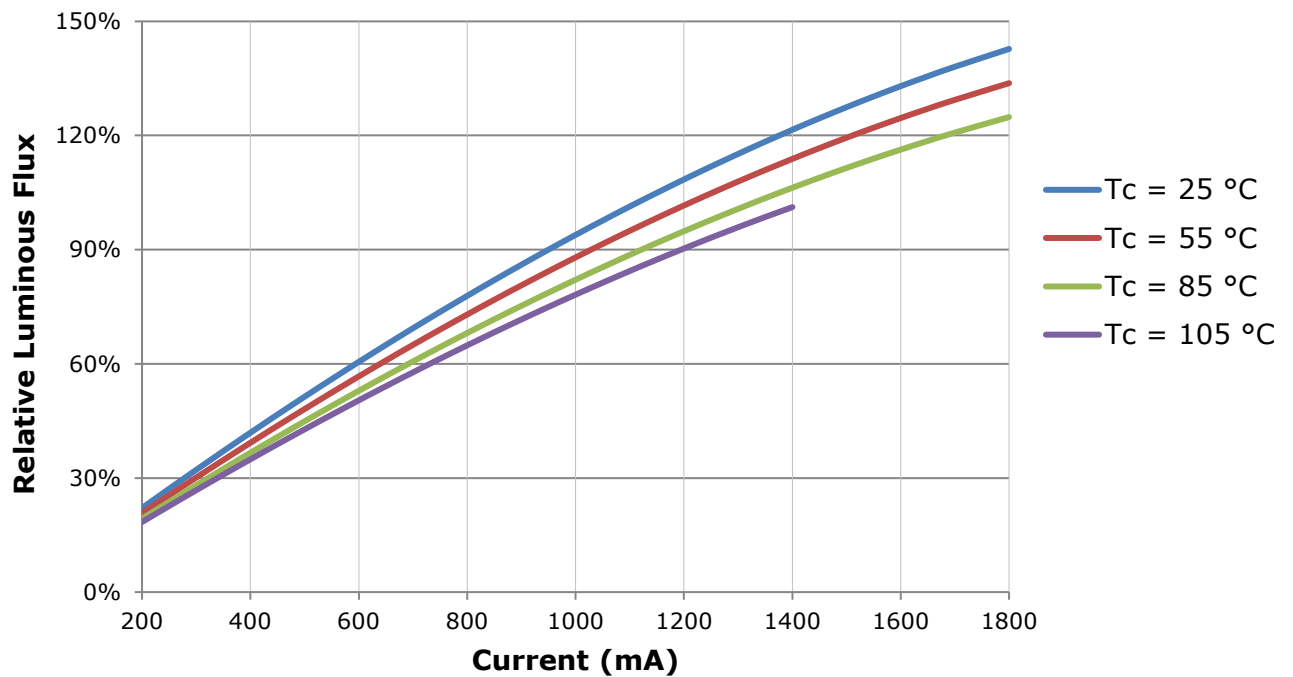
TYPICAL SPATIAL DISTRIBUTION
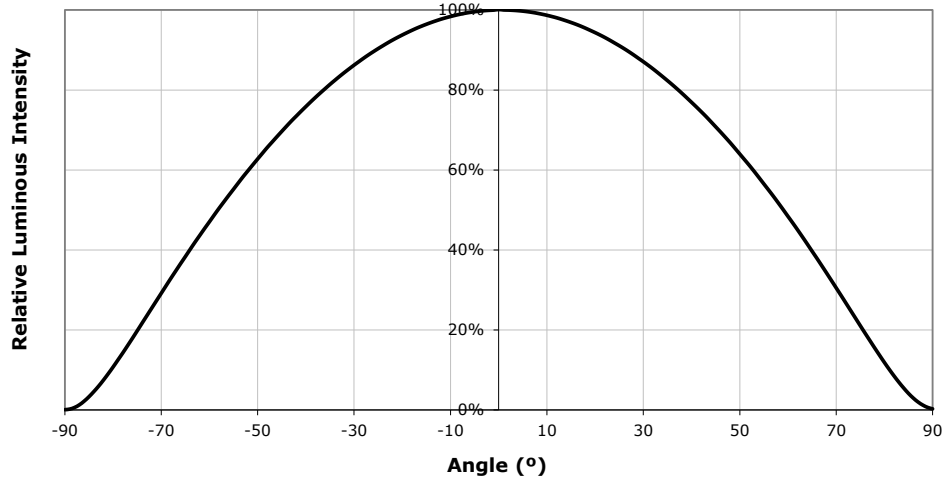
PERFORMANCE GROUPS - BRIGHTNESS (I_F = 1200 mA, T_J = 85 °C)

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 °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
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

CREE EASYWHITE BINS PLOTTED ON THE CIE 1931 COLOR SPACE (T$_J$ = 85 °C)
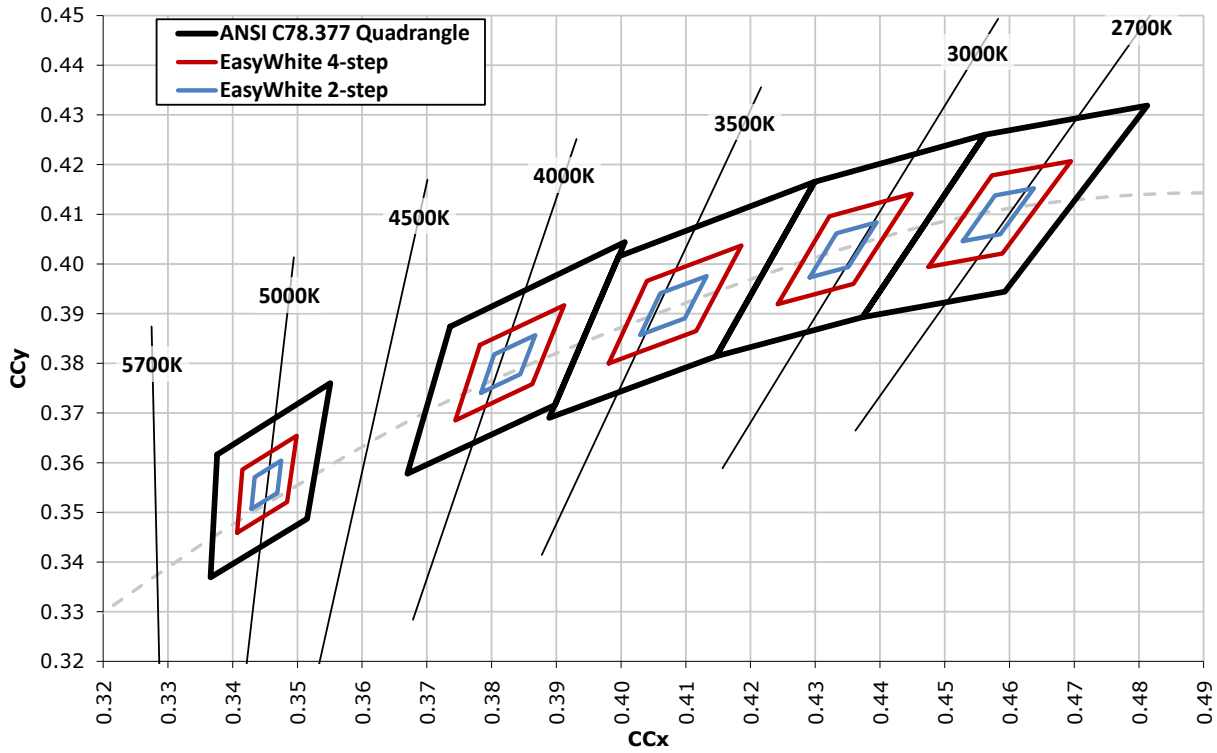
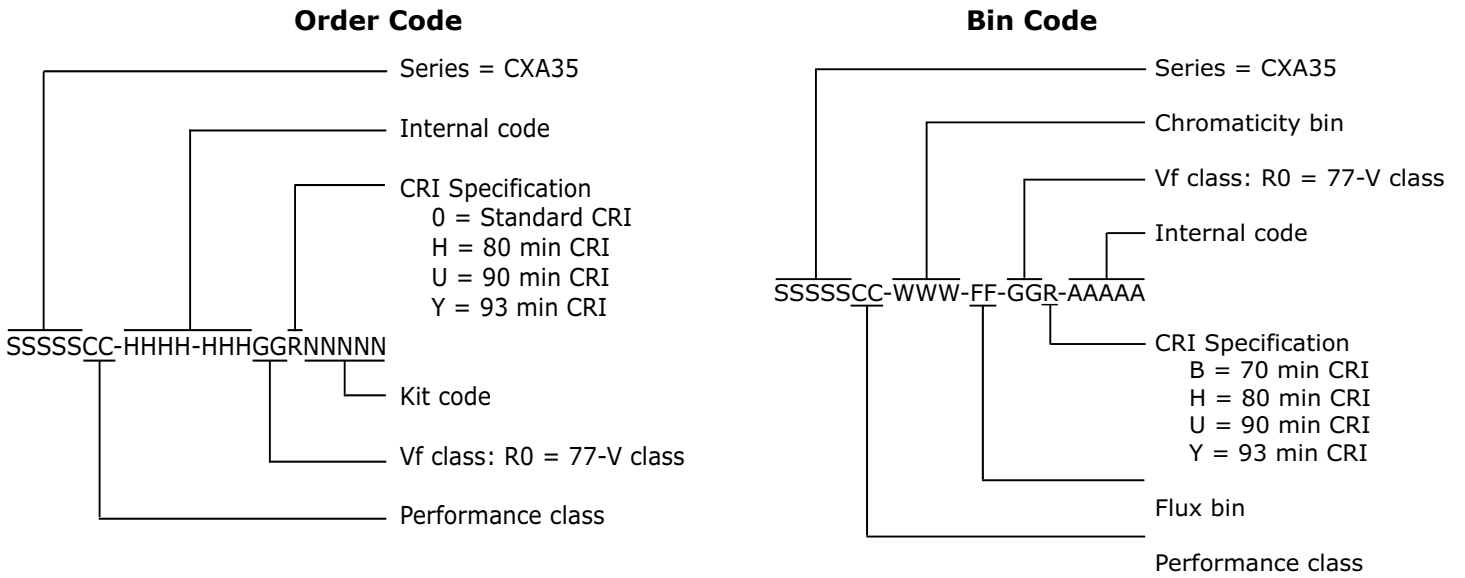## CREE ANSI WHITE BINS PLOTTED ON THE CIE 1931 COLOR SPACE (T$_J$ = 85 °C)
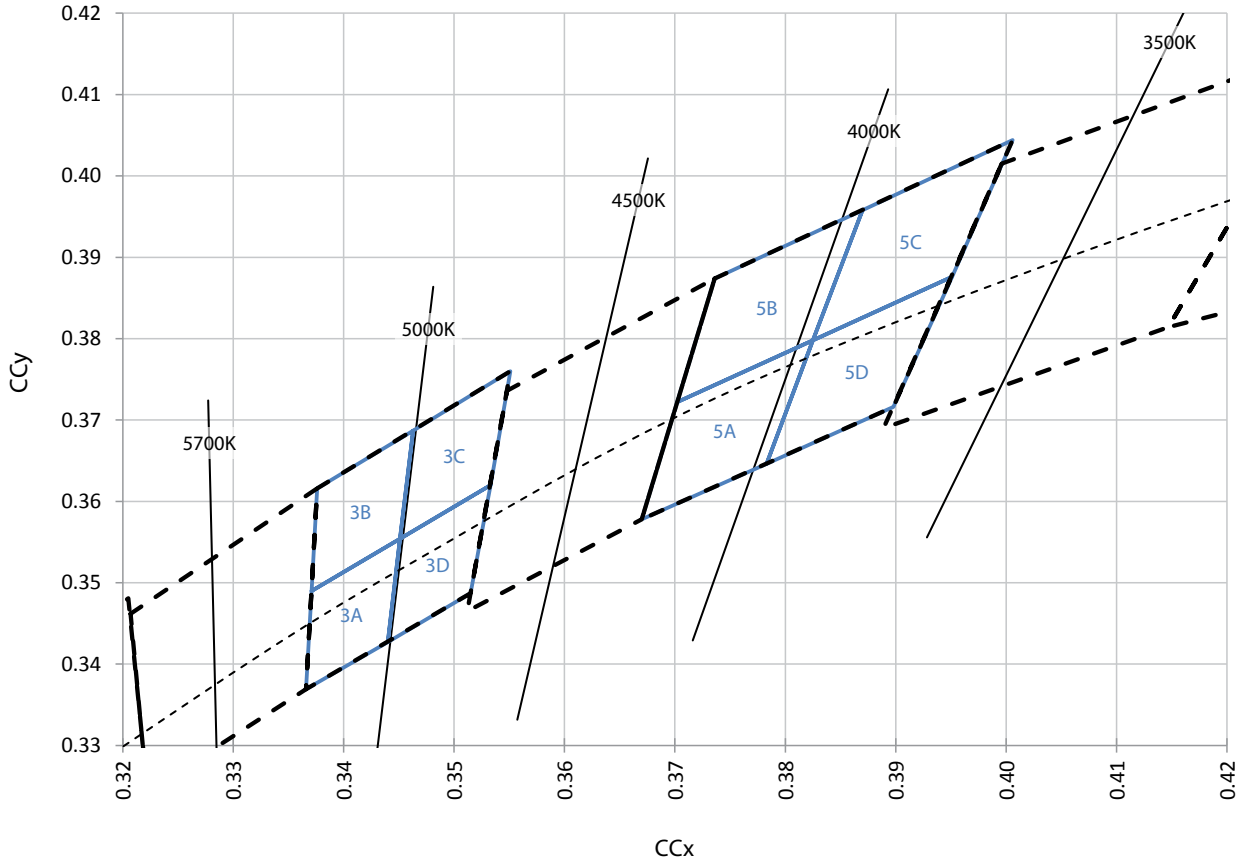
BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows:

Order Code

Series = CXA35

Internal code

CRI Specification
0 = Standard CRI
H = 80 min CRI
U = 90 min CRI
Y = 93 min CRI

SSSSSCC-HHHH-HHHGGRNNNNN

Kit code

Vf class: R0 = 77-V class

Performance class

Bin Code

Series = CXA35

Chromaticity bin

Vf class: R0 = 77-V class

Internal code

SSSSSCC-WWW-FF-GGR-AAAAA

CRI Specification
B = 70 min CRI
H = 80 min CRI
U = 90 min CRI
Y = 93 min CRI

Flux bin

Performance class

MECHANICAL DIMENSIONS

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

34.85 ±0.2
15.764
12.16
4.0
Tc
Ø 1.300
1.15 ± 0.15
4.0
15.902
34.85 ±0.2
14.25
Ø 30.00 ±0.2
Ø 32.00 ±0.2
15.902
4.0
4.0
15.764
0.55 ± 0.1
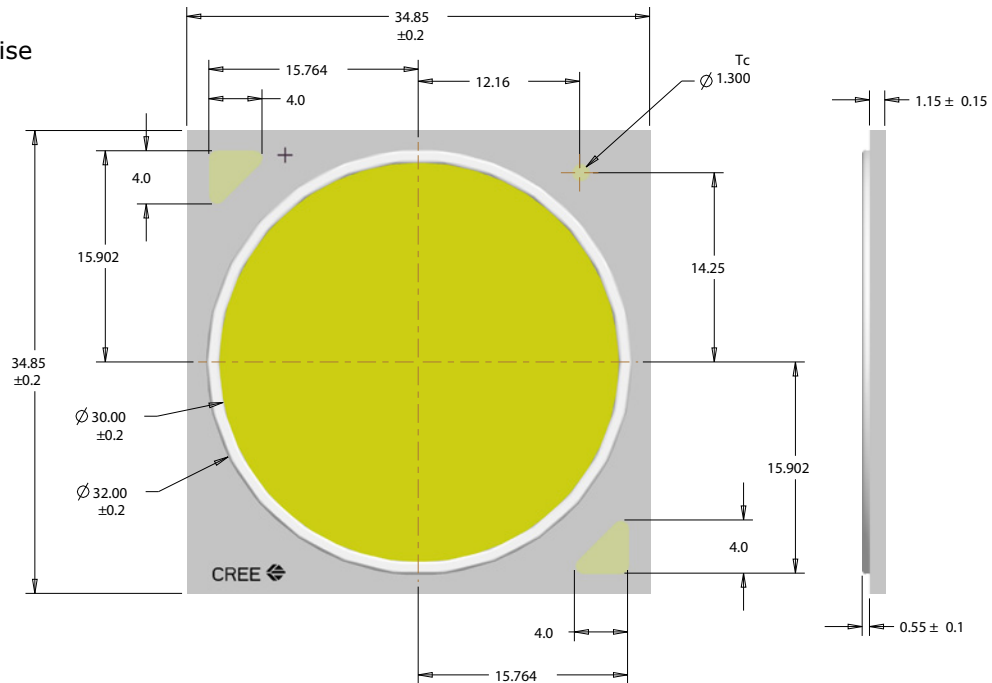
THERMAL DESIGN

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 (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 CXA3590 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).
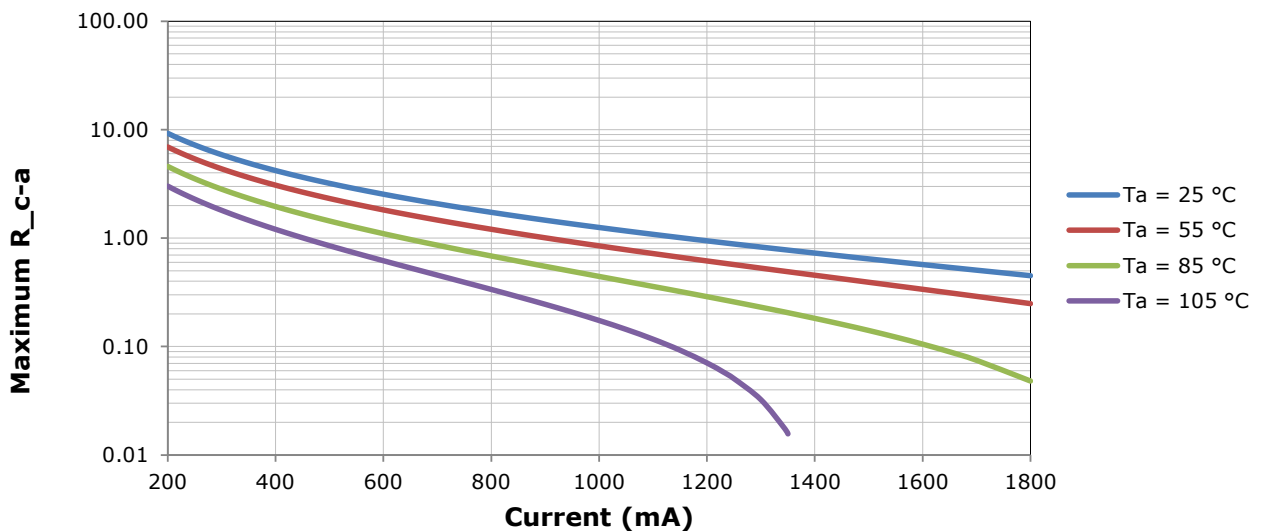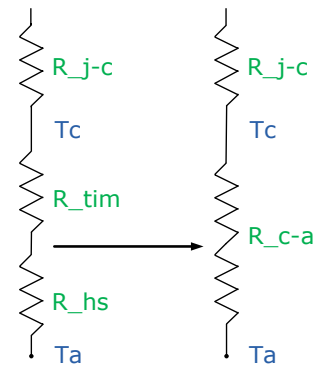
NOTES

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.

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 $\pm$ .1

.xx $\pm$ .05

.xxx $\pm$ .005

x° $\pm$ 1°

7.500

R.375

1.59

8.125

1.59

0.38

LABEL WITH CREE BIN CODE, QTY, LOT #

PATENT LABEL IS LOCATED ON UNDERSIDE OF CARTON

BAG

LABEL WITH CREE BIN CODE, QTY, LOT#

LABEL WITH CREE BIN CODE, QTY, LOT#