

# Cree® XLamp® CXA2590 LED



## PRODUCT DESCRIPTION

The XLamp® CXA2590 LED 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 provides unrivaled lumen density that can reduce system cost for the next generation of LED spotlights.

The [CX Family LED Design Guide](#) provides basic information on the requirements to use the CXA2590 LED successfully in luminaire designs.

## FEATURES

- Available in 4-step, 3-step and 2-step EasyWhite® bins at 2700 K, 3000 K, 3500 K, 4000 K and 5000 K and 4-step EasyWhite bins at 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 option: 72-V class
- 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
- 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, 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 1931 CIE Color Space .....	12
Cree ANSI White Bins Plotted on the 1931 CIE Color Space .....	12
Bin and Order Code Formats.....	13
Mechanical Dimensions .....	13
Thermal Design.....	14
Notes .....	15
Packaging.....	16



**CHARACTERISTICS**

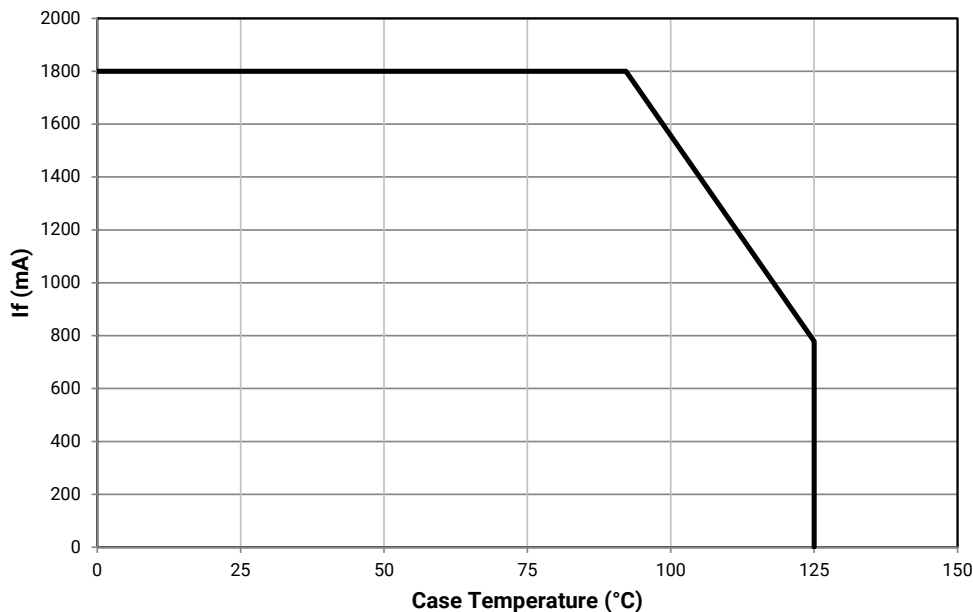
Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			1800*
Reverse current	mA			0.1
Forward voltage (@ 1200 mA, T <sub>j</sub> = 85 °C)	V		69	
Forward voltage (@ 1200 mA, T <sub>j</sub> = 25 °C)	V			80

\* Refer to the Operating Limits section.

**OPERATING LIMITS**

The maximum current rating of the CXA2590 depends on the case temperature (T<sub>c</sub>) 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 13 for the location of the T<sub>c</sub> measurement point.

Another important factor in good thermal management is the temperature of the Light Emitting Surface (LES). Cree recommends a maximum LES temperature of 135 °C to ensure optimal LED lifetime. Please refer to the Thermal Design section on page 14 for more information on LES temperature measurement.



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

The following table provides order codes for XLamp CXA2590 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		4-Step	
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Group	Order Code	Group	Order Code	Group	Order Code
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	50G	CXA2590-0000-000R0HAB50G	50F	CXA2590-0000-000R0HAB50F
			AD	9000	9767		CXA2590-0000-000R0HAD50H		CXA2590-0000-000R0HAD50G		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	40G	CXA2590-0000-000R0HZ440G	40F	CXA2590-0000-000R0HZ440F
			AB	8500	9225		CXA2590-0000-000R0HAB40H		CXA2590-0000-000R0HAB40G		CXA2590-0000-000R0HAB40F
3500 K	80	---	Z2	7390	8020	35H	CXA2590-0000-000R00Z235H	35G	CXA2590-0000-000R00Z235G	35F	CXA2590-0000-000R00Z235F
			Z4	7945	8020		CXA2590-0000-000R00Z435H		CXA2590-0000-000R00Z435G		CXA2590-0000-000R00Z435F
			AB	8500	9225		CXA2590-0000-000R00AB35H		CXA2590-0000-000R00AB35G		CXA2590-0000-000R00AB35F
	93	95	X4	6010	6522	35H	CXA2590-0000-000R0YX435H	35G	CXA2590-0000-000R0YX435G	35F	CXA2590-0000-000R0YX435F
			Y2	6430	6978		CXA2590-0000-000R0YY235H		CXA2590-0000-000R0YY235G		CXA2590-0000-000R0YY235F

- 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. See the Measurements section (page 15).
  - Cree XLamp CXA2590 LED order codes specify only a minimum flux bin and not a maximum. Cree 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.
  - \* 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**

Nominal CCT	CRI		Minimum Luminous Flux			2-Step		3-Step		4-Step	
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Group	Order Code	Group	Order Code	Group	Order Code
3000 K	80	---	Y4	6910	7499	30H	CXA2590-0000-000R00Y430H	30G	CXA2590-0000-000R00Y430G	30F	CXA2590-0000-000R00Y430F
			Z2	7390	8020		CXA2590-0000-000R00Z230H		CXA2590-0000-000R00Z230G		CXA2590-0000-000R00Z230F
			Z4	7945	8622		CXA2590-0000-000R00Z430H		CXA2590-0000-000R00Z430G		CXA2590-0000-000R00Z430F
	93	95	X2	5590	6067	30H	CXA2590-0000-000R0YX230H	30G	CXA2590-0000-000R0YX230G	30F	CXA2590-0000-000R0YX230F
			X4	6010	6522		CXA2590-0000-000R0YX430H		CXA2590-0000-000R0YX430G		CXA2590-0000-000R0YX430F
2700 K	80	---	Y4	6910	7499	27H	CXA2590-0000-000R00Y427H	27G	CXA2590-0000-000R00Y427G	27F	CXA2590-0000-000R00Y427F
			Z2	7390	8020		CXA2590-0000-000R00Z227H		CXA2590-0000-000R00Z227G		CXA2590-0000-000R00Z227F
			Z4	7945	8622		CXA2590-0000-000R00Z427H		CXA2590-0000-000R00Z427G		CXA2590-0000-000R00Z427F
	93	95	W4	5225	5671	27H	CXA2590-0000-000R0YW427H	27G	CXA2590-0000-000R0YW427G	27F	CXA2590-0000-000R0YW427F
			X2	5590	6067		CXA2590-0000-000R0YX227H		CXA2590-0000-000R0YX227G		CXA2590-0000-000R0YX227F

- 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. See the Measurements section (page 15).
  - Cree XLamp CXA2590 LED order codes specify only a minimum flux bin and not a maximum. Cree 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.
  - \* Flux values @ 25 °C are calculated and for reference only.

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

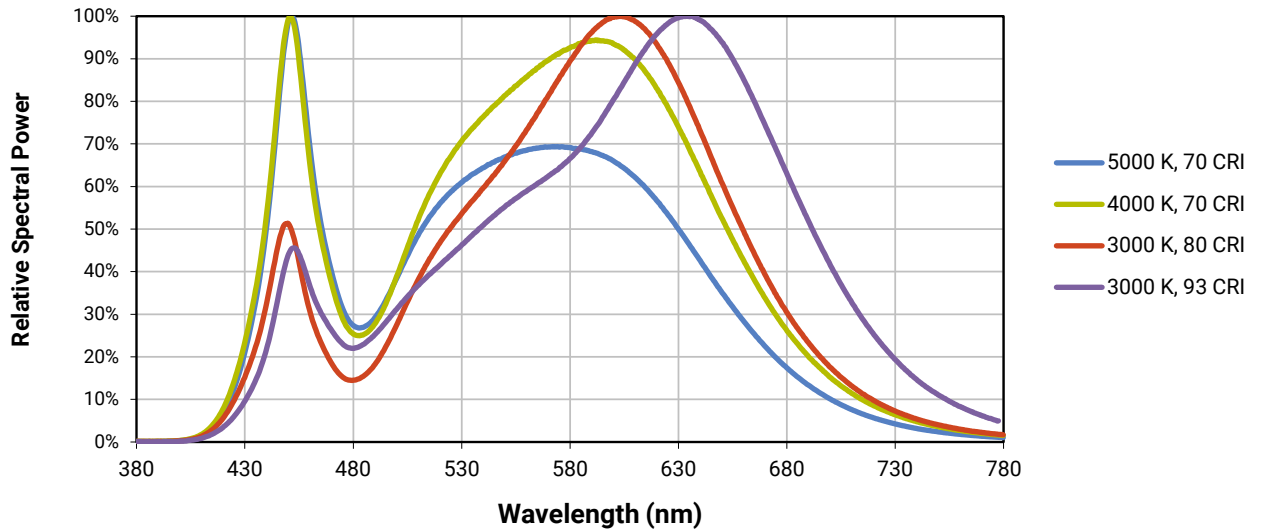
The following table provides order codes for XLamp CXA2590 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 13).

Nominal CCT	CRI		Minimum Luminous Flux			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, 65F	CXA2590-0000-000R00AD0E1
			BB	9500	10,310		CXA2590-0000-000R00BB0E1
	80	---	AB	8500	9225	1A0, 1B0, 1C0, 1D0, 65F	CXA2590-0000-000R0HAB0E1
			AD	9000	9767		CXA2590-0000-000R0HAD0E1
5700 K	70	75	AD	9000	9767	2A0, 2B0, 2C0, 2D0, 57F	CXA2590-0000-000R00AD0E2
			BB	9500	10,310		CXA2590-0000-000R00BB0E2
	80	---	AB	8500	9225	2A0, 2B0, 2C0, 2D0, 57F	CXA2590-0000-000R0HAB0E2
			AD	9000	9767		CXA2590-0000-000R0HAD0E2
5000 K	70	75	AD	9000	9767	3A0, 3B0, 3C0, 3D0, 50F	CXA2590-0000-000R00AD0E3
			BB	9500	10,310		CXA2590-0000-000R00BB0E3
	80	---	AB	8500	9225	3A0, 3B0, 3C0, 3D0, 50F	CXA2590-0000-000R0HAB0E3
			AD	9000	9767		CXA2590-0000-000R0HAD0E3
4000 K	70	75	AD	9000	9767	5A0, 5B0, 5C0, 5D0, 40F	CXA2590-0000-000R00AD0E5
			BB	9500	10,310		CXA2590-0000-000R00BB0E5

- 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. See the Measurements section (page 15).
  - Cree XLamp CXA2590 LED order codes specify only a minimum flux bin and not a maximum. Cree 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.
  - \* Flux values @ 25 °C are calculated and for reference only.

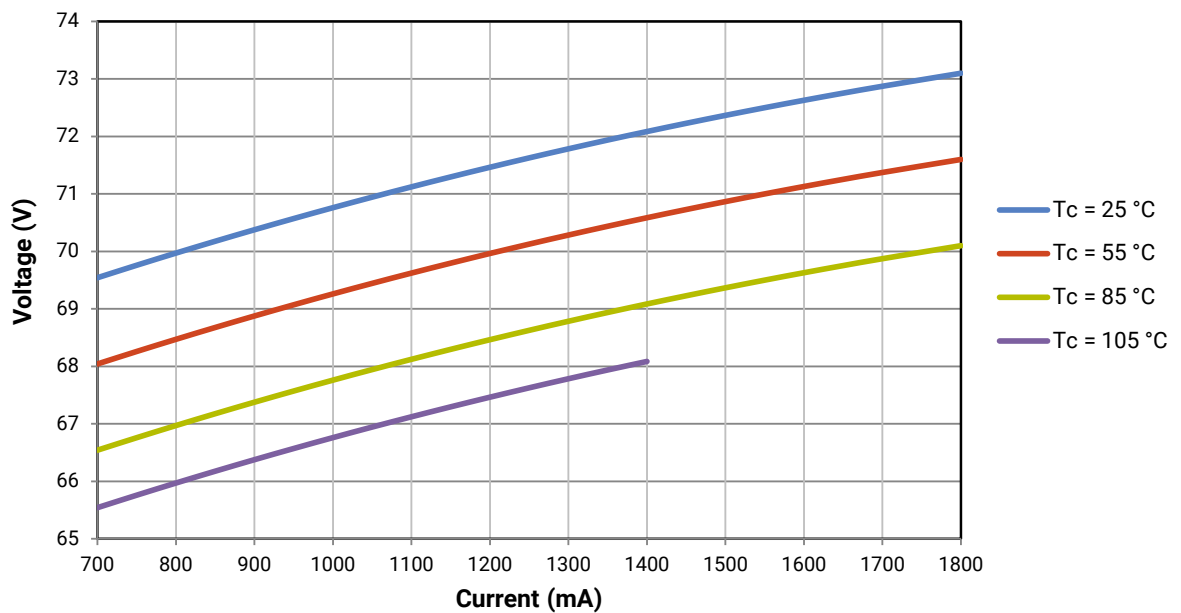
**RELATIVE SPECTRAL POWER DISTRIBUTION**

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.

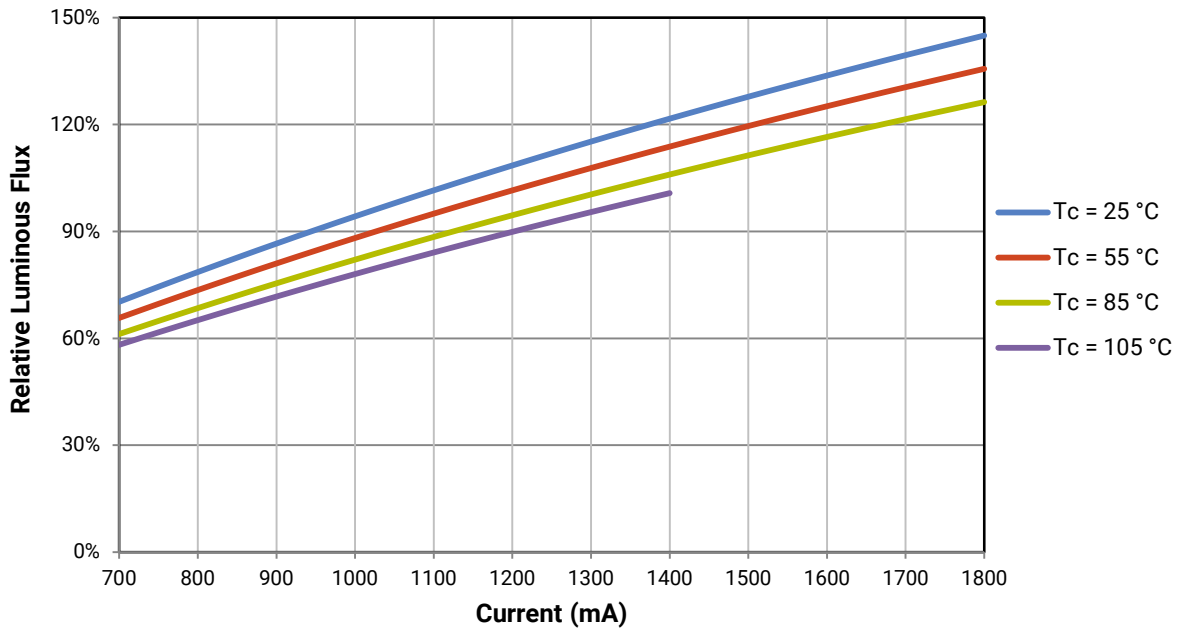


**RELATIVE LUMINOUS FLUX**

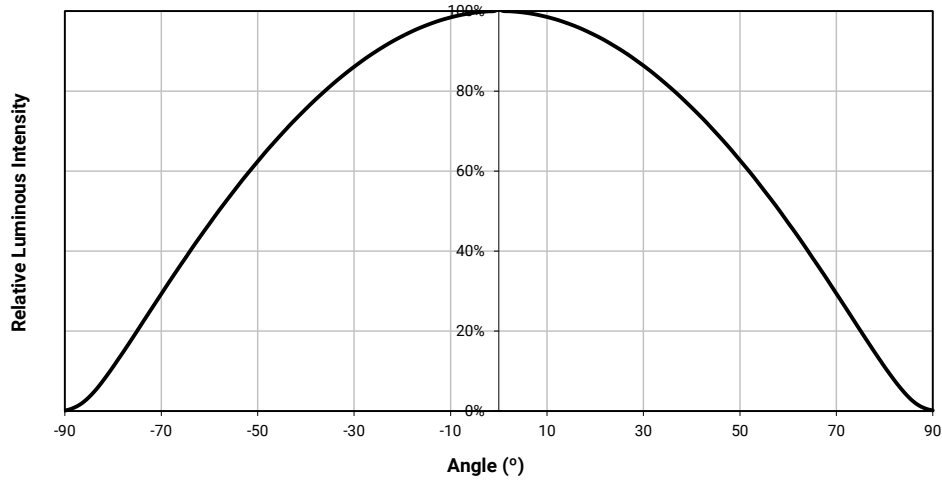
The relative luminous flux values provided below are the ratio of:

- 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  $T_j = 85\text{ }^\circ\text{C}$ .

For example, at steady-state operation of  $T_c = 55\text{ }^\circ\text{C}$ ,  $I_f = 1500\text{ mA}$ , the relative luminous flux ratio is 120% in the chart below. A CXA2590 LED that measures 9,000 lm during binning will deliver 10,800 lm ( $9,000 \times 1.2$ ) at steady-state operation of  $T_c = 55\text{ }^\circ\text{C}$ ,  $I_f = 1500\text{ mA}$ .



**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	Minimum Luminous Flux	Maximum Luminous Flux
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



**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 – 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

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

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

EasyWhite Color Temperatures – 4-Step			
Code	CCT	x	y
65F	6500 K	0.3097	0.3196
		0.3079	0.3297
		0.3164	0.3382
		0.3176	0.3275
57F	5700 K	0.3253	0.3325
		0.3249	0.3439
		0.3331	0.3514
		0.3330	0.3393
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

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

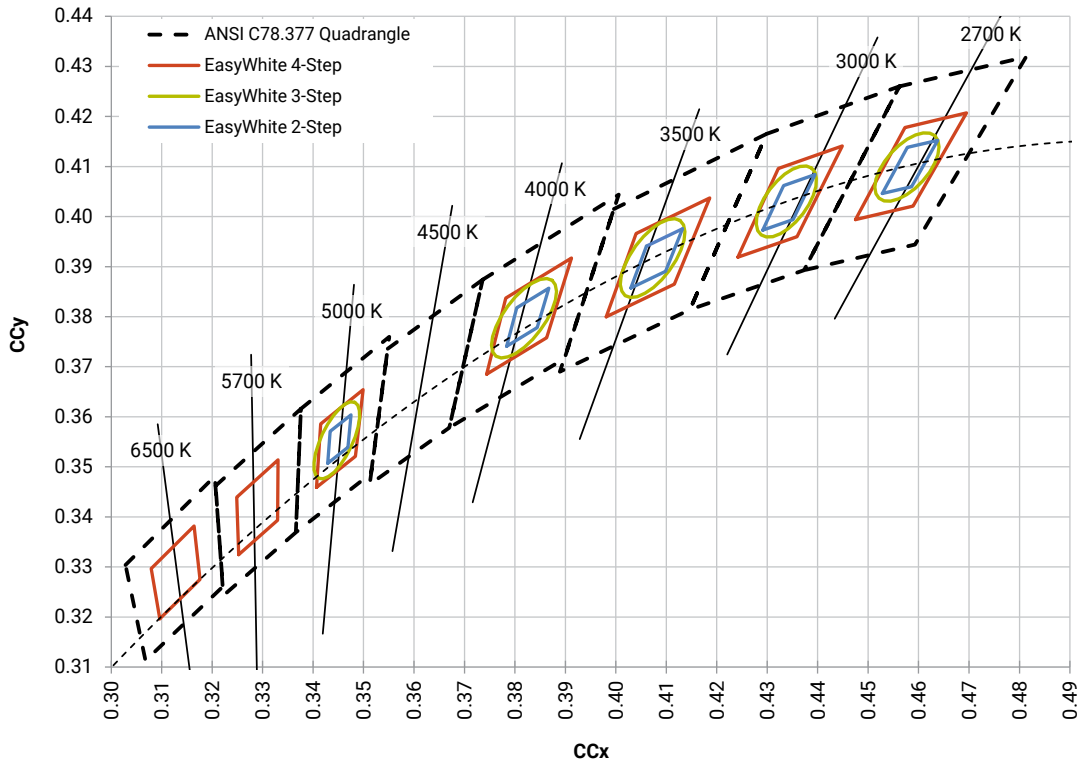
ANSI White Bins				
Code	CCT	Bin Code	x	y
0E1	6500 K	1A0	0.3048	0.3207
			0.3130	0.3290
			0.3144	0.3186
			0.3068	0.3113
		1B0	0.3028	0.3304
			0.3115	0.3391
			0.3130	0.3290
			0.3048	0.3207
		1C0	0.3115	0.3391
			0.3205	0.3481
			0.3213	0.3373
			0.3130	0.3290
		1D0	0.3130	0.3290
			0.3213	0.3373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

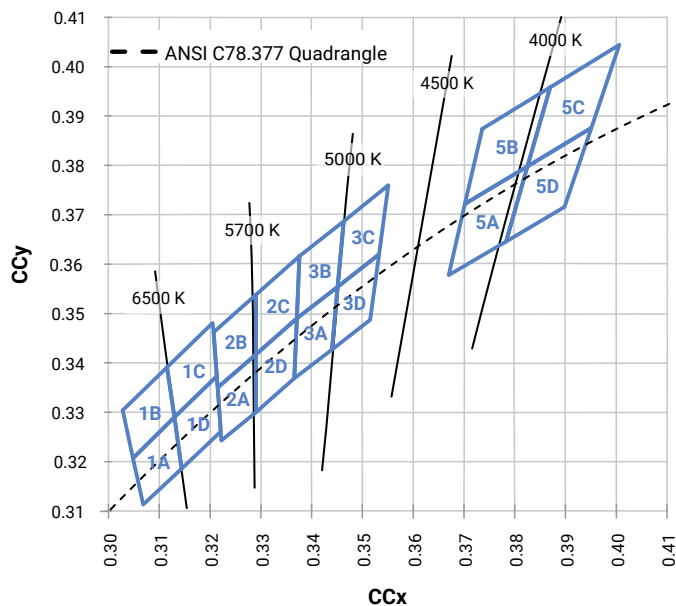
ANSI White Bins				
Code	CCT	Bin Code	x	y
0E3	5000 K	3A0	.3371	.3490
			.3451	.3554
			.3440	.3427
			.3366	.3369
		3B0	.3376	.3616
			.3463	.3687
			.3451	.3554
			.3371	.3490
		3C0	.3463	.3687
			.3551	.3760
			.3533	.3620
			.3451	.3554
		3D0	.3451	.3554
			.3533	.3620
			.3515	.3487
			.3440	.3427

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 1931 CIE COLOR SPACE ( $T_j = 85^\circ\text{C}$ )**

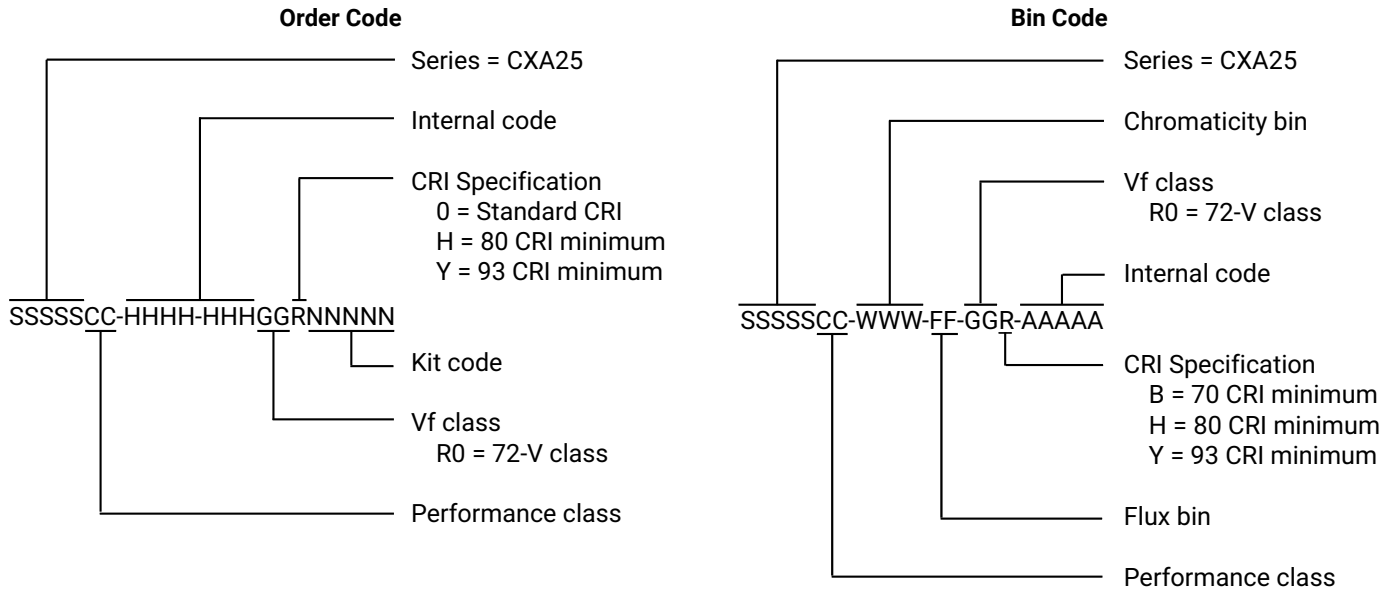


**CREE ANSI WHITE BINS PLOTTED ON THE 1931 CIE COLOR SPACE ( $T_j = 85^\circ\text{C}$ )**



**BIN AND ORDER CODE FORMATS**

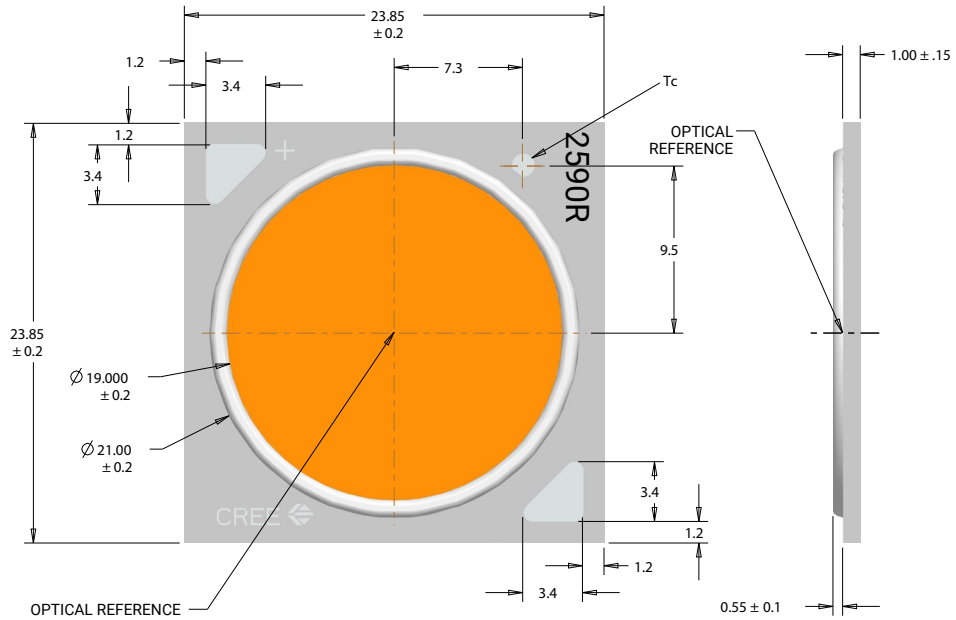
Bin codes and order codes are configured as follows:



**MECHANICAL DIMENSIONS**

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

**Meaning of 2590R**  
2590R = 72-V CXA2590



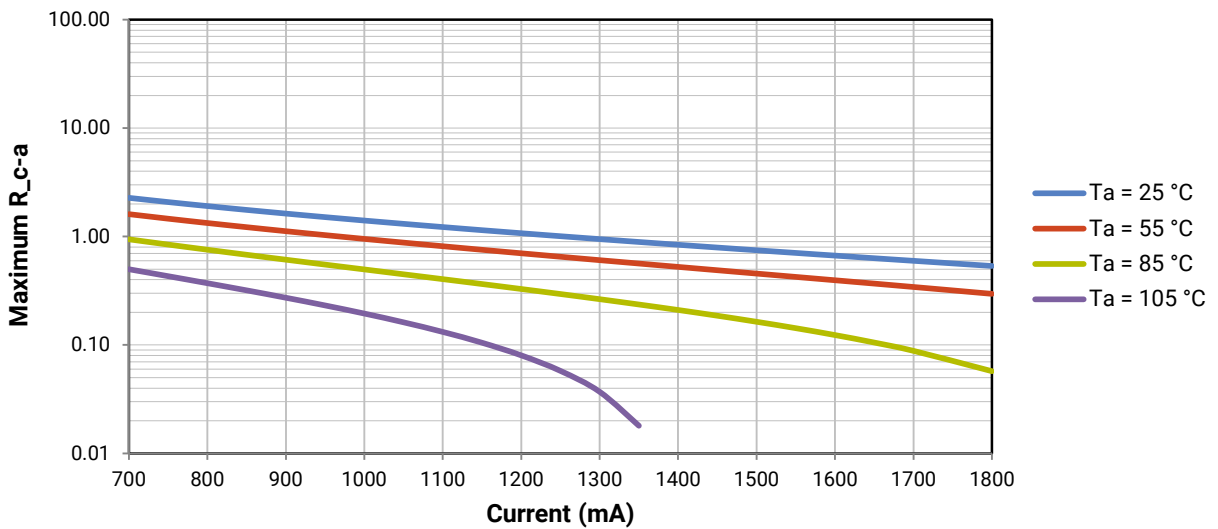
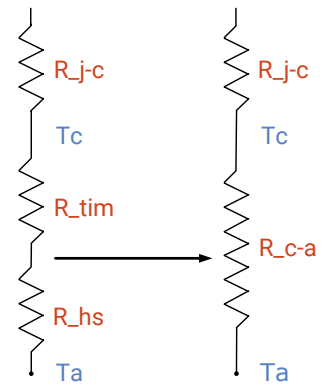
**THERMAL DESIGN**

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 that the CXA 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 Cree XLamp LEDs, please refer to the [Thermal Management application note](#). For CXA soldering recommendations and more information on thermal interface materials (TIM), LES temperature measurement, and connection methods, please refer to the [Cree XLamp CX Family LEDs soldering and handling document](#). The [CX Family LED Design Guide](#) provides basic information on the requirements to use Cree XLamp CXA LEDs successfully in luminaire designs.

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 ( $R_{hs}$ ).



## 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'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 applies to ensure long-term reliability for XLamp LEDs and details of Cree's pre-release qualification testing for XLamp LEDs.

### Lumen Maintenance

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](#).

Please read the [Long-Term Lumen Maintenance application note](#) for more details on Cree'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 representative or from the [Product Ecology](#) section of the Cree 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 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.

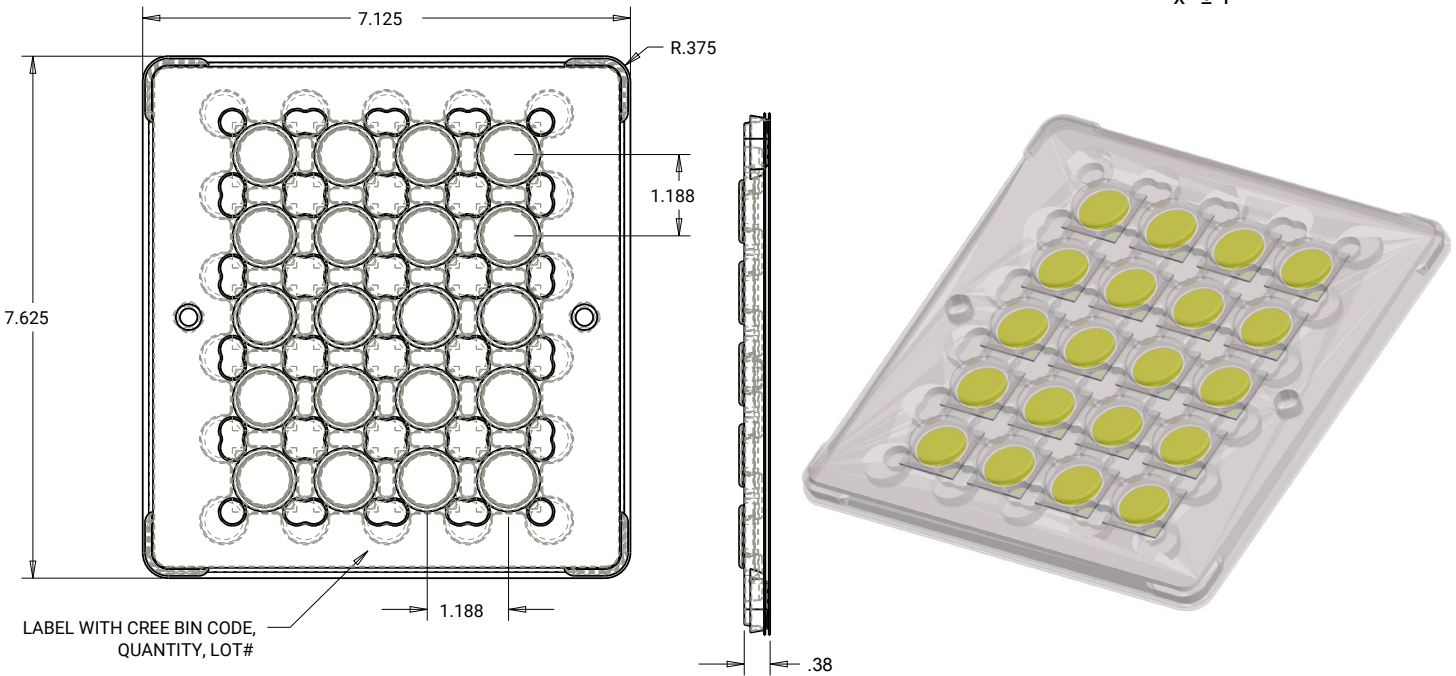
### Vision Advisory

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**

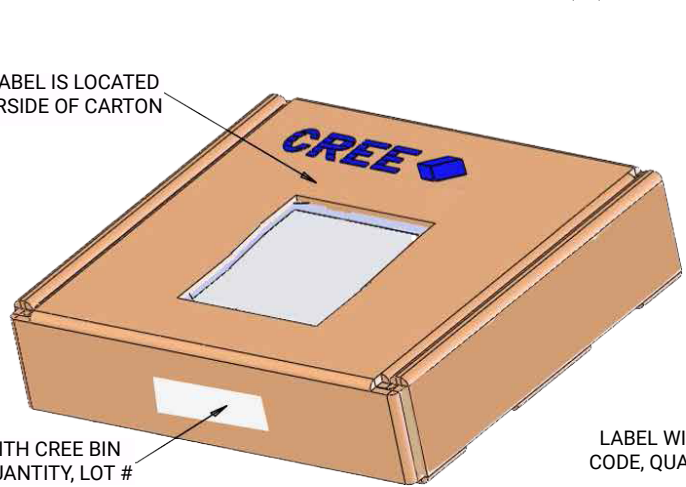
Cree CXA2590 LEDs are packaged in trays of 20. Two trays are sealed in an anti-static bag and placed inside a carton, for a total of 40 LEDs per carton. Each carton contains 40 LEDs from the same performance bin.

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



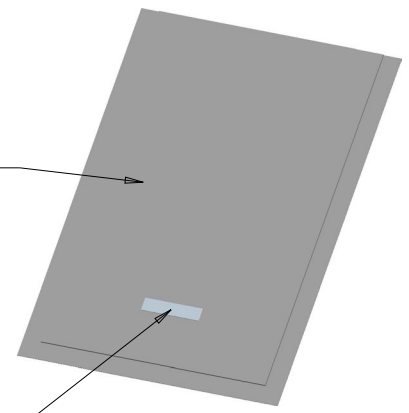
PATENT LABEL IS LOCATED ON UNDERSIDE OF CARTON

LABEL WITH CREE BIN CODE, QUANTITY, LOT #



BAG

LABEL WITH CREE BIN CODE, QUANTITY, LOT #





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