Cree® XLamp® CXA1830 LED

PRODUCT DESCRIPTION

The XLamp® CXA1830 LED array expands Cree's family of high-flux, multi-die arrays in a smaller, easy-to-use platform. With XLamp LED lighting-class reliability, the CXA1830's small, uniform emitting surface enables both directional and non-directional lighting applications including lamp retrofit and luminaire designs. Available in 2-step, 3-step and 4-step color consistency, and featuring a 14-mm optical source, the CXA1830 brings new levels of flux and efficacy to this form factor.

The CX Family LED Design Guide provides basic information on the requirements to use the CXA1830 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 & 5000 K CCT and 4-step EasyWhite bins at 5700 K & 6500 K CCT
- Available in ANSI white bins at 4000 K, 5000 K, 5700 K & 6500 K CCT
- Available in 70-, 80-, 90- and 93-minimum CRI options
- Forward voltage option: 36-V class
- 85 °C binning and characterization
- Maximum drive current: 1400 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)

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CHARACTERISTICS

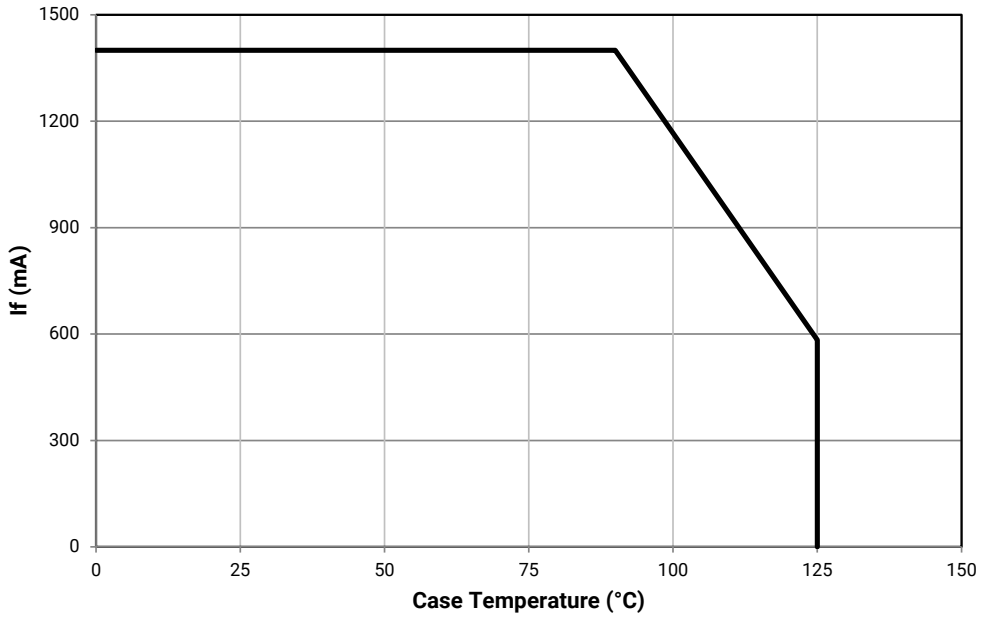
Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			1400*
Reverse current	mA			0.1
Forward voltage (800 mA, 85 °C)	V		36.4	
Forward voltage (800 mA, 25 °C)	V			42

* Refer to the Operating Limits section.

OPERATING LIMITS

The maximum current rating of the CXA1830 depends on the case temperature (Tc) 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 14 for the location of the Tc 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 15 for more information on LES temperature measurement.



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FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS (I_F = 800 mA, T_J = 85 °C)

The following table provides order codes for XLamp CXA1830 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 14).

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	T4	3440	3887					65F	CXA1830-0000-000N00T465F
			U2	3680	4158						CXA1830-0000-000N00U265F
			U4	3955	4424						CXA1830-0000-000N00U465F
	80	---	T4	3440	3887					65F	CXA1830-0000-000N0HT465F
			U2	3680	4158						CXA1830-0000-000N0HU265F
5700 K	70	75	T4	3440	3887					57F	CXA1830-0000-000N00T457F
			U2	3680	4158						CXA1830-0000-000N00U257F
			U4	3955	4424						CXA1830-0000-000N00U457F
	80	---	T4	3440	3887					57F	CXA1830-0000-000N0HT457F
			U2	3680	4158						CXA1830-0000-000N0HU257F
5000 K	70	75	T4	3440	3887	50H	CXA1830-0000-000N00T450H			50F	CXA1830-0000-000N00T450F
			U2	3680	4158		CXA1830-0000-000N00U250H				CXA1830-0000-000N00U250F
			U4	3955	4424		CXA1830-0000-000N00U450H				CXA1830-0000-000N00U450F
	80	---	T2	3200	3616	50H	CXA1830-0000-000N0HT250H			50F	CXA1830-0000-000N0HT250F
			T4	3440	3887		CXA1830-0000-000N0HT450H	50G	CXA1830-0000-000N0HT450G		CXA1830-0000-000N0HT450F
			U2	3680	4158		CXA1830-0000-000N0HU250H		CXA1830-0000-000N0HU250G		CXA1830-0000-000N0HU250F
	90	95	R4	2600	2938	50H	CXA1830-0000-000N0UR450H	50G	CXA1830-0000-000N0UR450G	50F	CXA1830-0000-000N0UR450F
			S2	2780	3141		CXA1830-0000-000N0US250H		CXA1830-0000-000N0US250G		CXA1830-0000-000N0US250F
			S4	2990	3379		CXA1830-0000-000N0US450H		CXA1830-0000-000N0US450G		CXA1830-0000-000N0US450F

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. See the Measurements section (page 16).
- Cree XLamp CXA1830 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.

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FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS (I_F = 800 mA, T_J = 85 °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
4000 K	70	75	T4	3440	3887	40H	CXA1830-0000-000N00T440H			40F	CXA1830-0000-000N00T440F
			U2	3680	4158		CXA1830-0000-000N00U240H				CXA1830-0000-000N00U240F
			U4	3955	4424		CXA1830-0000-000N00U440H				CXA1830-0000-000N00U440F
	80	---	T2	3200	3616	40H	CXA1830-0000-000N0HT240H	40G		40F	CXA1830-0000-000N0HT240F
			T4	3440	3887		CXA1830-0000-000N0HT440H		CXA1830-0000-000N0HT440G		CXA1830-0000-000N0HT440F
			U2	3680	4158		CXA1830-0000-000N0HU240H		CXA1830-0000-000N0HU240G		CXA1830-0000-000N0HU240F
	90	95	R4	2600	2938	40H	CXA1830-0000-000N0UR440H	40G		40F	CXA1830-0000-000N0UR440F
			S2	2780	3141		CXA1830-0000-000N0US240H		CXA1830-0000-000N0US240G		CXA1830-0000-000N0US240F
			S4	2990	3379		CXA1830-0000-000N0US440H		CXA1830-0000-000N0US440G		CXA1830-0000-000N0US440F
3500 K	80	---	S4	2990	3379	35H	CXA1830-0000-000N00S435H	35G		35F	CXA1830-0000-000N00S435F
			T2	3200	3616		CXA1830-0000-000N00T235H		CXA1830-0000-000N00T235G		CXA1830-0000-000N00T235F
			T4	3440	3887		CXA1830-0000-000N00T435H		CXA1830-0000-000N00T435G		CXA1830-0000-000N00T435F
	93	95	R2	2420	2735	35H	CXA1830-0000-000N0YR235H	35G		35F	CXA1830-0000-000N0YR235F
			R4	2600	2938		CXA1830-0000-000N0YR435H		CXA1830-0000-000N0YR435G		CXA1830-0000-000N0YR435F
			S2	2780	3141		CXA1830-0000-000N0YS235H		CXA1830-0000-000N0YS235G		CXA1830-0000-000N0YS235F
3000 K	80	---	S4	2990	3379	30H	CXA1830-0000-000N00S430H	30G		30F	CXA1830-0000-000N00S430F
			T2	3200	3616		CXA1830-0000-000N00T230H		CXA1830-0000-000N00T230G		CXA1830-0000-000N00T230F
			T4	3440	3887		CXA1830-0000-000N00T430H		CXA1830-0000-000N00T430G		CXA1830-0000-000N00T430F
	93	95	Q4	2260	2554	30H	CXA1830-0000-000N0YQ430H	30G		30F	CXA1830-0000-000N0YQ430F
			R2	2420	2735		CXA1830-0000-000N0YR230H		CXA1830-0000-000N0YR230G		CXA1830-0000-000N0YR230F
			R4	2600	2938		CXA1830-0000-000N0YR430H		CXA1830-0000-000N0YR430G		CXA1830-0000-000N0YR430F

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. See the Measurements section (page 16).
- Cree XLamp CXA1830 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.

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FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS (I_F = 800 mA, T_J = 85 °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
2700 K	80	---	S2	2780	3141	27H	CXA1830-0000-000N00S227H	27G		27F	CXA1830-0000-000N00S227F
			S4	2990	3379		CXA1830-0000-000N00S427H		CXA1830-0000-000N00S427G		CXA1830-0000-000N00S427F
			T2	3200	3616		CXA1830-0000-000N00T227H		CXA1830-0000-000N00T227G		CXA1830-0000-000N00T227F
	93	95	Q2	2100	2373	27H	CXA1830-0000-000N0YQ227H	27G		27F	CXA1830-0000-000N0YQ227F
			Q4	2260	2554		CXA1830-0000-000N0YQ427H		CXA1830-0000-000N0YQ427G		CXA1830-0000-000N0YQ427F
			R2	2420	2735		CXA1830-0000-000N0YR227H		CXA1830-0000-000N0YR227G		CXA1830-0000-000N0YR227F

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. See the Measurements section (page 16).
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FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS (I_F = 800 mA, T_J = 85 °C)

The following table provides order codes for XLamp CXA1830 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 14).

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	T4	3440	3887	1A0, 1B0, 1C0, 1D0, 65F	CXA1830-0000-000N00T40E1
			U2	3680	4158		CXA1830-0000-000N00U20E1
			U4	3955	4424		CXA1830-0000-000N00U40E1
	80	---	T4	3440	3887	1A0, 1B0, 1C0, 1D0, 65F	CXA1830-0000-000N0HT40E1
			U2	3680	4158		CXA1830-0000-000N0HU20E1
5700 K	70	75	T4	3440	3887	2A0, 2B0, 2C0, 2D0, 57F	CXA1830-0000-000N00T40E2
			U2	3680	4158		CXA1830-0000-000N00U20E2
			U4	3955	4424		CXA1830-0000-000N00U40E2
	80	---	T4	3440	3887	2A0, 2B0, 2C0, 2D0, 57F	CXA1830-0000-000N0HT40E2
			U2	3680	4158		CXA1830-0000-000N0HU20E2
5000 K	70	75	T4	3440	3887	3A0, 3B0, 3C0, 3D0, 50F	CXA1830-0000-000N00T40E3
			U2	3680	4158		CXA1830-0000-000N00U20E3
			U4	3955	4424		CXA1830-0000-000N00U40E3
	80	---	T2	3200	3616	3A0, 3B0, 3C0, 3D0, 50F	CXA1830-0000-000N0HT20E3
			T4	3440	3887		CXA1830-0000-000N0HT40E3
			U2	3680	4158		CXA1830-0000-000N0HU20E3
4000 K	70	75	T4	3440	3887	5A0, 5B0, 5C0, 5D0, 40F	CXA1830-0000-000N00T40E5
			U2	3680	4158		CXA1830-0000-000N00U20E5
			U4	3955	4424		CXA1830-0000-000N00U40E5

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. See the Measurements section (page 16).
- Cree XLamp CXA1830 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.

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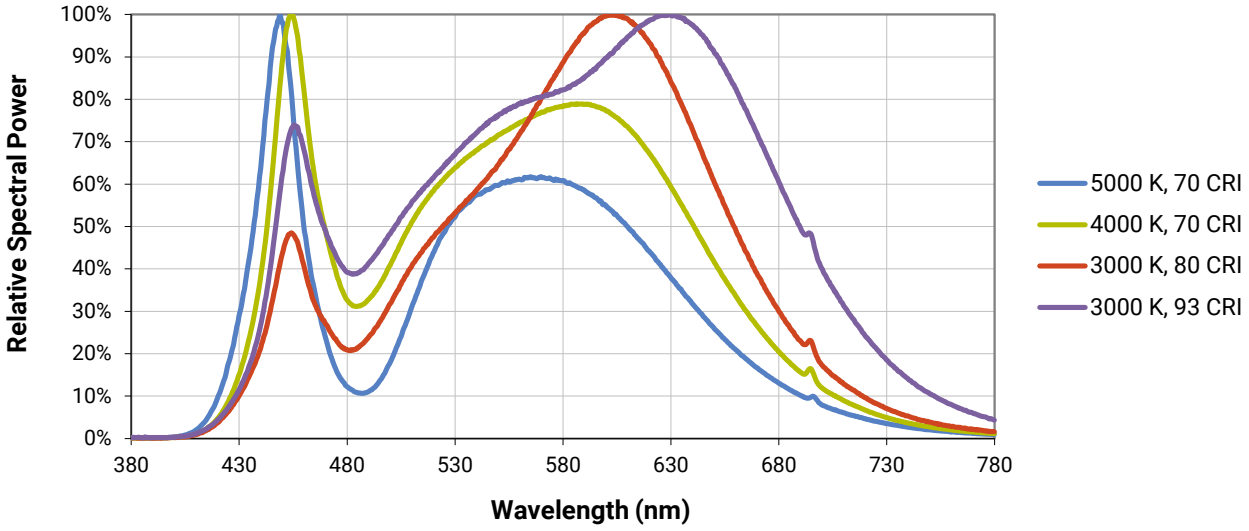
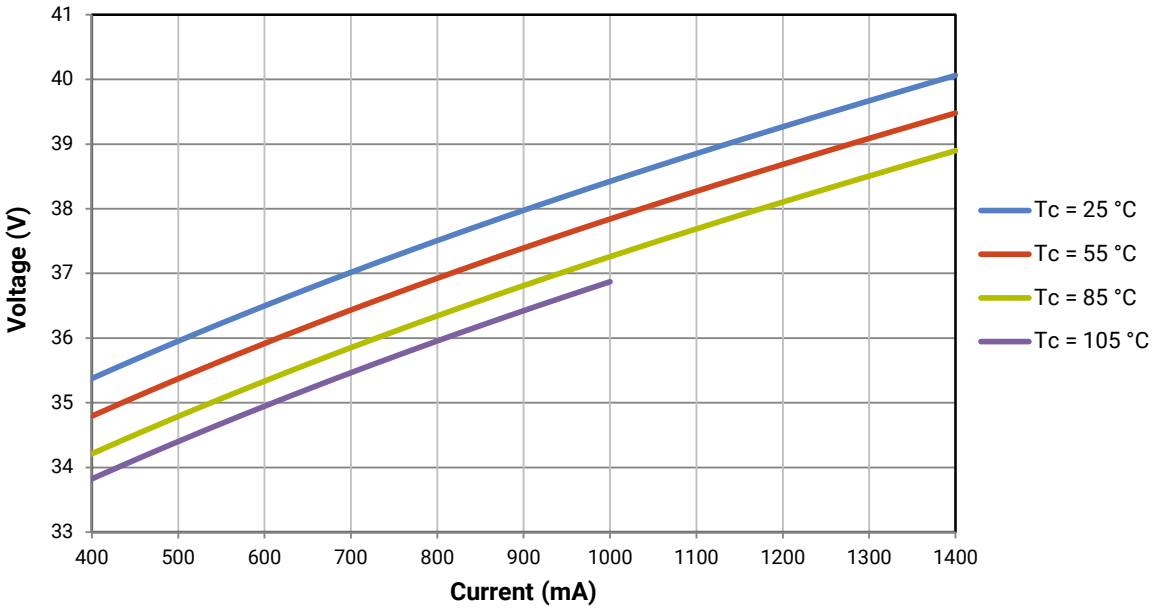
RELATIVE SPECTRAL POWER DISTRIBUTION

The following graph is the result of a series of pulsed measurements at 800 mA and T_J = 85 °C.



ELECTRICAL CHARACTERISTICS

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



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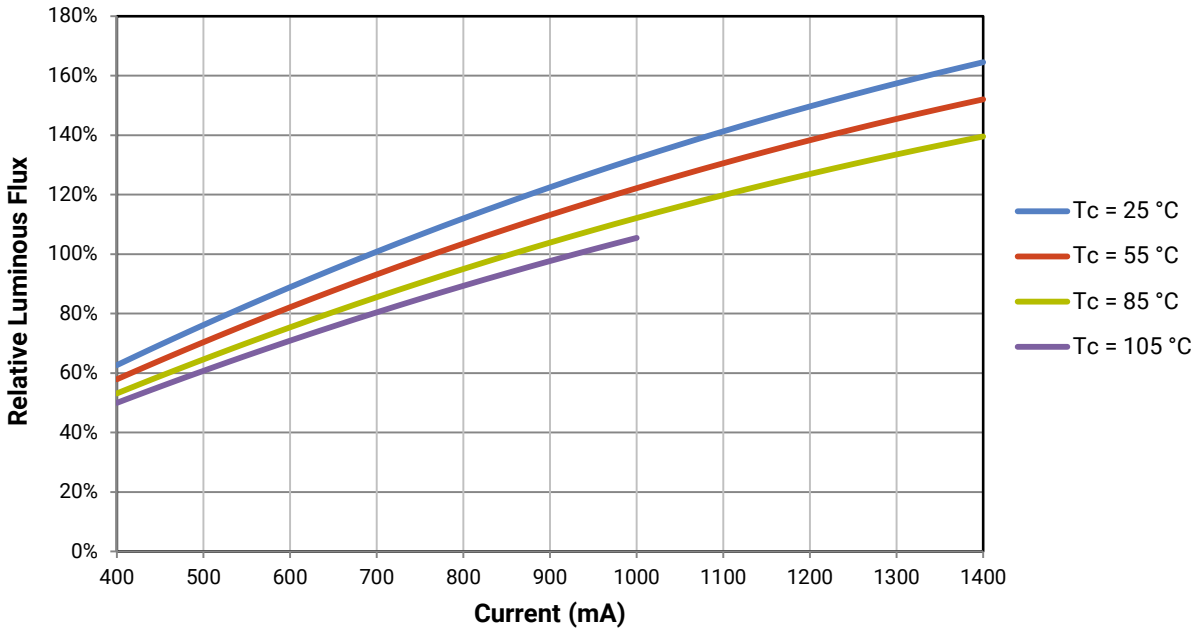
RELATIVE LUMINOUS FLUX

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

- Measurements of CXA1830 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 800 mA at T_J = 85 °C.

For example, at steady-state operation of Tc = 25 °C, I_F = 1100 mA, the relative luminous flux ratio is 140% in the chart below. A CXA1830 LED that measures 2100 lm during binning will deliver 2940 lm (2100 * 1.4) at steady-state operation of Tc = 25 °C, I_F = 1100 mA.



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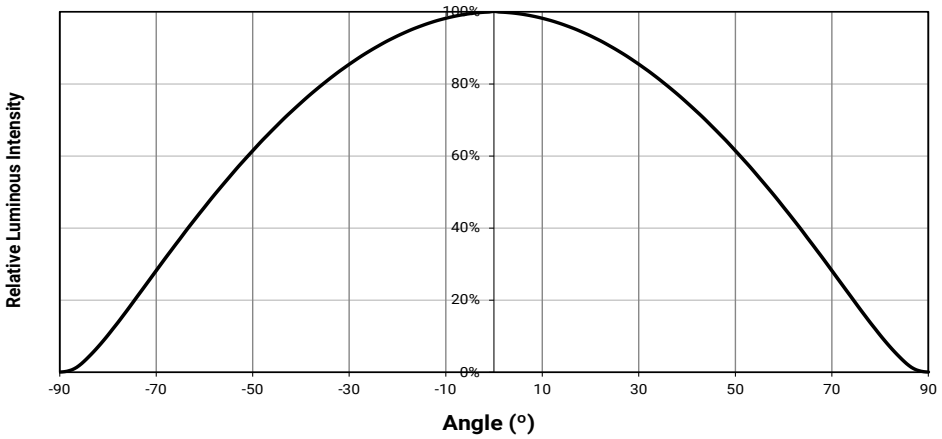
TYPICAL SPATIAL DISTRIBUTION



PERFORMANCE GROUPS - BRIGHTNESS (I_F = 800 mA, T_J = 85 °C)

XLamp CXA1830 LEDs are tested for luminous flux and placed into one of the following bins.

Group Code	Minimum Luminous Flux	Maximum Luminous Flux
Q2	2100	2260
Q4	2260	2420
R2	2420	2600
R4	2600	2780
S2	2780	2990
S4	2990	3200
T2	3200	3440
T4	3440	3680
U2	3680	3955
U4	3955	4230
V2	4230	4545

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PERFORMANCE GROUPS - CHROMATICITY (T_J = 85 °C)

XLamp CXA1830 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

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PERFORMANCE GROUPS - CHROMATICITY (T_J = 85 °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

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PERFORMANCE GROUPS - CHROMATICITY (T_J = 85 °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

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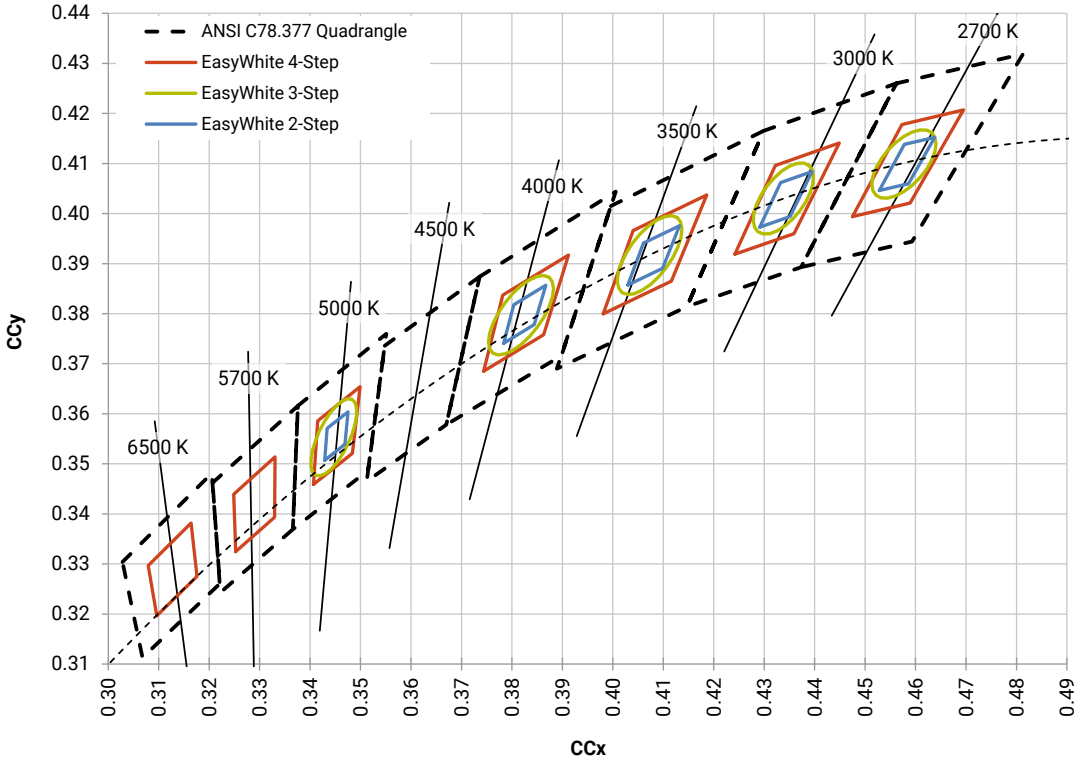
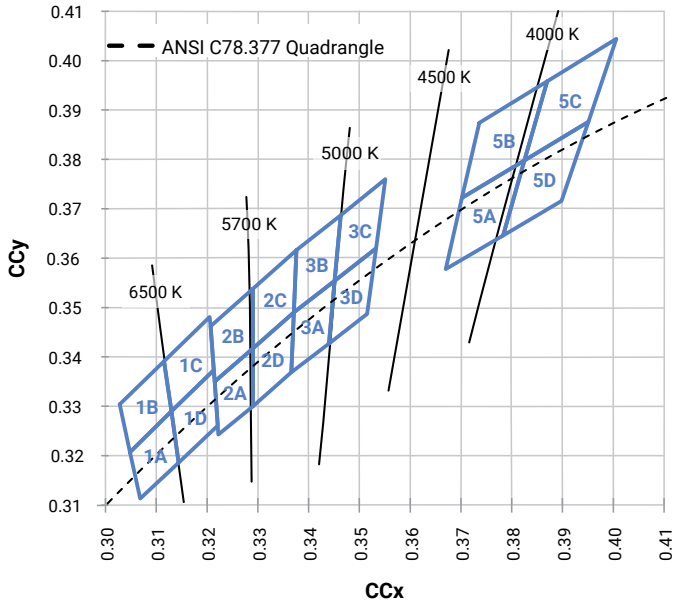
CREE EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE (T_J = 85 °C)



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



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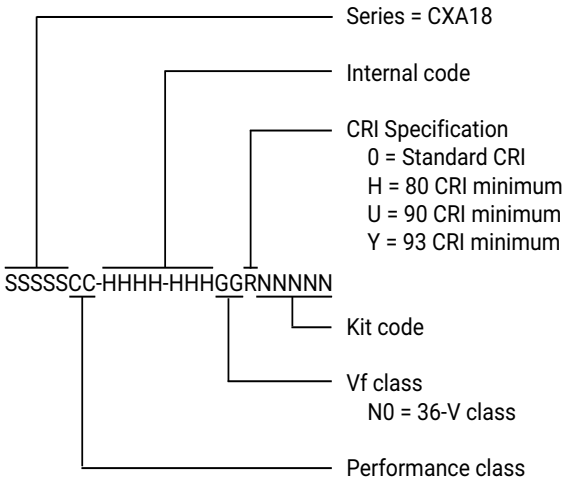
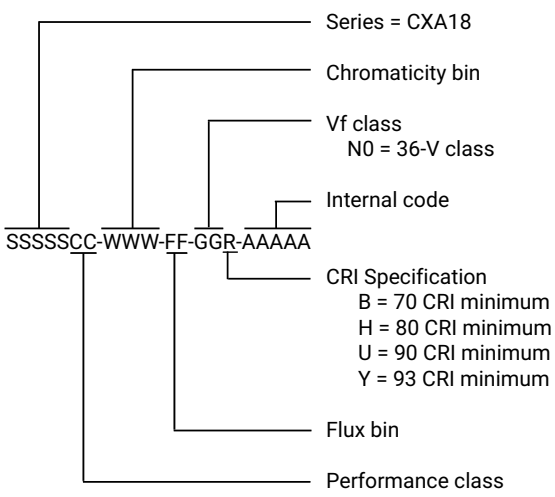
BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows:

Order Code



Bin Code



MECHANICAL DIMENSIONS

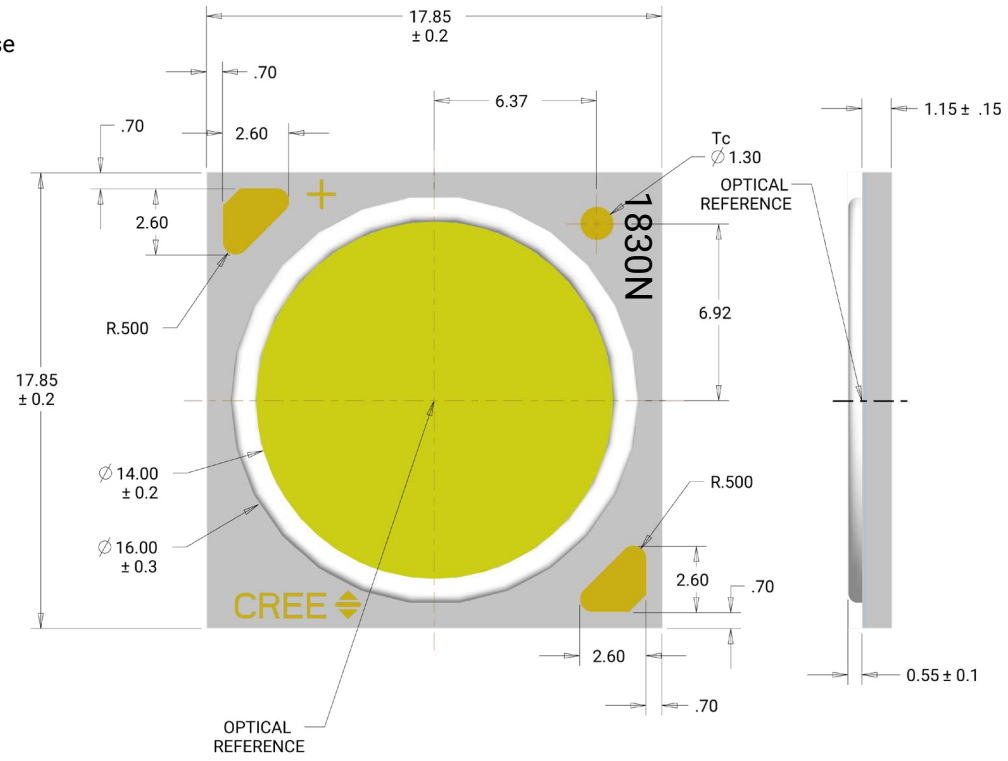
Dimensions are in mm.

Tolerances unless otherwise specified: ±.13

x° ±1°

Meaning of 1830N

1830N = 36-V CXA1830



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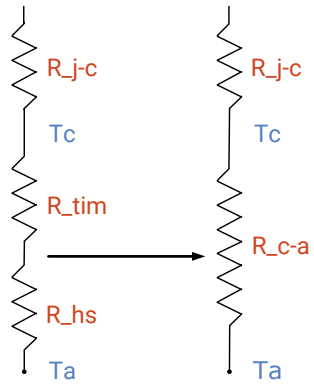
THERMAL DESIGN

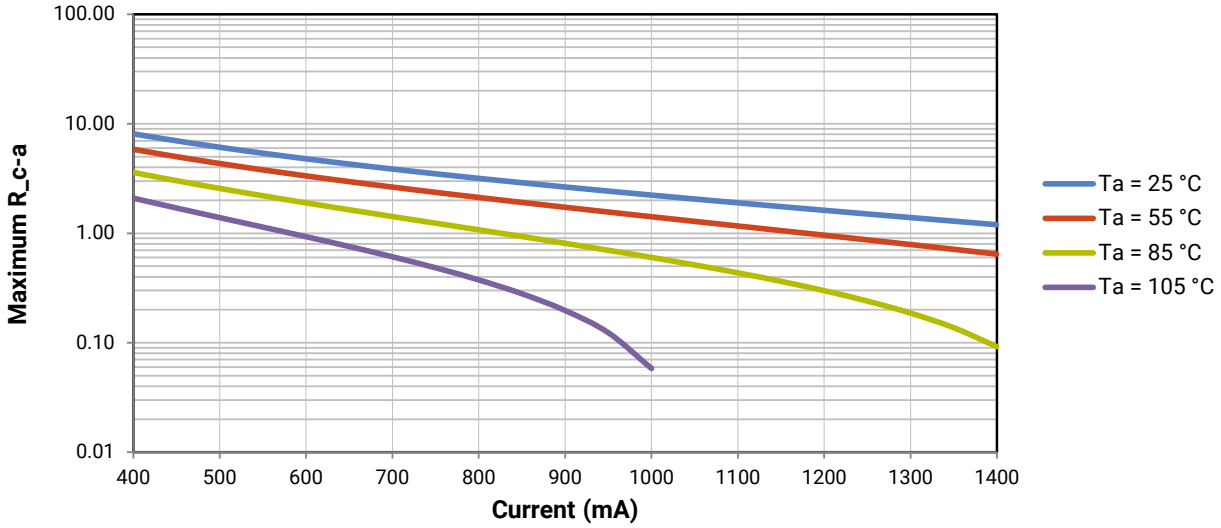
The CXA family of LED arrays can include over a hundred different LED die inside one package, and thus over a hundred different junction temperatures (T_J). Cree has intentionally removed junction-temperature-based operating limits and replaced the commonplace maximum T_J calculations with maximum ratings based on forward current (I_F) and case temperature (Tc). No additional calculations are required to ensure 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 CXA1830 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).





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NOTES

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 SVHC 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.

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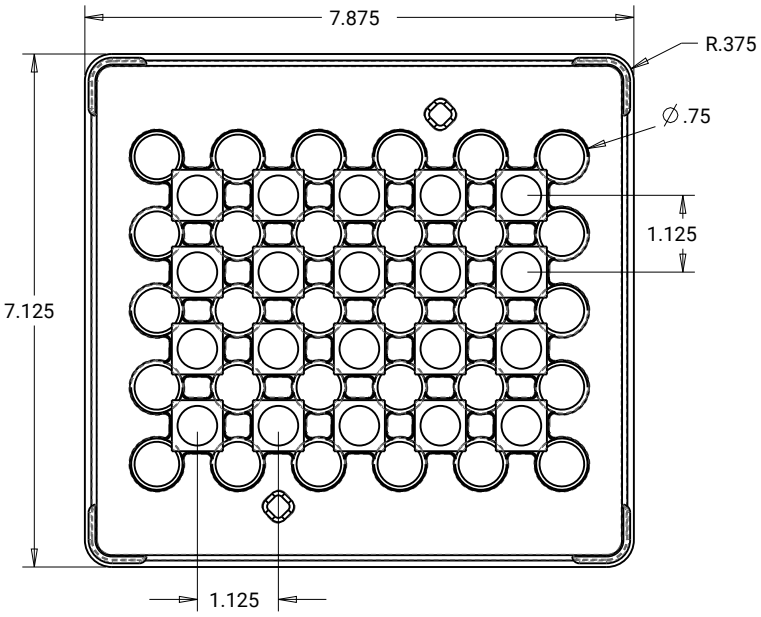
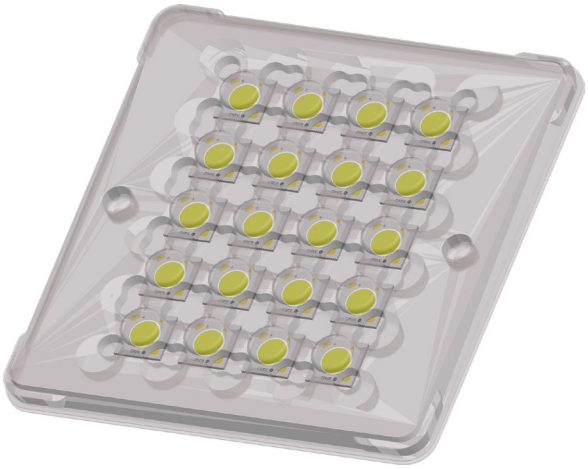
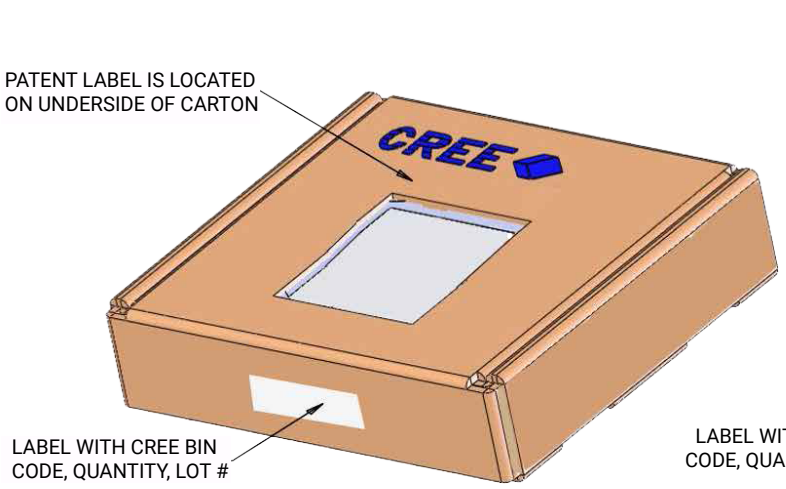
PACKAGING

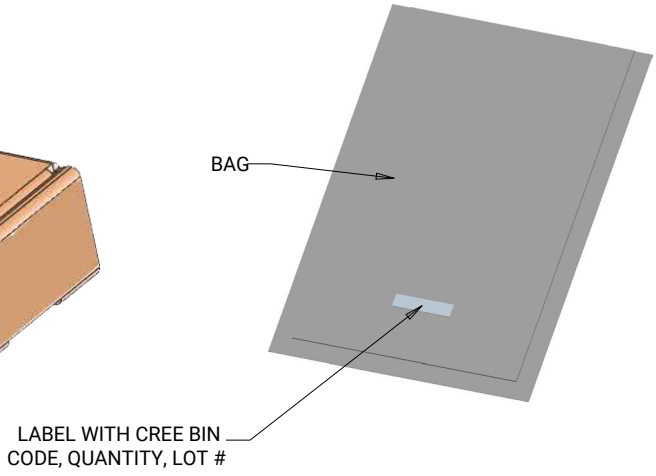
Cree CXA1830 LEDs are packaged in trays of 20. Five trays are sealed in an anti-static bag and placed inside a carton, for a total of 100 LEDs per carton. Each carton contains 100 LEDs from the same performance bin.

Dimensions are in inches.
Tolerances: ±.13
x° ±1°









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Поставка электронных компонентов

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Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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AVIC JONHON

«JONHON» (основан в 1970 г.)

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(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

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