

Cree® XLamp® CXA2540 LED



PRODUCT DESCRIPTION

The XLamp® CXA2540 LED array expands Cree's family of high-flux, multi-die integrated arrays, offering high performance in an easy-to-use platform. With XLamp LED lighting-class reliability, the CXA2540's uniform emitting surface enables both directional and non-directional lighting applications and luminaire and lamp designs. Available in 2-step, 3-step and 4-step color consistency, and featuring a 19-mm optical source, the CXA2540 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 CXA2540 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: 2100 mA
- 115° viewing angle, uniform chromaticity profile
- Top-side solder connections
- Thermocouple attach point
- NEMA SSL-3 2011 standard flux bins
- Mechanical and optical footprint consistent with CXA2520 and CXA2530
- 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	6
Relative Spectral Power Distribution	7
Electrical Characteristics	7
Relative Luminous Flux	8
Typical Spatial Distribution	9
Performance Groups - Brightness	9
Performance Groups - Chromaticity	10
Cree EasyWhite® Bins Plotted on the 1931 CIE Color Space	13
Cree ANSI White Bins Plotted on the 1931 CIE Color Space	13
Bin and Order Code Formats	14
Mechanical Dimensions	14
Thermal Design	15
Notes	16
Packaging	17



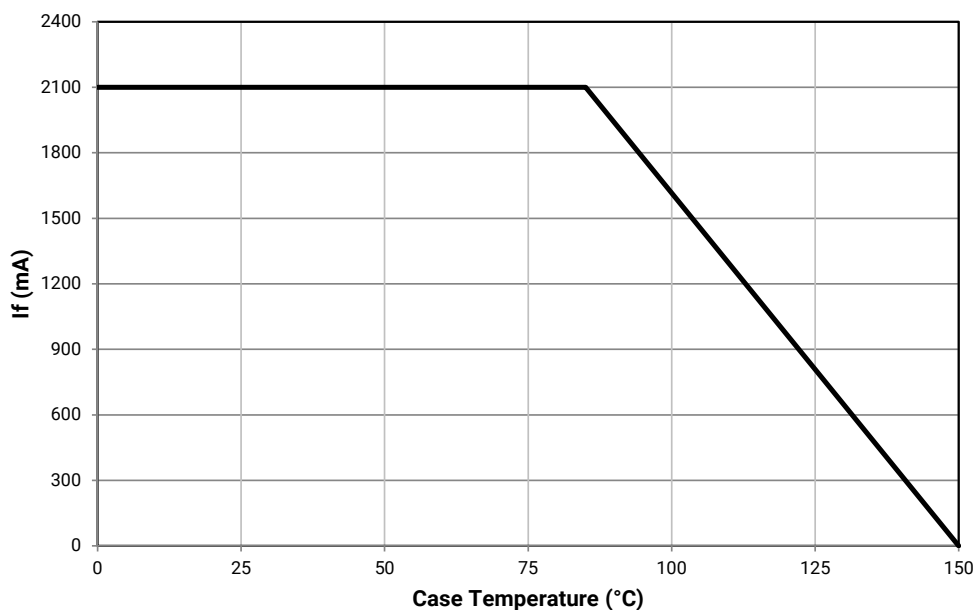
CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			2100*
Reverse current	mA			0.1
Forward voltage (@ 1100 mA, $T_j = 85^\circ\text{C}$)	V		36.2	
Forward voltage (@ 1100 mA, $T_j = 25^\circ\text{C}$)	V			42

* Refer to the Operating Limits section.

OPERATING LIMITS

The maximum current rating of the CXA2540 is dependent on the case temperature (T_c) 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 Drawings section on page 14 for the location of the T_c measurement point.



FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS ($I_F = 1100 \text{ mA}$, $T_J = 85^\circ \text{C}$)

The following table provides order codes for XLamp CXA2540 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	W2	4860	5435					65F	CXA2540-0000-000N00W265F
			W4	5225	5843						CXA2540-0000-000N00W465F
			X2	5590	6244						CXA2540-0000-000N00X265F
	80	---	V4	4545	5083					65F	CXA2540-0000-000N0HV465F
			W2	4860	5435						CXA2540-0000-000N0HW265F
			W4	5225	5843						CXA2540-0000-000N0HW465F
5700 K	70	75	W2	4860	5435					57F	CXA2540-0000-000N00W257F
			W4	5225	5843						CXA2540-0000-000N00W457F
			X2	5590	6244						CXA2540-0000-000N00X257F
	80	---	V4	4545	5083					57F	CXA2540-0000-000N0HV457F
			W2	4860	5435						CXA2540-0000-000N0HW257F
			W4	5225	5843						CXA2540-0000-000N0HW457F
5000 K	70	75	W2	4860	5435	50H	CXA2540-0000-000N00W250H			50F	CXA2540-0000-000N00W250F
			W4	5225	5843		CXA2540-0000-000N00W450H				CXA2540-0000-000N00W450F
			X2	5590	6244		CXA2540-0000-000N00X250H				CXA2540-0000-000N00X250F
	80	---	V4	4545	5083	50H	CXA2540-0000-000N0HV450H	50G		50F	CXA2540-0000-000N0HV450F
			W2	4860	5435		CXA2540-0000-000N0HW250H		CXA2540-0000-000N0HW250G		CXA2540-0000-000N0HW250F
			W4	5225	5843		CXA2540-0000-000N0HW450H		CXA2540-0000-000N0HW450G		CXA2540-0000-000N0HW450F
	90	95	U2	3680	4115	50H	CXA2540-0000-000N0UU250H	50G		50F	CXA2540-0000-000N0UU250F
			U4	3955	4391		CXA2540-0000-000N0UU450H		CXA2540-0000-000N0UU450G		CXA2540-0000-000N0UU450F
			V2	4230	4730		CXA2540-0000-000N0UV250H		CXA2540-0000-000N0UV250G		CXA2540-0000-000N0UV250F

- 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. See the Measurements section (page 16).
 - Cree XLamp CXA2540 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 = 1100 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	V4	4545	5083	40H	CXA2540-0000-000N00V440H			40F	CXA2540-0000-000N00V440F
			W2	4860	5435		CXA2540-0000-000N00W240H				CXA2540-0000-000N00W240F
			W4	5225	5843		CXA2540-0000-000N00W440H				CXA2540-0000-000N00W440F
	80	---	V2	4230	4730	40H	CXA2540-0000-000N0HV240H	40G		40F	CXA2540-0000-000N0HV240F
			V4	4545	5083		CXA2540-0000-000N0HV440H				CXA2540-0000-000N0HV440F
			W2	4860	5435		CXA2540-0000-000N0HW240H				CXA2540-0000-000N0HW240F
	90	95	T4	3440	3818	40H	CXA2540-0000-000N0UT40H	40G		40F	CXA2540-0000-000N0UT440F
			U2	3680	4115		CXA2540-0000-000N0UU240H				CXA2540-0000-000N0UU240F
			U4	3955	4423		CXA2540-0000-000N0UU440H				CXA2540-0000-000N0UU440F
3500 K	80	---	V2	4230	4730	35H	CXA2540-0000-000N00V235H	35G		35F	CXA2540-0000-000N00V235F
			V4	4545	5083		CXA2540-0000-000N00V435H				CXA2540-0000-000N00V435F
			W2	4860	5435		CXA2540-0000-000N00W235H				CXA2540-0000-000N00W235F
	93	95	T2	3200	3552	35H	CXA2540-0000-000N0YT235H	35G		35F	CXA2540-0000-000N0YT235F
			T4	3440	3818		CXA2540-0000-000N0YT435H				CXA2540-0000-000N0YT435F
			U2	3680	4115		CXA2540-0000-000N0YU235H				CXA2540-0000-000N0YU235F

Notes

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- Cree XLamp CXA2540 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 ($I_F = 1100 \text{ mA}$, $T_J = 85^\circ\text{C}$) - 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	—	V2	4230	4730	30H	CXA2540-0000-000N00V230H	30G		30F	CXA2540-0000-000N00V230F
			V4	4545	5083		CXA2540-0000-000N00V430H		CXA2540-0000-000N00V430G		CXA2540-0000-000N00V430F
			W2	4860	5435		CXA2540-0000-000N00W230H		CXA2540-0000-000N00W230G		CXA2540-0000-000N00W230F
	90	95	T4	3440	3818	30H	CXA2540-0000-000N00T430H	30G	CXA2540-0000-000N00T430G	30F	CXA2540-0000-000N00T430F
			U2	3680	4115		CXA2540-0000-000N00U230H		CXA2540-0000-000N00U230G		CXA2540-0000-000N00U230F
			U4	3955	4423		CXA2540-0000-000N00U430H				CXA2540-0000-000N00U430F
	93	95	T2	3200	3552	30H	CXA2540-0000-000N00T230H	30G		30F	CXA2540-0000-000N00T230F
			T4	3440	3818		CXA2540-0000-000N00T430H		CXA2540-0000-000N00T430G		CXA2540-0000-000N00T430F
			U2	3680	4115		CXA2540-0000-000N00U230H		CXA2540-0000-000N00U230G		CXA2540-0000-000N00U230F
2700 K	80	—	U4	3955	4423	27H	CXA2540-0000-000N00U427H	27G		27F	CXA2540-0000-000N00U427F
			V2	4230	4730		CXA2540-0000-000N00V227H		CXA2540-0000-000N00V227G		CXA2540-0000-000N00V227F
			V4	4545	5083		CXA2540-0000-000N00V427H		CXA2540-0000-000N00V427G		CXA2540-0000-000N00V427F
	90	95	S4	2990	3319	27H	CXA2540-0000-000N00S427H	27G	CXA2540-0000-000N00S427G	27F	CXA2540-0000-000N00S427F
			T2	3200	3552		CXA2540-0000-000N00T227H		CXA2540-0000-000N00T227G		CXA2540-0000-000N00T227F
			T4	3440	3818		CXA2540-0000-000N00T427H		CXA2540-0000-000N00T427G		CXA2540-0000-000N00T427F
	93	95	S4	2990	3319	27H	CXA2540-0000-000N00S427H	27G		27F	CXA2540-0000-000N00S427F
			T2	3200	3552		CXA2540-0000-000N00T227H		CXA2540-0000-000N00T227G		CXA2540-0000-000N00T227F
			T4	3440	3818		CXA2540-0000-000N00T427H		CXA2540-0000-000N00T427G		CXA2540-0000-000N00T427F

Notes

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- Cree XLamp CXA2540 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 ($I_F = 1100 \text{ mA}$, $T_J = 85^\circ \text{C}$)

The following table provides order codes for XLamp CXA2540 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 14).

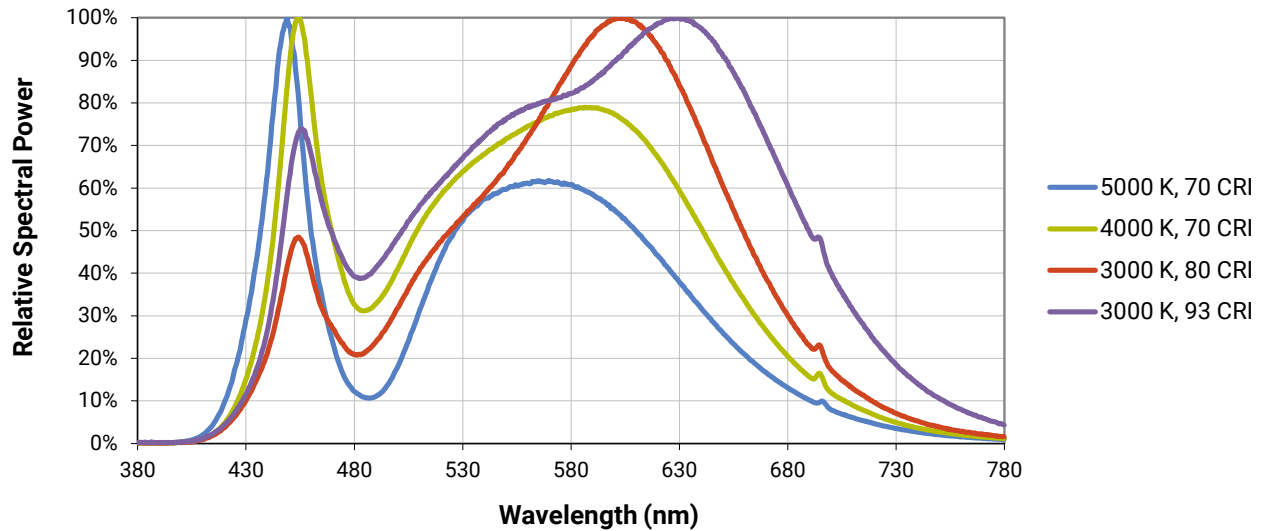
Nominal CCT	CRI		Minimum Luminous Flux			Chromaticity Regions	Order Code
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*		
6500 K	70	75	W2	4860	5435	1A0, 1B0, 1C0, 1D0, 65F	CXA2540-0000-000N00W20E1
			W4	5225	5843		CXA2540-0000-000N00W40E1
			X2	5590	6244		CXA2540-0000-000N00X20E1
	80	---	V4	4545	5083	1A0, 1B0, 1C0, 1D0, 65F	CXA2540-0000-000N0HV40E1
			W2	4860	5435		CXA2540-0000-000N0HW20E1
			W4	5225	5843		CXA2540-0000-000N0HW40E1
5700 K	70	75	W2	4860	5435	2A0, 2B0, 2C0, 2D0, 57F	CXA2540-0000-000N00W20E2
			W4	5225	5843		CXA2540-0000-000N00W40E2
			X2	5590	6244		CXA2540-0000-000N00X20E2
	80	---	V4	4545	5083	2A0, 2B0, 2C0, 2D0, 57F	CXA2540-0000-000N0HV40E2
			W2	4860	5435		CXA2540-0000-000N0HW20E2
			W4	5225	5843		CXA2540-0000-000N0HW40E2
5000 K	70	75	W2	4860	5435	3A0, 3B0, 3C0, 3D0, 50F	CXA2540-0000-000N00W20E3
			W4	5225	5843		CXA2540-0000-000N00W40E3
			X2	5590	6244		CXA2540-0000-000N00X20E3
	80	---	V4	4545	5083	3A0, 3B0, 3C0, 3D0, 50F	CXA2540-0000-000N0HV40E3
			W2	4860	5435		CXA2540-0000-000N0HW20E3
			W4	5225	5843		CXA2540-0000-000N0HW40E3
4000 K	70	75	V4	4545	5083	5A0, 5B0, 5C0, 5D0, 40F	CXA2540-0000-000N00V40E5
			W2	4860	5435		CXA2540-0000-000N00W20E5
			W4	5225	5843		CXA2540-0000-000N00W40E5

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. See the Measurements section (page 16).
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- * Flux values @ 25 °C are calculated and for reference only.

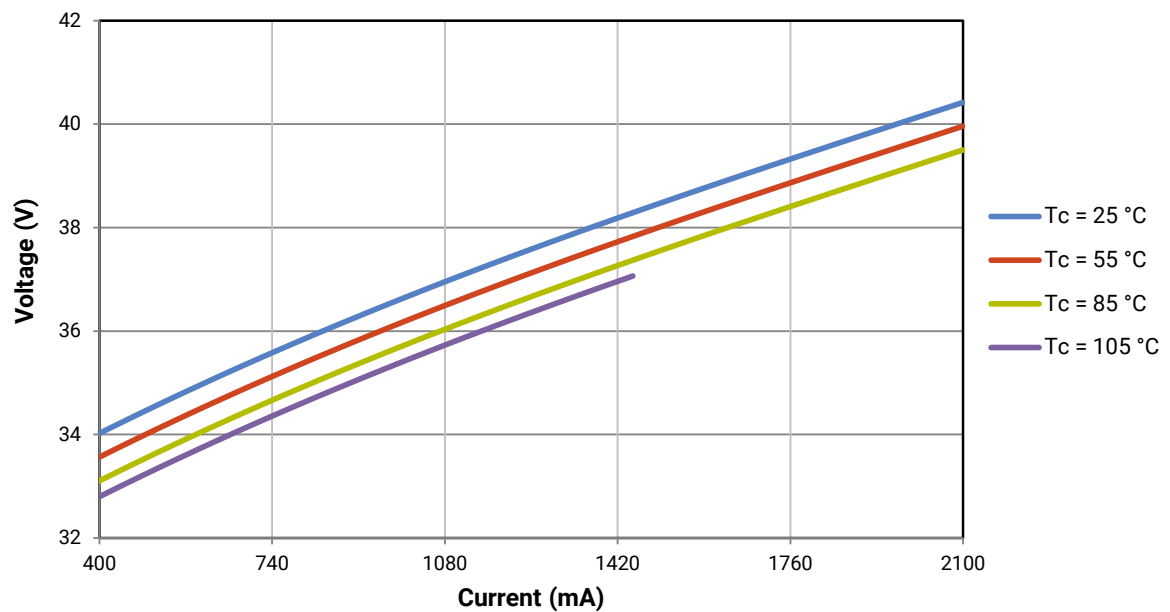
RELATIVE SPECTRAL POWER DISTRIBUTION

The following graph is the result of a series of pulsed measurements at 1100 mA and $T_j = 85^\circ\text{C}$.



ELECTRICAL CHARACTERISTICS

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

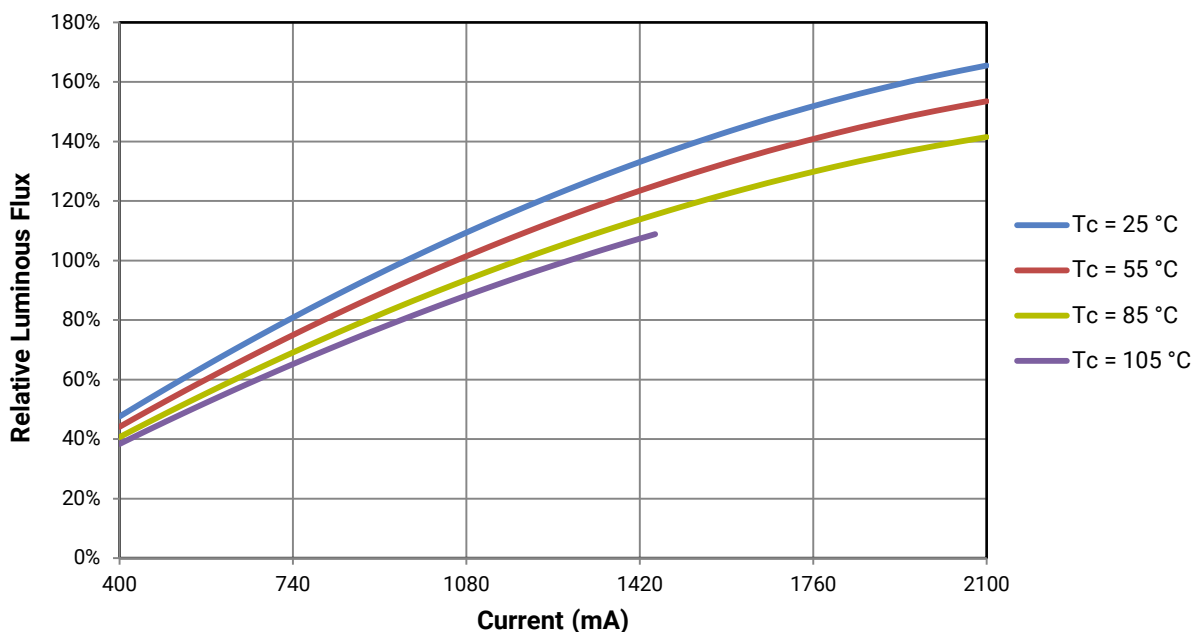


RELATIVE LUMINOUS FLUX

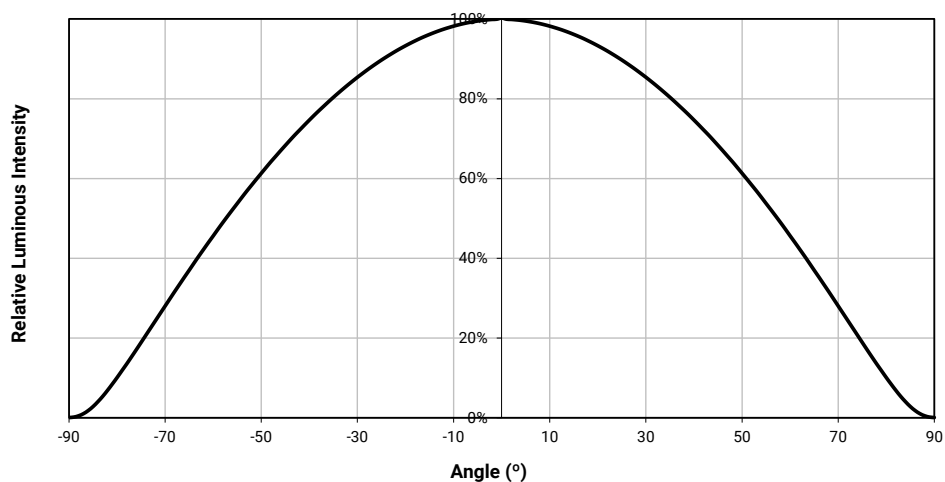
The relative luminous flux values provided below are the ratio of:

- Measurements of CXA2540 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 1100 mA at $T_J = 85^\circ\text{C}$.

For example, at steady-state operation of $T_c = 55^\circ\text{C}$, $I_F = 1760\text{ mA}$, the relative luminous flux ratio is 140% in the chart below. A CXA2540 LED that measures 4600 lm during binning will deliver 6440 lm (4600×1.4) at steady-state operation of $T_c = 55^\circ\text{C}$, $I_F = 1760\text{ mA}$.



TYPICAL SPATIAL DISTRIBUTION



PERFORMANCE GROUPS - BRIGHTNESS ($I_F = 1100 \text{ mA}$, $T_J = 85^\circ\text{C}$)

XLamp CXA2540 LEDs are tested for luminous flux and placed into one of the following bins.

Group Code	Minimum Luminous Flux	Maximum Luminous Flux
S4	2990	3200
T2	3200	3440
T4	3440	3680
U2	3680	3955
U4	3955	4230
V2	4230	4545
V4	4545	4860
W2	4860	5225
W4	5225	5590
X2	5590	6010
X4	6010	6430

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

XLamp CXA2540 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 ($T_j = 85\text{ }^{\circ}\text{C}$) - CONTINUED

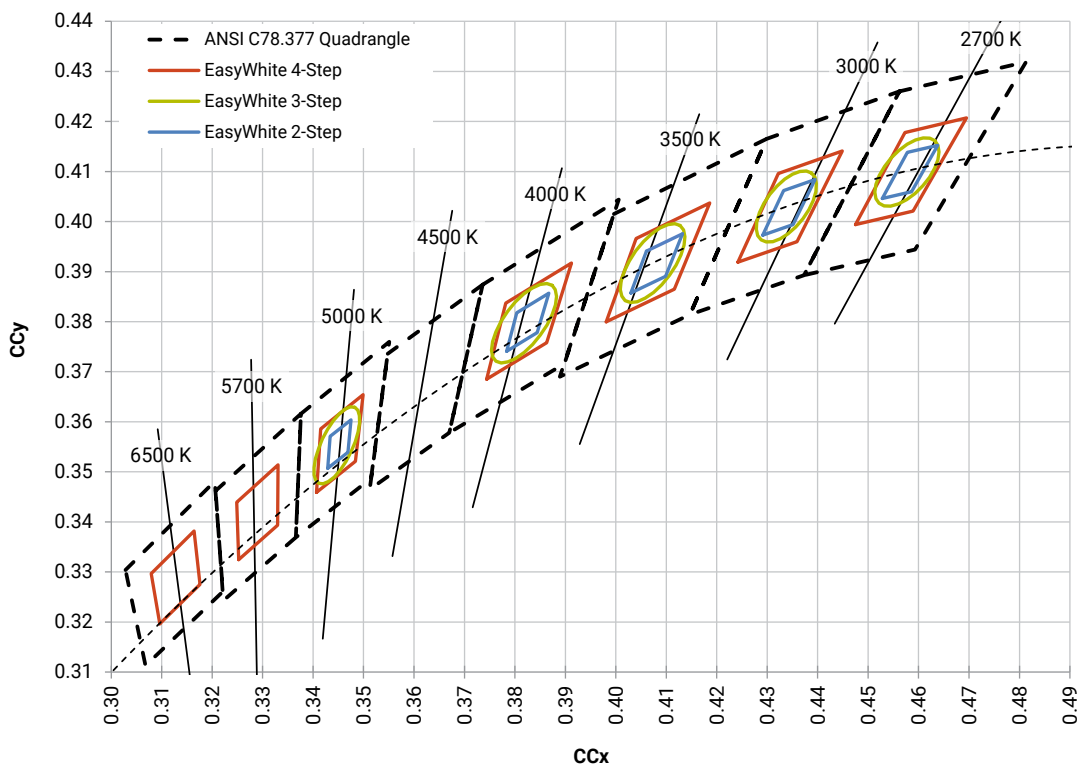
ANSI White Bins				
Code	CCT	Bin Code	x	y
0E1	6500 K	1A0	0.3048	0.3207
			0.3130	0.3290
			0.3144	0.3186
			0.3068	0.3113
		1B0	0.3028	0.3304
			0.3115	0.3391
			0.3130	0.3290
			0.3048	0.3207
		1C0	0.3115	0.3391
			0.3205	0.3481
			0.3213	0.3373
			0.3130	0.3290
		1D0	0.3130	0.3290
			0.3213	0.3373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

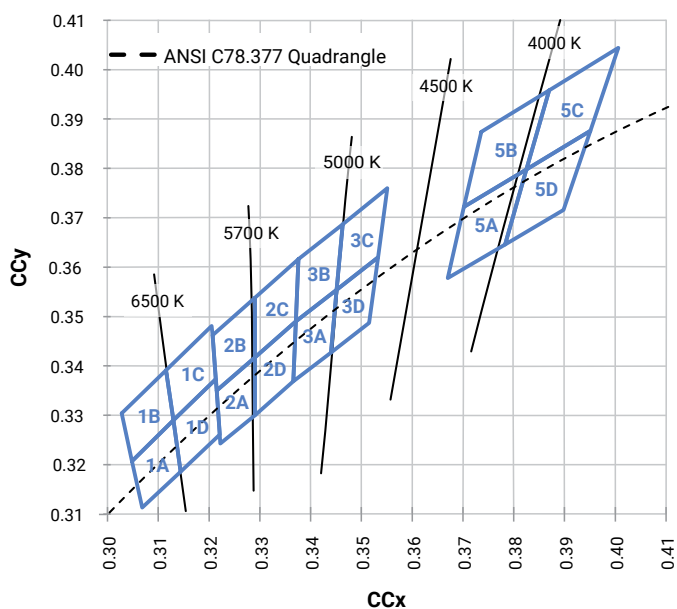
ANSI White Bins				
Code	CCT	Bin Code	x	y
0E3	5000 K	3A0	.3371	.3490
			.3451	.3554
			.3440	.3427
			.3366	.3369
		3B0	.3376	.3616
			.3463	.3687
			.3451	.3554
			.3371	.3490
		3C0	.3463	.3687
			.3551	.3760
			.3533	.3620
			.3451	.3554
		3D0	.3451	.3554
			.3533	.3620
			.3515	.3487
			.3440	.3427

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

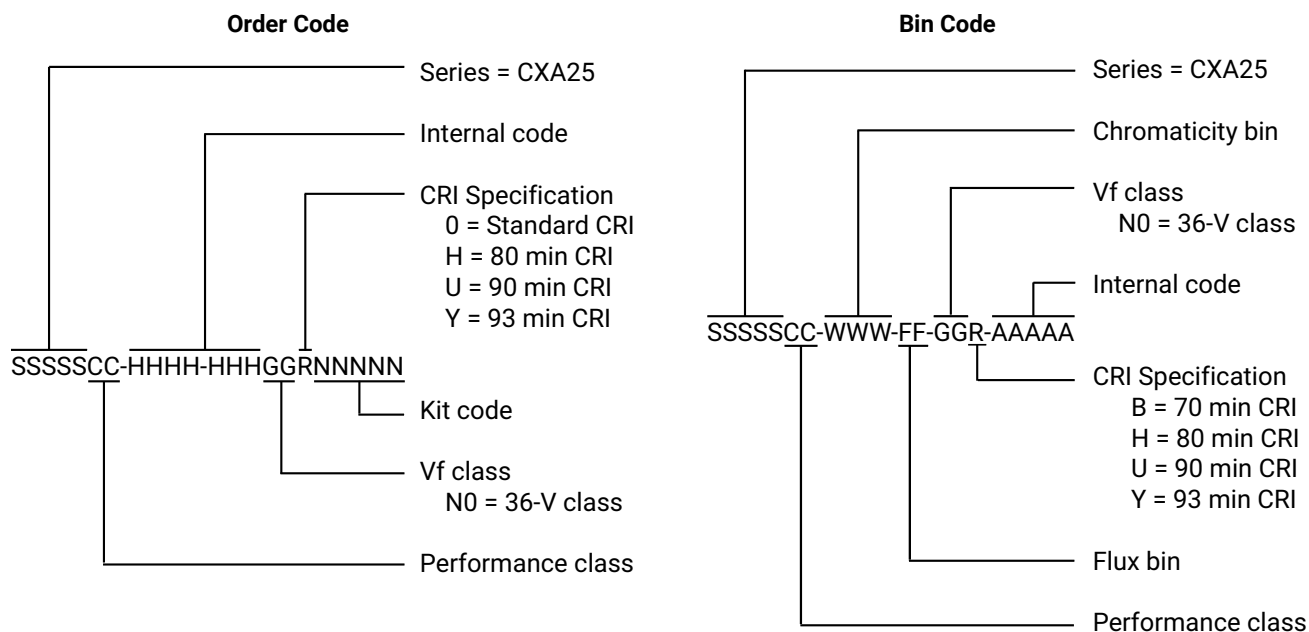
CREE EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE ($T_j = 85^\circ\text{C}$)



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

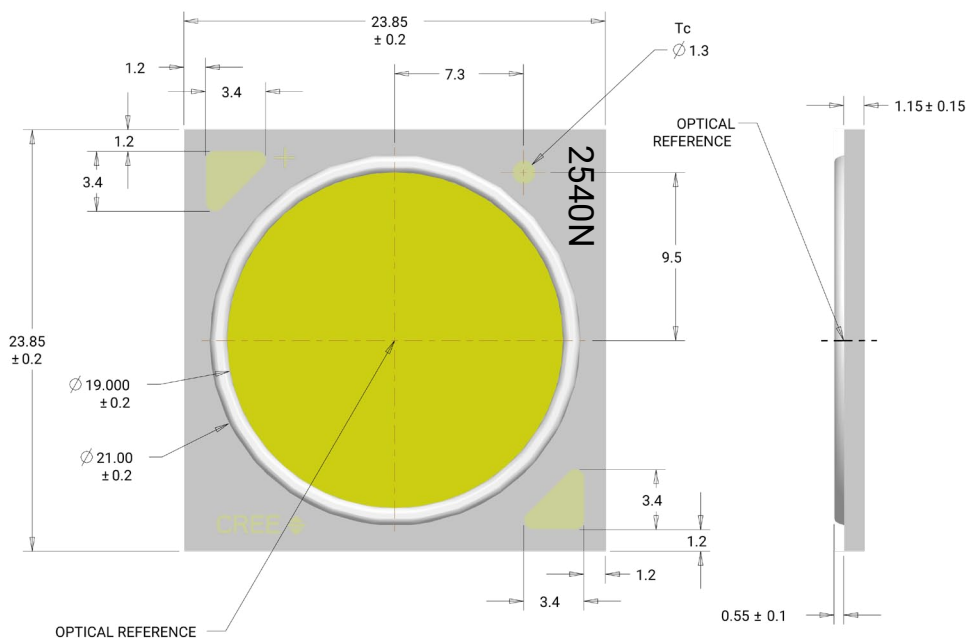


Bin codes and order codes are configured as follows:



Dimensions are in mm.
Tolerances unless otherwise
specified: ± 13
 $x^\circ \pm 1^\circ$

Meaning of 2540N
2540N = 36-V CXA2540



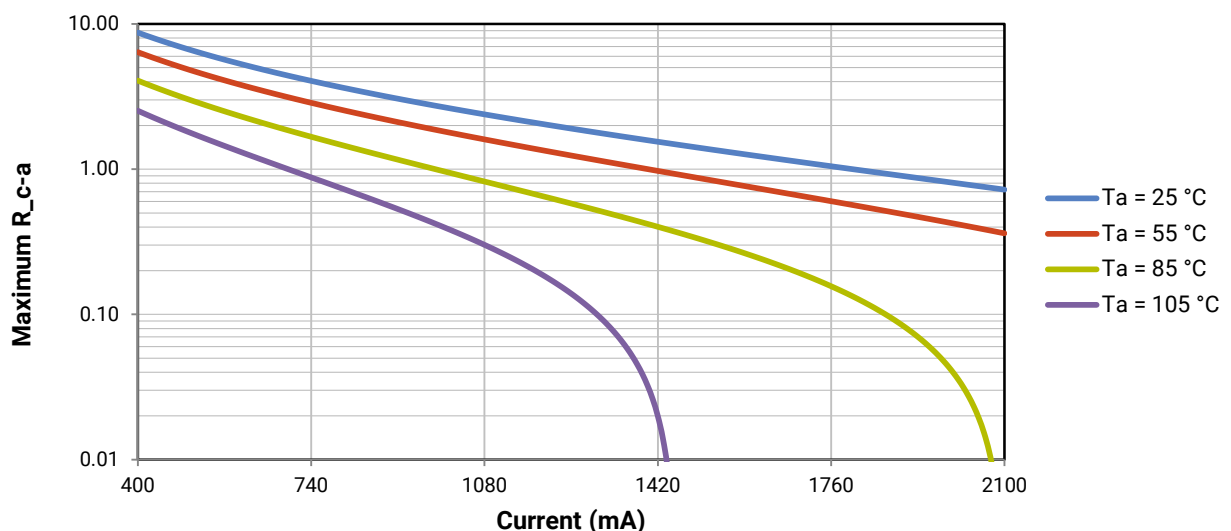
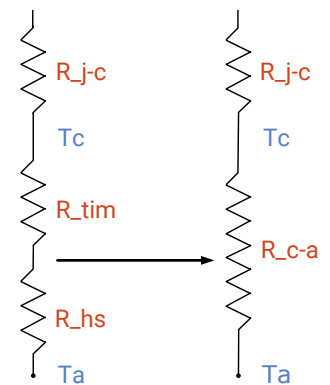
THERMAL DESIGN

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.

There is no need to calculate for T_j inside the package, as the thermal management design process, specifically from solder point (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) 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 CXA2540 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

Measurements

The luminous flux, radiant power, chromaticity 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 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 Documentation sections of www.cree.com.

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

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 CXA2540 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: $\pm .13$

$x^{\circ} \pm 1^{\circ}$

