# Cree® XLamp® CXB2540 LED



#### **PRODUCT DESCRIPTION**

The XLamp® CXB2540 LED Array is a member of the second generation of the CXA family that delivers up to 30% higher efficacy and up to 20% higher lumens than the first generation in the same LES. The higher performance second generation CXA LED Arrays provide a drop-in performance upgrade to existing CXA LED designs to shorten product development time. In addition, the CXB LEDs also allow lighting manufacturers to achieve the same or better performance with a smaller LES, enabling a smaller, more impactful luminaire. Available in 2-step, 3-step and 5-step EasyWhite® bins and 2-step and 3-step Premium Color bins, the CXB2540 LED delivers high lumen output and high efficacy in a single, easy-to-use package that eliminates the need for reflow soldering.

The CX Family LED Design Guide provides basic information on the requirements to use the CXB2540 LED successfully in luminaire designs.

### **FEATURES**

- · 19-mm optical source
- Mechanical and optical design consistent with other CXA25 and CXB25 LEDs
- Available in 70-, 80-, 90- and 95-minimum CRI options
- Cree EasyWhite® 2-, 3- and 5-step binning
- Premium Color 2- and 3-step binning
- · Forward voltage option: 36-V class
- 85 °C binning and characterization
- Extremely uniform color over viewing angle
- 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**

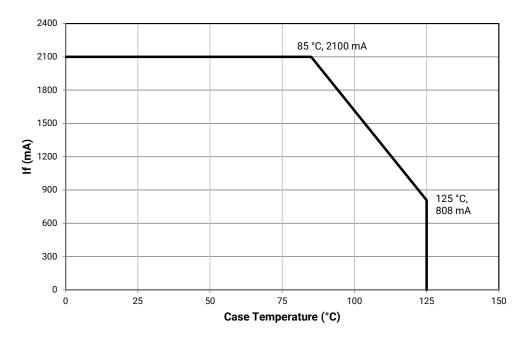
Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			2100*
Reverse current	mA			0.1
Forward voltage (@ 1100 mA, T <sub>j</sub> = 85 °C)	V		34.1	38

<sup>\*</sup> Refer to the Operating Limits section.

#### **OPERATING LIMITS**

The maximum current rating of the CXB2540 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 16 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 17 for more information on LES temperature measurement.





# FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS (I<sub>F</sub> = 1100 mA, T<sub>I</sub> = 85 °C)

The following table provides order codes for XLamp CXB2540 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 16).

Nominal	CR	ll*	Minir	num Lumin	ous Flux		2-Step		3-Step		5-Step
CCT	Min	Тур	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**	Group	Order Code	Group	Order Code	Group	Order Code
			W4	5225	5784						CXB2540-0000- 000N0BW465E
	70		X2	5590	6188					65E	CXB2540-0000- 000N0BX265E
6500 K			X4	6010	6653						CXB2540-0000- 000N0BX465E
0000 K			W4	5225	5784						CXB2540-0000- 000N0HW465E
	80		X2	5590	6188					65E	CXB2540-0000- 000N0HX265E
			X4	6010	6653						CXB2540-0000- 000N0HX465E
			W4	5225	5784						CXB2540-0000- 000N0BW457E
	70		X2	5590	6188					57E	CXB2540-0000- 000N0BX257E
5700 K			X4	6010	6653						CXB2540-0000- 000N0BX457E
3700 K			W4	5225	5784						CXB2540-0000- 000N0HW457E
	80		X2	5590	6188					57E	CXB2540-0000- 000N0HX257E
			X4	6010	6653						CXB2540-0000- 000N0HX457E

- 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 18).
- Cree XLamp CXB2540 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.
- \* For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.
- \*\* Flux values @ 25 °C are calculated and for reference only.



# FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS (I<sub>E</sub> = 1100 mA, T<sub>I</sub> = 85 °C) - CONTINUED

Nominal	CF	RI*	Minir	num Lumin	ous Flux		2-Step		3-Step		5-Step
CCT	Min	Тур	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**	Group	Order Code	Group	Order Code	Group	Order Code
			W4	5225	5784						CXB2540-0000- 000N0BW450E
	70		X2	5590	6188					50E	CXB2540-0000- 000N0BX250E
			X4	6010	6653						CXB2540-0000- 000N0BX450E
			W4	5225	5784				CXB2540-0000- 000N0HW450G		CXB2540-0000- 000N0HW450E
5000 K	80		X2	5590	6188			50G	CXB2540-0000- 000N0HX250G	50E	CXB2540-0000- 000N0HX250E
			X4	6010	6653				CXB2540-0000- 000N0HX450G		CXB2540-0000- 000N0HX450E
			V4	4545	5031				CXB2540-0000- 000N0UV450G		
	90	92	W2	4860	5380			50G	CXB2540-0000- 000N0UW250G		
			W4	5225	5784				CXB2540-0000- 000N0UW450G		
			W4	5225	5784						CXB2540-0000- 000N0BW440E
	70		X2	5590	6188					40E	CXB2540-0000- 000N0BX240E
			X4	6010	6653						CXB2540-0000- 000N0BX440E
			W2	4860	5380		CXB2540-0000- 000N0HW240H		CXB2540-0000- 000N0HW240G		
4000 K	80		W4	5225	5784	40H	CXB2540-0000- 000N0HW440H	40G	CXB2540-0000- 000N0HW440G		
			X2	5590	6188		CXB2540-0000- 000N0HX240H		CXB2540-0000- 000N0HX240G		
			V2	4230	4683		CXB2540-0000- 000N0UV240H		CXB2540-0000- 000N0UV240G		
	90	92	V4	4545	5031	40H	CXB2540-0000- 000N0UV440H	40G	CXB2540-0000- 000N0UV440G		
			W2	4860	5380		CXB2540-0000- 000N0UW240H		CXB2540-0000- 000N0UW240G		

- 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 18).
- Cree XLamp CXB2540 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.
- \* For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.
- \*\* Flux values @ 25 °C are calculated and for reference only.



# FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS (I<sub>E</sub> = 1100 mA, T<sub>I</sub> = 85 °C) - CONTINUED

Nominal	CF	<b>?</b> I*	Minir	num Lumin	ous Flux		2-Step		3-Step		5-Step
CCT	Min	Тур	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**	Group	Order Code	Group	Order Code	Group	Order Code
			W2	4860	5380		CXB2540-0000- 000N0HW235H		CXB2540-0000- 000N0HW235G		
	80		W4	5225	5784	35H	CXB2540-0000- 000N0HW435H	35G	CXB2540-0000- 000N0HW435G		
05001/			X2	5590	6188		CXB2540-0000- 000N0HX235H		CXB2540-0000- 000N0HX235G		
3500 K			V2	4230	4683		CXB2540-0000- 000N0UV235H	CXB2540-0000- 000N0UV235G  CXB2540-0000- 000N0UV435G  CXB2540-0000- 000N0UW235G			
	90	92	V4	4545	5031	35H	CXB2540-0000- 000N0UV435H				
			W2	4860	5380		CXB2540-0000- 000N0UW235H				
			V4	4545	5031		CXB2540-0000- 000N0HV430H		CXB2540-0000- 000N0HV430G		
	80		W2	4860	5380	30H	CXB2540-0000- 000N0HW230H	30G	CXB2540-0000- 000N0HW230G		
2000 14			W4	5225	5784		CXB2540-0000- 000N0HW430H		CXB2540-0000- 000N0HW430G		
3000 K			U4	3955	4378	30H	CXB2540-0000- 000N0UU430H	30G	CXB2540-0000- 000N0UU430G		
	90	92	V2	4230	4683		CXB2540-0000- 000N0UV230H		CXB2540-0000- 000N0UV230G		
			V4	4545	5031		CXB2540-0000- 000N0UV430H		CXB2540-0000- 000N0UV430G		
			V4	4545	5031		CXB2540-0000- 000N0HV427H		CXB2540-0000- 000N0HV427G		
	80		W2	4860	5380	27H	CXB2540-0000- 000N0HW227H	27G	CXB2540-0000- 000N0HW227G		
0700 1/			W4	5225	5784		CXB2540-0000- 000N0HW427H		CXB2540-0000- 000N0HW427G		
2700 K			U2	3680	4074		CXB2540-0000- 000N0UU227H		CXB2540-0000- 000N0UU227G		
	90	90 92	U4	3955	4378	27H	CXB2540-0000- 000N0UU427H	27G	CXB2540-0000- 000N0UU427G		
			V2	4230	4683		CXB2540-0000- 000N0UV227H		CXB2540-0000- 000N0UV227G		
2200 K	80		V2	4230	4683			22G	CXB2540-0000- 000N0HV222G		

- 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 18).
- Cree XLamp CXB2540 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.
- \* For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.
- \*\* Flux values @ 25 °C are calculated and for reference only.



# FLUX CHARACTERISTICS, PREMIUM COLOR ORDER CODES AND BINS (I<sub>F</sub> = 1100 mA, T<sub>I</sub> = 85 °C)

#### **Fidelity**

Nominal	CRI*		Minimum Luminous Flux			Typical Luminous	2-Step		
CCT	Min	Тур	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**	Flux (lm)	Group	Order Code	
4000 K	95	98	U4	3955	4378	4451	L5A	CXB2540-0000-000N0ZU4L5A	
3500 K	95	98	U4	3955	4378	4286	35H	CXB2540-0000-000N0ZU435H	
3000 K	95	98	U2	3680	4074	4121	30H	CXB2540-0000-000N0ZU230H	
2700 K	95	98	U2	3680	4074	3888	27H	CXB2540-0000-000N0ZU227H	

### **Specialty**

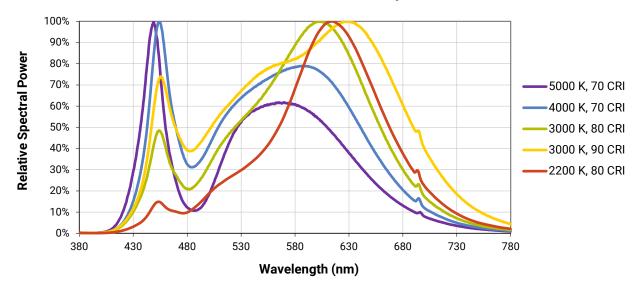
opcolar	pecially											
Nominal	C	RI	Minir	num Lumin	ous Flux	Typical Luminous		2-Step	3-Step			
CCT	Min	Тур	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**	Flux (lm)	Group	Order Code	Group	Order Code	Group	Order Code
3100 K	90	92	U4	3955	4378	4749			31Q	CXB2540-0000- 000N0UU431Q		
	80		W2	4860	5380	5522	L7B	CXB2540-0000- 000N0HW2L7B				
			U2	3680	4074						30U	CXB2540-0000- 000N0UU230U
3000 K	90	92	U4	3955	4378	4749			30Q	CXB2540-0000- 000N0UU430Q		CXB2540-0000- 000N0UU430U
			V2	4230	4683					CXB2540-0000- 000N0UV230Q		CXB2540-0000- 000N0UV230U
	95	98	U2	3680	4074	4121	L7C	CXB2540-0000- 000N0ZU2L7C				

- 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 18).
- Cree XLamp CXB2540 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.
- \* For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.
- \*\* Flux values @ 25 °C are calculated and for reference only.



### **RELATIVE SPECTRAL POWER DISTRIBUTION**

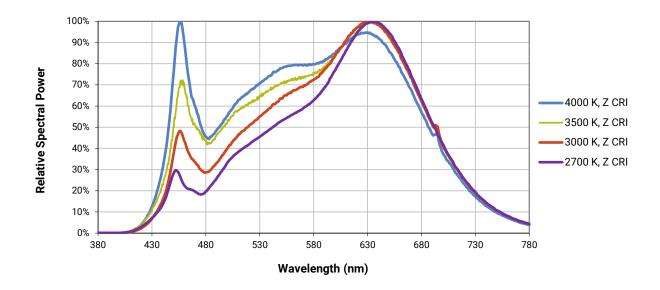
The following graph is the result of a series of pulsed measurements at 1100 mA and  $T_1$  = 85 °C.



### RELATIVE SPECTRAL POWER DISTRIBUTION, PREMIUM COLOR

The following graphs are the result of a series of pulsed measurements at 800 mA and  $T_1$  = 85 °C.

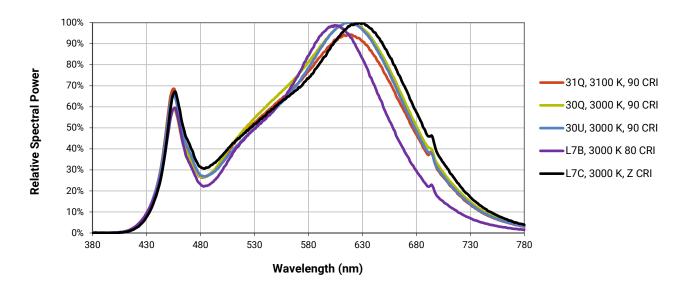
### **Fidelity**





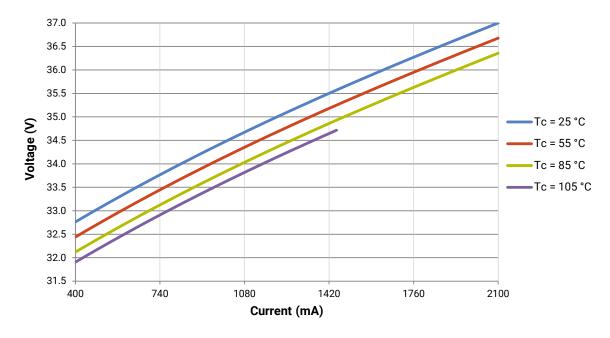
### RELATIVE SPECTRAL POWER DISTRIBUTION, PREMIUM COLOR - CONTINUED

### **Specialty**



#### **ELECTRICAL CHARACTERISTICS**

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

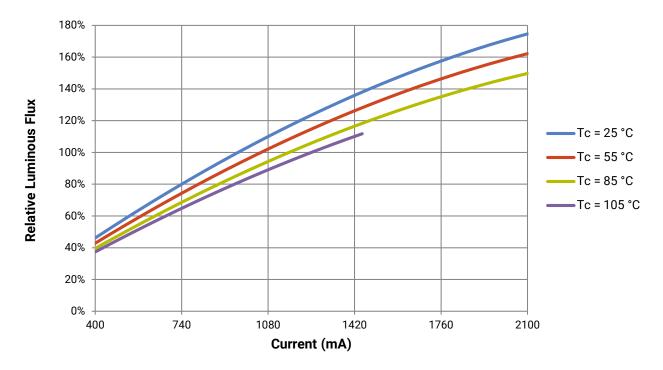




#### **RELATIVE LUMINOUS FLUX**

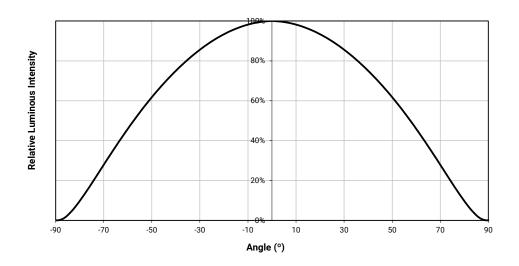
The relative luminous flux values provided below are the ratio of measurements of the CXB2540 LED at steady-state operation at the given conditions, divided by the flux measured during binning, which is a pulsed measurement at 1100 mA at  $T_1 = 85$  °C.

For example, at steady-state operation of Tc = 25 °C, I<sub>F</sub> = 740 mA, the relative luminous flux ratio is 80% in the chart below. A CXB2540 LED that measures 5225 lm during binning will deliver 4180 lm (5225 \* 0.8) at steady-state operation of Tc = 25 °C, I<sub>F</sub> = 740 mA.





### **TYPICAL SPATIAL DISTRIBUTION**



# PERFORMANCE GROUPS - BRIGHTNESS (I<sub>F</sub> = 1100 mA, T<sub>J</sub> = 85 °C)

XLamp CXB2540 LEDs are tested for luminous flux and placed into one of the following bins.

Group Code	Minimum Luminous Flux	Maximum Luminous Flux
U2	3680	3955
U4	3955	4230
V2	4230	4545
V4	4545	4860
W2	4860	5225
W4	5225	5590
X2	5590	6010
X4	6010	6430
Y2	6430	6910



# PERFORMANCE GROUPS - CHROMATICITY (T<sub>1</sub> = 85 °C)

XLamp CXB2540 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

EasyV	EasyWhite Color Temperatures - 2-Step									
Code	ССТ	х	у							
		0.3777	0.3739							
40H	4000 K	0.3797	0.3816							
<del>4</del> 0H	4000 K	0.3861	0.3855							
		0.3838	0.3777							
		0.4022	0.3858							
35H	3500 K	0.4053	0.3942							
ээп		0.4125	0.3977							
		0.4091	0.3891							
		0.4287	0.3975							
30H	3000 K	0.4328	0.4064							
зип	3000 K	0.4390	0.4086							
		0.4347	0.3996							
		0.4524	0.4048							
27H	2700 K	0.4574	0.4140							
2/П	2700 K	0.4633	0.4154							
		0.4581	0.4062							

	EasyWhite Color Temperatures – 3-Step Ellipse										
Bin Code	сст	Cente	Point	Major Axis	Minor Axis	Rotation Angle					
Bill Code	CCI	х	у	а	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					
22G	2200 K	0.5066	0.4158	0.00980	0.00480	45.5					

	EasyWhite Color Temperatures - 5-Step Ellipse											
Bin Code	сст	Cente	r Point	Major Axis	Minor Axis	Rotation Angle						
Bill Code	CCI	х	у	а	b	(°)						
65E	6500 K	0.3123	0.3282	0.01110	0.00550	61.0						
57E	5700 K	0.3287	0.3417	0.01230	0.00600	72.0						
50E	5000 K	0.3447	0.3553	0.01400	0.00520	65.0						
40E	4000 K	0.3818	0.3797	0.01565	0.00670	53.7						



# PREMIUM COLOR PERFORMANCE GROUPS - CHROMATICITY (T, = 85 °C)

XLamp CXB2540 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

### **Fidelity**

EasyV	EasyWhite Color Temperatures - 2-Step									
Code	ССТ	х	у							
		0.3764	0.3711							
L5A	4000 K	0.3784	0.3787							
LSA	4000 K	0.3847	0.3826							
		0.3825	0.3748							
		0.4022	0.3858							
35H	3500 K	0.4053	0.3942							
3311		0.4125	0.3977							
		0.4091	0.3891							
		0.4287	0.3975							
30H	3000 K	0.4328	0.4064							
ЗИП	3000 K	0.4390	0.4086							
		0.4347	0.3996							
		0.4524	0.4048							
27H	2700 K	0.4574	0.4140							
2/П	2/00 K	0.4633	0.4154							
		0.4581	0.4062							

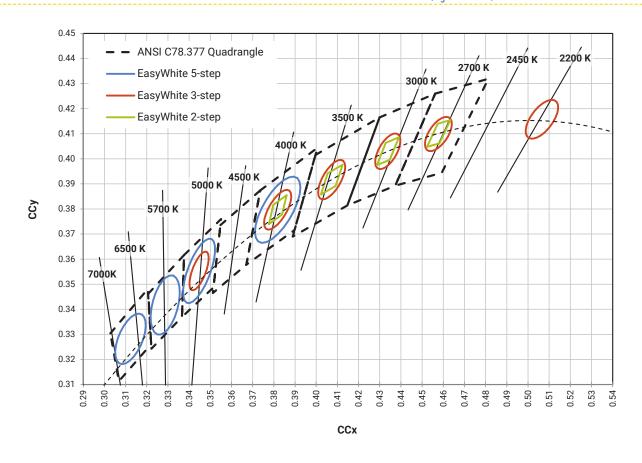
### **Specialty**

EasyWhite Color Temperatures – 2-Step							
Code	ССТ	х	у				
L7B	3000 K	0.4263	0.3848				
		0.4296	0.3916				
		0.4361	0.3938				
		0.4326	0.3868				
L7C	3000 K	0.4192	0.3754				
		0.4224	0.3823				
		0.4291	0.3847				
		0.4257	0.3777				

EasyWhite Color Temperatures – 3-Step Ellipse								
Bin Code	сст	Center Point		Major Axis	Minor Axis	Rotation Angle		
	CCI	х	у	а	b	(°)		
31Q	3100 K	0.4236	0.3888	0.00848	0.00455	50.3		
30Q	3000 K	0.4305	0.3935	0.00834	0.00408	53.2		
30U	3000 K	0.4274	0.3837	0.00834	0.00408	53.2		



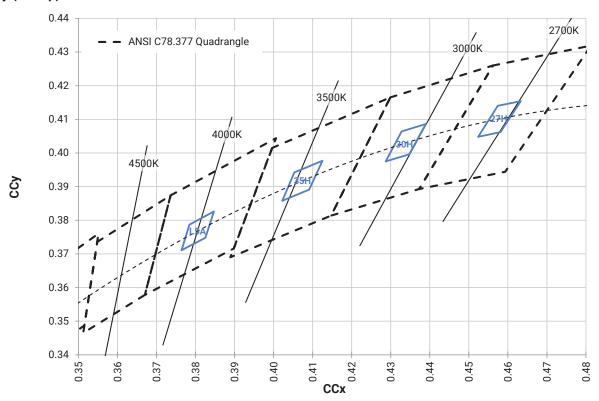
# CREE'S EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE (T, = 85 °C)





# CREE PREMIUM COLOR BINS PLOTTED ON THE 1931 CIE COLOR SPACE (T, = 85 °C)

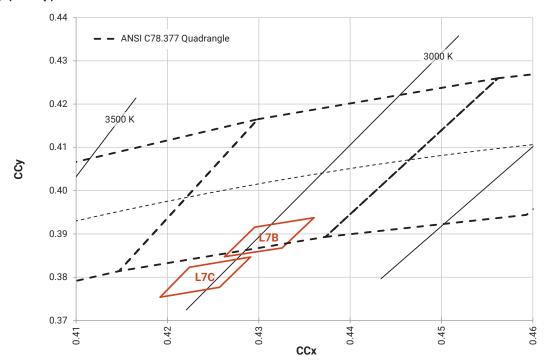
### Fidelity (2-step)



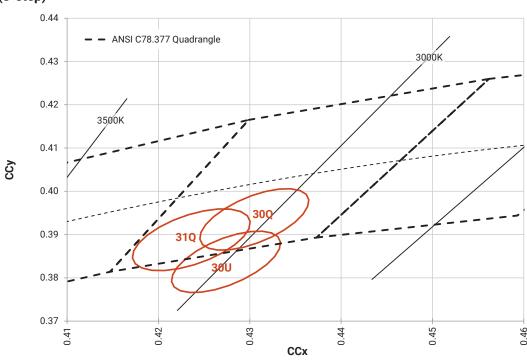


# CREE PREMIUM COLOR BINS PLOTTED ON THE 1931 CIE COLOR SPACE (T, = 85 °C) - CONTINUED

### Speciality (2-step)



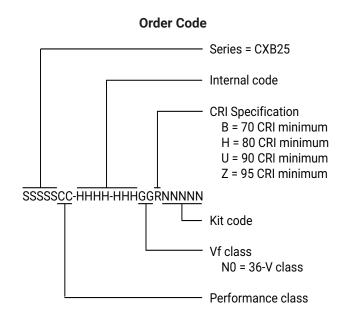
### Speciality (3-step)

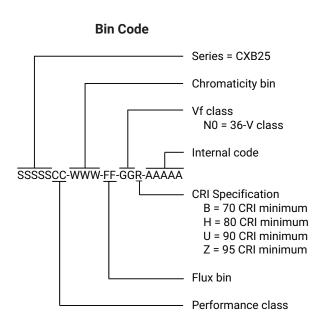




#### **BIN AND ORDER CODE FORMATS**

Bin codes and order codes are configured as follows:





#### **MECHANICAL DIMENSIONS**

Dimensions are in mm.

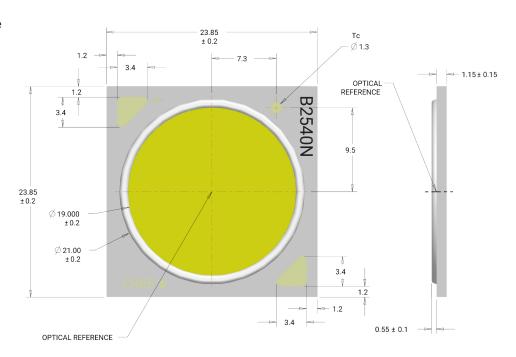
Tolerances unless otherwise

specified: ±.13

x° ±1°

### Meaning of B2540N

B2540N = 36-V CXB2540





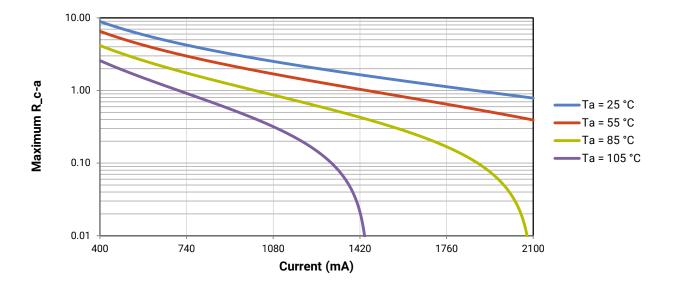
#### THERMAL DESIGN

The CXB 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 CXB 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 CXB 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 CXB LEDs successfully in luminaire designs.

To keep the CXB2540 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 ( $R_t$ im) plus the thermal resistance of the heat sink ( $R_t$ ).





#### **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 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.

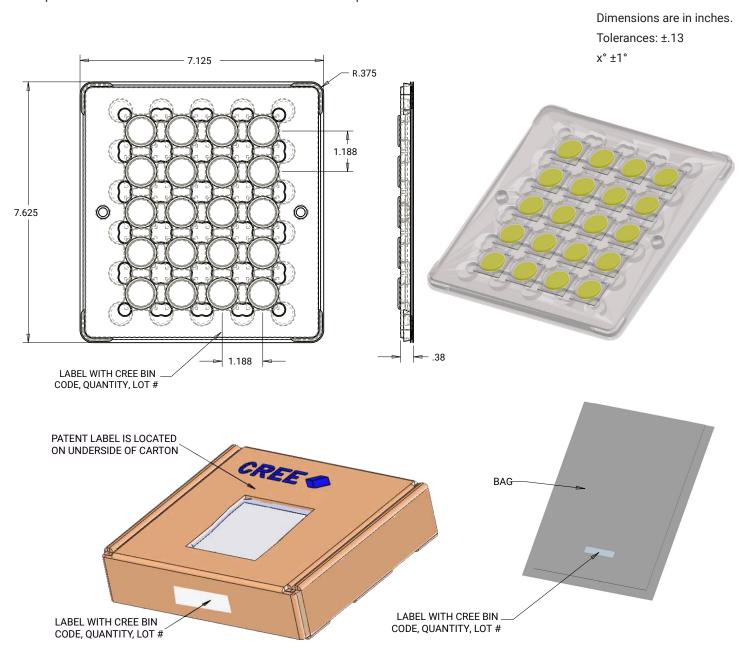
#### **Vision Advisory**

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 CXB2540 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.





Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

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