

Cree® XLamp® CXB1820 LED



PRODUCT DESCRIPTION

XLamp® CXA2 LED Arrays lead the industry in efficacy and reliability for ceramic-based COB LEDs. Cree CXA2 LEDs easily deliver TM-21 lifetimes well beyond L90 60,000 hours under a wide range of operating conditions. CXA2 LED Arrays share the same physical design as XLamp CXA and CMA LED families, allowing lighting manufacturers to leverage the existing optical, mechanical and electrical design elements to accelerate time to market without additional cost.

CXA2 Standard Density LED Arrays are now available in two different versions: Standard and eTone™ LEDs. The eTone version delivers beautiful 90 CRI light quality at the same efficacy as today's standard 80 CRI LEDs.

FEATURES

- 12-mm optical source
- Mechanical and optical design consistent with other CXA18 and CXB18 LEDs with a 12-mm optical source
- Cree EasyWhite® 2-, 3- and 5-step binning
- Premium Color 2- and 3-step binning
- Standard & Premium Color LEDs available in 70, 80, 90 and 95 CRI minimum options
- eTone™ LEDs available in 90 CRI minimum option
- 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

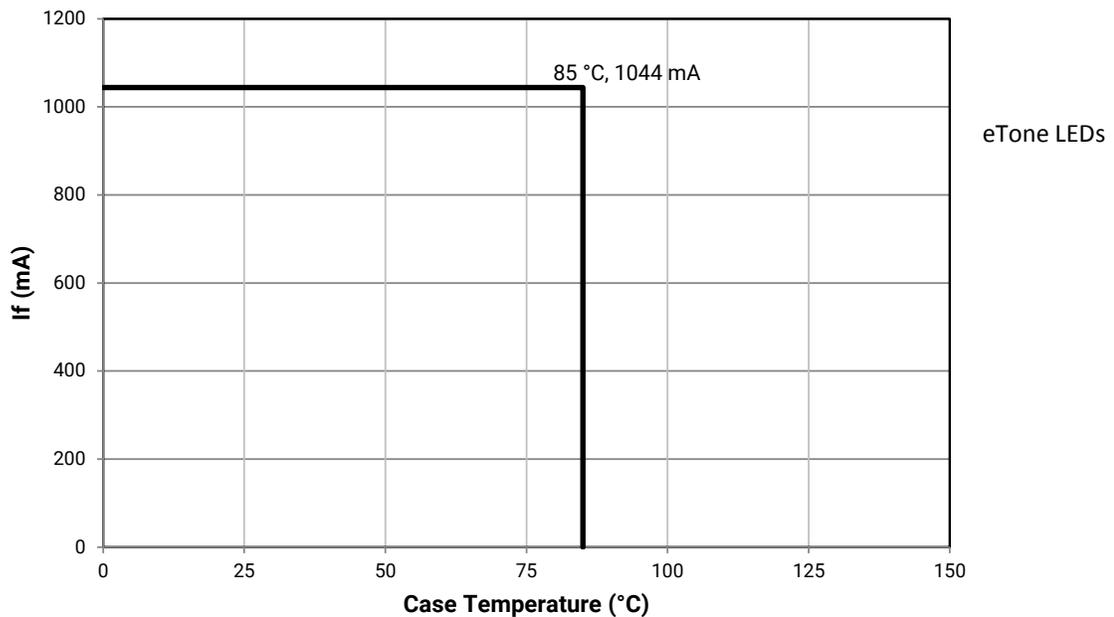
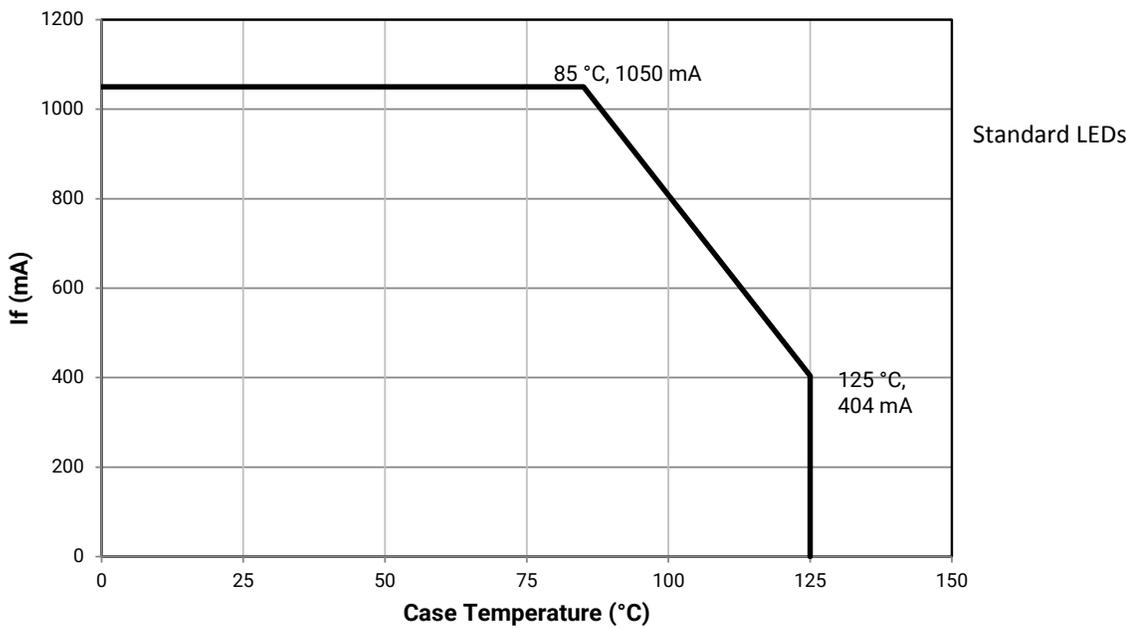
Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		115	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current - Standard	mA			1050*
DC forward current - eTone	mA			1044*
Reverse current	mA			0.1
Forward voltage (@ 550 mA, 85 °C)	V		35	38

* Refer to the Operating Limits section.

OPERATING LIMITS

The maximum current rating of the CXB1820 depends 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 Dimensions section on page 20 for the location of the T_c 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 21 for more information on LES temperature measurement.



FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS ($I_F = 550 \text{ mA}$, $T_J = 85 \text{ °C}$)

The following table provides order codes for XLamp CXB1820 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 19).

Nominal CCT	CRI*		Minimum Luminous Flux			2-Step		3-Step		5-Step		
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**	Group	Order Code	Group	Order Code	Group	Order Code	
6500 K	70	---	S2	2780	3050					65E	CXB1820-0000-000N0BS265E	
			S4	2990	3280				CXB1820-0000-000N0BS465E			
			T2	3200	3510				CXB1820-0000-000N0BT265E			
	80	---	S2	2780	3050					65E	CXB1820-0000-000N0HS265E	
			S4	2990	3280				CXB1820-0000-000N0HS465E			
5700 K	70	---	S2	2780	3050					57E	CXB1820-0000-000N0BS257E	
			S4	2990	3280				CXB1820-0000-000N0BS457E			
			T2	3200	3510				CXB1820-0000-000N0BT257E			
	80	---	S2	2780	3050					57E	CXB1820-0000-000N0HS257E	
			S4	2990	3280				CXB1820-0000-000N0HS457E			
5000 K	70	---	S2	2780	3050					50E	CXB1820-0000-000N0BS250E	
			S4	2990	3280				CXB1820-0000-000N0BS450E			
			T2	3200	3510				CXB1820-0000-000N0BT250E			
	80	---	S2	2780	3050			50G	CXB1820-0000-000N0HS250G	50E	CXB1820-0000-000N0HS250E	
			S4	2990	3280				CXB1820-0000-000N0HS450G		CXB1820-0000-000N0HS450E	
	90	92	R2	2420	2655							
			R4	2600	2852							
									50G	CXB1820-0000-000N0UR250G		
										CXB1820-0000-000N0UR450G		

- 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 22).
 - Cree XLamp CXB1820 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, ORDER CODES & BINS - STANDARD LEDS (I_F = 550 mA, T_J = 85 °C) - CONTINUED

Nominal CCT	CRI*		Minimum Luminous Flux			2-Step		3-Step		5-Step	
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**	Group	Order Code	Group	Order Code	Group	Order Code
4000 K	70	---	S2	2780	3050					40E	CXB1820-0000-000N0BS240E
			S4	2990	3280		CXB1820-0000-000N0BS440E				
			T2	3200	3510		CXB1820-0000-000N0BT240E				
	80	---	R4	2600	2852	40H	CXB1820-0000-000N0HR440H	40G	CXB1820-0000-000N0HR440G		
			S2	2780	3050		CXB1820-0000-000N0HS240H		CXB1820-0000-000N0HS240G		
			S4	2990	3280		CXB1820-0000-000N0HS440H		CXB1820-0000-000N0HS440G		
	90	92	Q4	2260	2479	40H	CXB1820-0000-000N0UQ440H	40G	CXB1820-0000-000N0UQ440G		
			R2	2420	2655		CXB1820-0000-000N0UR240H		CXB1820-0000-000N0UR240G		
			R4	2600	2852		CXB1820-0000-000N0UR440H		CXB1820-0000-000N0UR440G		
3500 K	80	---	R4	2600	2852	35H	CXB1820-0000-000N0HR435H	35G	CXB1820-0000-000N0HR435G		
			S2	2780	3050		CXB1820-0000-000N0HS235H		CXB1820-0000-000N0HS235G		
	90	92	Q4	2260	2479	35H	CXB1820-0000-000N0UQ435H	35G	CXB1820-0000-000N0UQ435G		
			R2	2420	2655		CXB1820-0000-000N0UR235H		CXB1820-0000-000N0UR235G		
3000 K	80	---	R2	2420	2655	30H	CXB1820-0000-000N0HR230H	30G	CXB1820-0000-000N0HR230G		
			R4	2600	2852		CXB1820-0000-000N0HR430H		CXB1820-0000-000N0HR430G		
			S2	2780	3050		CXB1820-0000-000N0HS230H		CXB1820-0000-000N0HS230G		
	90	92	Q2	2100	2304	30H	CXB1820-0000-000N0UQ230H	30G	CXB1820-0000-000N0UQ230G		
			Q4	2260	2479		CXB1820-0000-000N0UQ430H		CXB1820-0000-000N0UQ430G		
			R2	2420	2655		CXB1820-0000-000N0UR230H		CXB1820-0000-000N0UR230G		

- 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 22).
 - Cree XLamp CXB1820 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, ORDER CODES & BINS - STANDARD LEDS ($I_F = 550 \text{ mA}$, $T_J = 85 \text{ °C}$) - CONTINUED

Nominal CCT	CRI*		Minimum Luminous Flux			2-Step		3-Step		5-Step	
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**	Group	Order Code	Group	Order Code	Group	Order Code
2700 K	80	---	R2	2420	2655	27H	CXB1820-0000-000N0HR227H	27G	CXB1820-0000-000N0HR227G		
			R4	2600	2852		CXB1820-0000-000N0HR427H		CXB1820-0000-000N0HR427G		
	90	92	P4	1965	2156	27H	CXB1820-0000-000N0UP427H	27G	CXB1820-0000-000N0UP427G		
			Q2	2100	2304		CXB1820-0000-000N0UQ227H		CXB1820-0000-000N0UQ227G		
			Q4	2260	2479		CXB1820-0000-000N0UQ427H		CXB1820-0000-000N0UQ427G		
	2200 K	80	---	Q4	2260	2479			22G	CXB1820-0000-000N0HQ422G	

- 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 22).
 - Cree XLamp CXB1820 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, ORDER CODES & BINS - STANDARD LEDS, PREMIUM COLOR ($I_F = 550 \text{ mA}$, $T_J = 85 \text{ °C}$)
Fidelity

Nominal CCT	CRI*		Minimum Luminous Flux			Typical Luminous Flux (lm) @ 85 °C	2-Step	
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**		Group	Order Code
4000 K	95	98	Q2	2100	2304	2297	L5A	CXB1820-0000-000N0ZQ2L5A
3500 K	95	98	Q2	2100	2304	2212	35H	CXB1820-0000-000N0ZQ235H
3000 K	95	98	P4	1965	2156	2127	30H	CXB1820-0000-000N0ZP430H
2700 K	95	98	P2	1830	2007	2006	27H	CXB1820-0000-000N0ZP227H

Specialty

Nominal CCT	CRI		Minimum Luminous Flux			Typical Luminous Flux (lm) @ 85 °C	2-Step		3-Step				
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C**		Group	Order Code	Group	Order Code	Group	Order Code	
3100 K	90	92	N4	1710	1876	2451			31Q		CXB1820-0000-000N0UN431Q		
			Q2	2100	2304						CXB1820-0000-000N0UQ231Q		
3000 K	80	---	R2	2420	2655	2850	L7B	CXB1820-0000-000N0HR2L7B					
	90	92	P4	1965	2156	2451			30Q		30U		CXB1820-0000-000N0UP430U
			Q2	2100	2304								CXB1820-0000-000N0UQ230Q
			Q4	2260	2479								CXB1820-0000-000N0UQ430Q
	95	98	P2	1830	2007	2127	L7C	CXB1820-0000-000N0ZP2L7C					

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 22).
- Cree XLamp CXB1820 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, ORDER CODES AND BINS - ETONE™ LEDS ($I_F = 550 \text{ mA}$, $T_J = 85 \text{ °C}$)

Nominal CCT	CRI*		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step		3-Step	
	Min.	Typ			Group	Order Code	Group	Order Code
4000 K	90	92	2392	2782	40H	CXB1820-0000-00PN0U0A40H	40G	CXB1820-0000-00PN0U0A40G
3500 K	90	92	2418	2735	35H	CXB1820-0000-00PN0U0A35H	35G	CXB1820-0000-00PN0U0A35G
3000 K	90	92	2299	2708	30H	CXB1820-0000-00PN0U0A30H	30G	CXB1820-0000-00PN0U0A30G
2700 K	90	92	2299	2599	27H	CXB1820-0000-00PN0U0A27H	27G	CXB1820-0000-00PN0U0A27G

Specialty

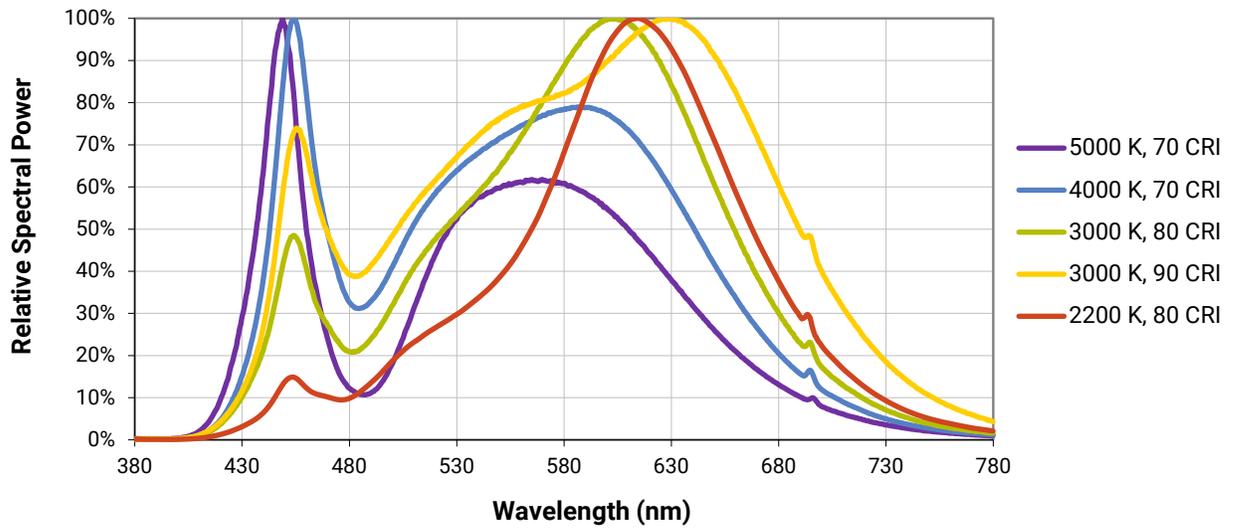
Nominal CCT	CRI		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	3-Step			
	Min.	Typ			Group	Order Code	Group	Order Code
3100 K	90	92	2275	2679	31Q	CXB1820-0000-00PN0U0A31Q		
3000 K	90	92	2299	2708	30Q	CXB1820-0000-00PN0U0A30Q	30U	CXB1820-0000-00PN0U0A30U

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 21).
- Cree XLamp CXB1820 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.

RELATIVE SPECTRAL POWER DISTRIBUTION - STANDARD LEDS

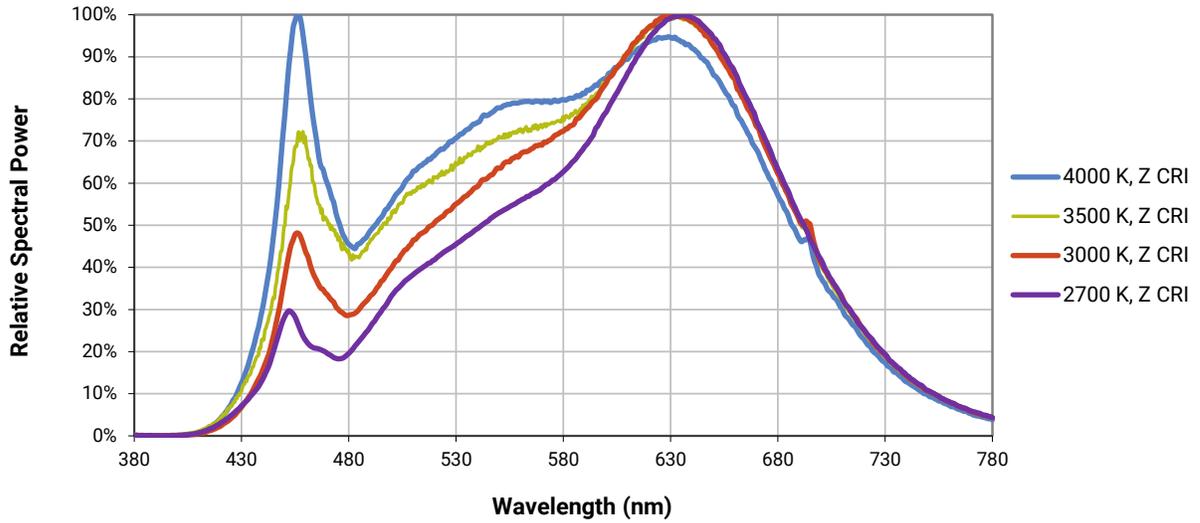
The following graph is the result of a series of pulsed measurements at 550 mA and $T_j = 85\text{ }^\circ\text{C}$.



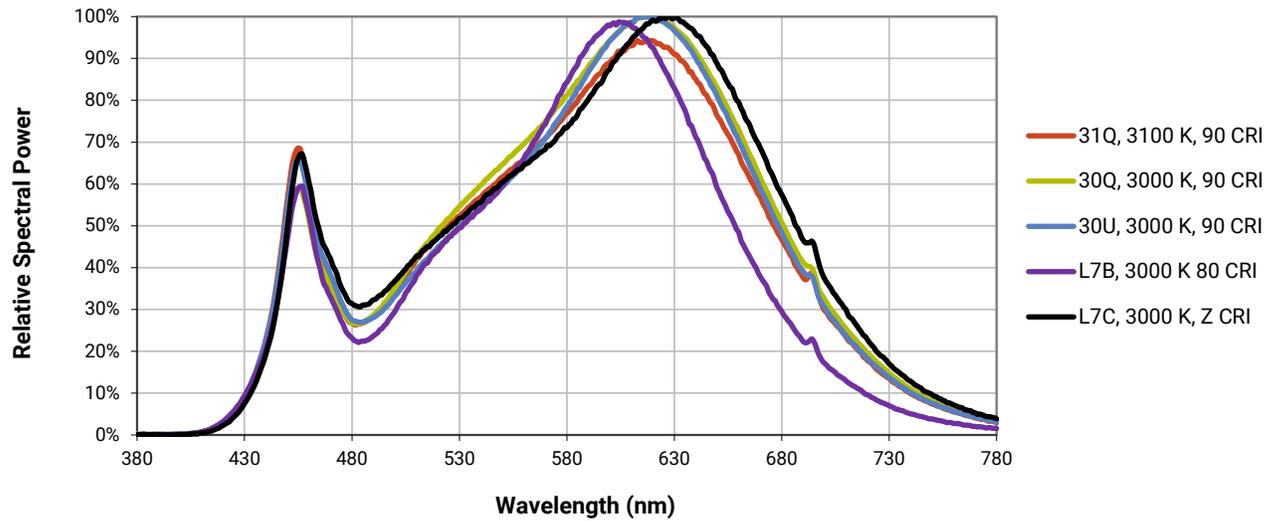
RELATIVE SPECTRAL POWER DISTRIBUTION - STANDARD LEDS, PREMIUM COLOR

The following graphs are the result of a series of pulsed measurements at 550 mA and $T_j = 85\text{ }^\circ\text{C}$.

Fidelity

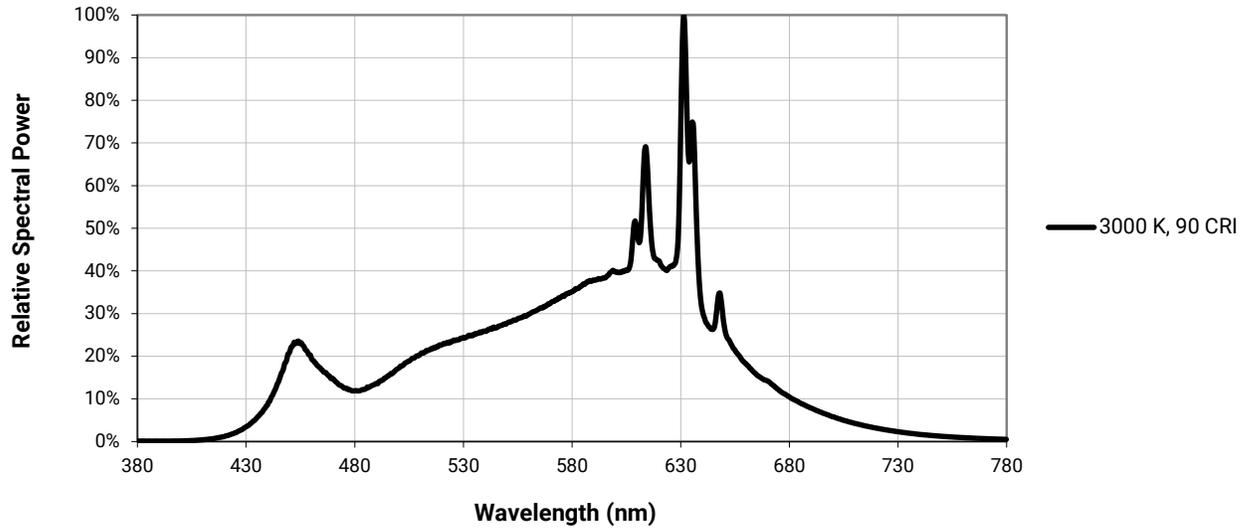


Specialty



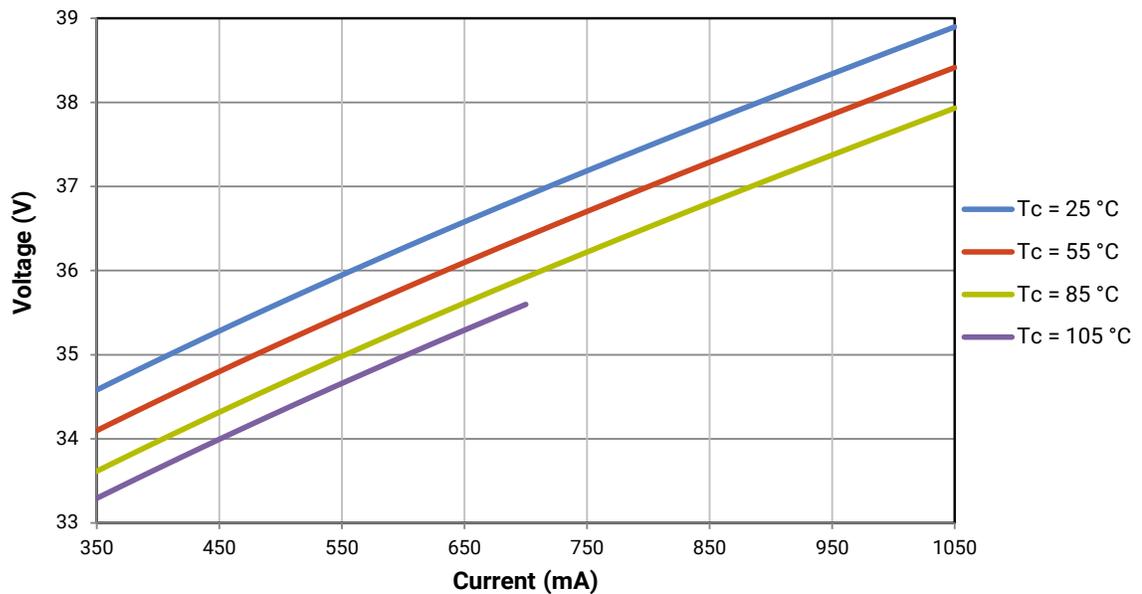
RELATIVE SPECTRAL POWER DISTRIBUTION - ETONE™ LEDS

The following graph is the result of a series of pulsed measurements at 550 mA and $T_j = 85^\circ\text{C}$.



ELECTRICAL CHARACTERISTICS

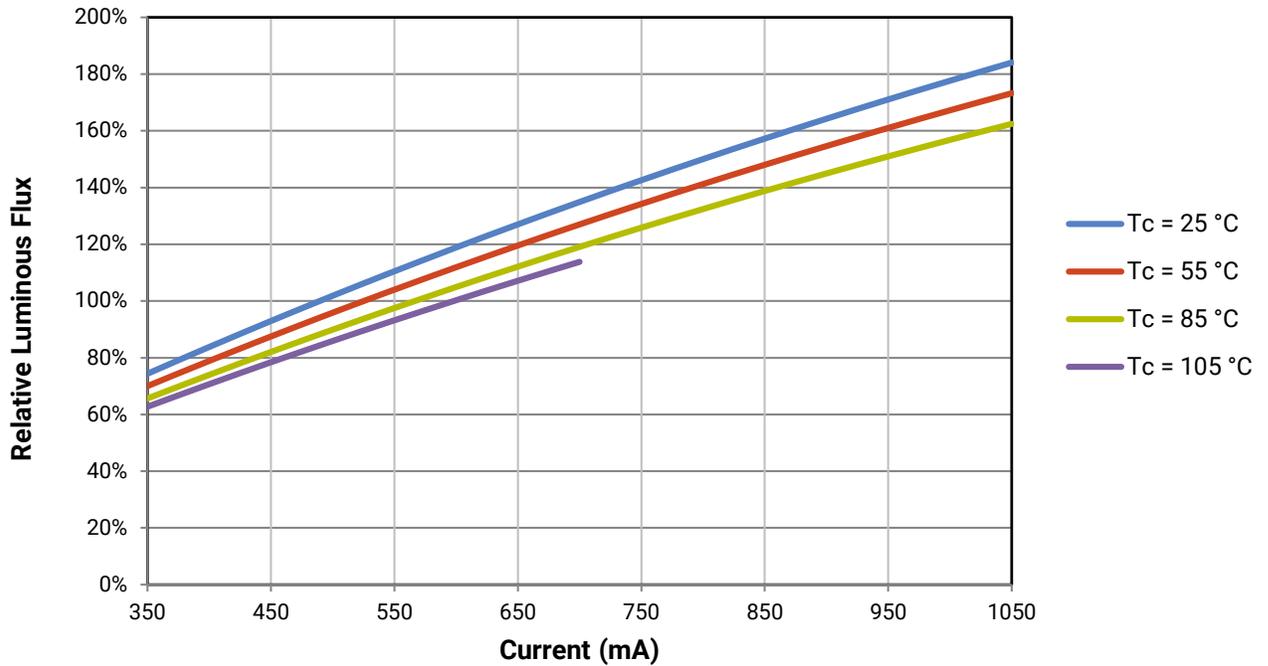
The following graph is the result of a series of steady-state measurements.



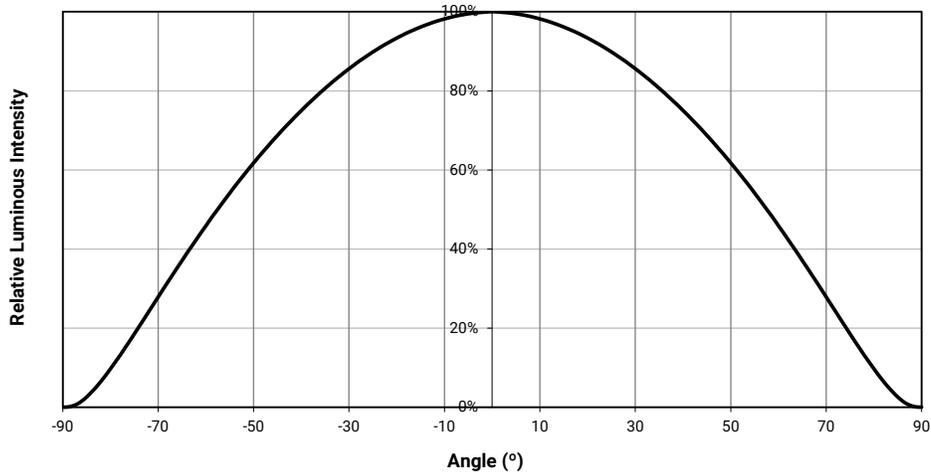
RELATIVE LUMINOUS FLUX

The relative luminous flux values provided below are the ratio of measurements of the CXB1820 LED at steady-state operation at the given conditions, divided by the flux measured during binning, which is a pulsed measurement at 550 mA at $T_j = 85^\circ\text{C}$.

For example, at steady-state operation of $T_c = 55^\circ\text{C}$, $I_f = 650\text{ mA}$, the relative luminous flux ratio is 120% in the chart below. A CXB1820 LED that measures 2100 lm during binning will deliver 2520 lm (2100×1.2) at steady-state operation of $T_c = 55^\circ\text{C}$, $I_f = 650\text{ mA}$.



TYPICAL SPATIAL DISTRIBUTION



PERFORMANCE GROUPS - BRIGHTNESS ($I_F = 550 \text{ mA}$, $T_J = 85 \text{ °C}$)

XLamp CXB1820 LEDs are tested for luminous flux and placed into one of the following bins.

Group Code	Minimum Luminous Flux	Maximum Luminous Flux
N4	1710	1830
P2	1830	1965
P4	1965	2100
Q2	2100	2260
Q4	2260	2420
R2	2420	2600
R4	2600	2780
S2	2780	2990
S4	2990	3200
T2	3200	3440
T4	3440	3680

EASYWHITE® PERFORMANCE GROUPS - CHROMATICITY ($T_j = 85\text{ °C}$)

XLamp CXB1820 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
40H	4000 K	0.3777	0.3739
		0.3797	0.3816
		0.3861	0.3855
		0.3838	0.3777
35H	3500 K	0.4022	0.3858
		0.4053	0.3942
		0.4125	0.3977
		0.4091	0.3891
30H	3000 K	0.4287	0.3975
		0.4328	0.4064
		0.4390	0.4086
		0.4347	0.3996
27H	2700 K	0.4524	0.4048
		0.4574	0.4140
		0.4633	0.4154
		0.4581	0.4062

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
22G	2200 K	0.5066	0.4158	0.00980	0.00480	45.5

EasyWhite Color Temperatures – 5-Step Ellipse						
Bin Code	CCT	Center Point		Major Axis	Minor Axis	Rotation Angle (°)
		x	y	a	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 ($T_j = 85\text{ }^\circ\text{C}$)

XLamp CXB1820 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

Fidelity

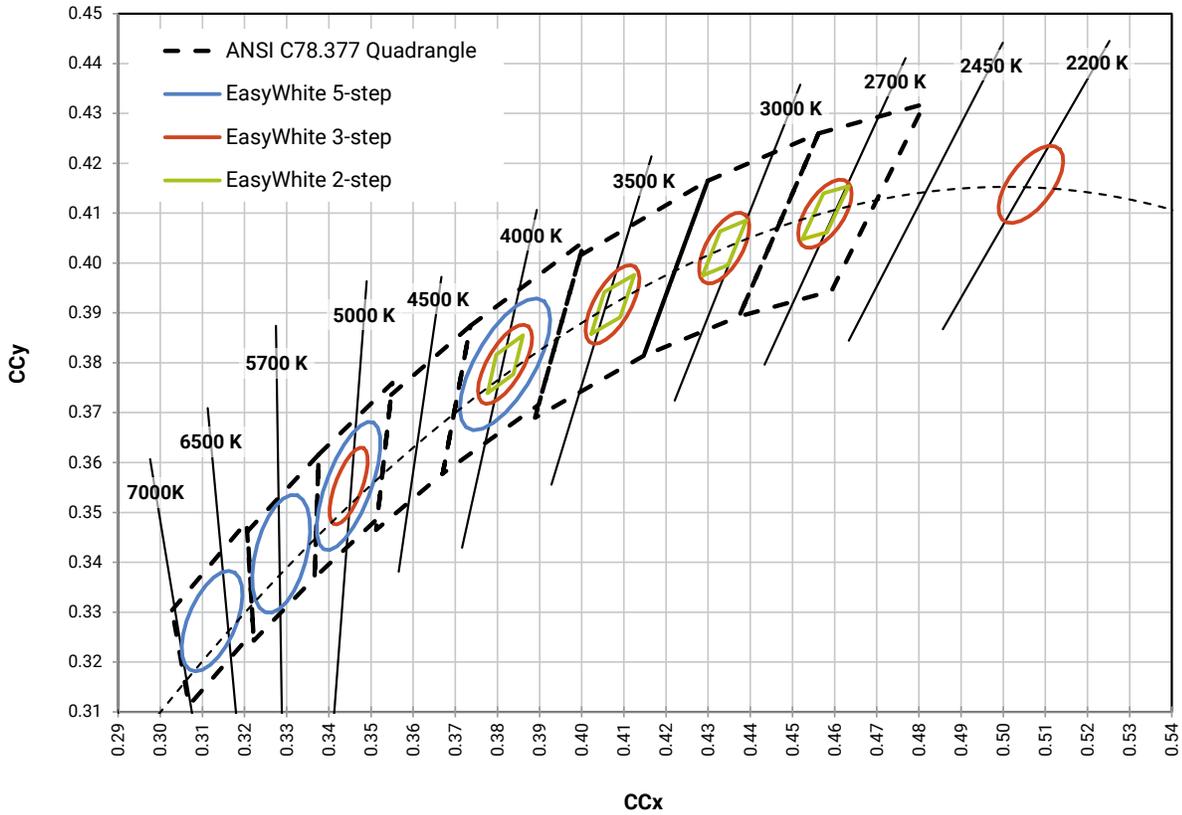
EasyWhite Color Temperatures – 2-Step			
Code	CCT	x	y
L5A	4000 K	0.3764	0.3711
		0.3784	0.3787
		0.3847	0.3826
		0.3825	0.3748
35H	3500 K	0.4022	0.3858
		0.4053	0.3942
		0.4125	0.3977
		0.4091	0.3891
30H	3000 K	0.4287	0.3975
		0.4328	0.4064
		0.4390	0.4086
		0.4347	0.3996
27H	2700 K	0.4524	0.4048
		0.4574	0.4140
		0.4633	0.4154
		0.4581	0.4062

Specialty

EasyWhite Color Temperatures – 2-Step			
Code	CCT	x	y
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

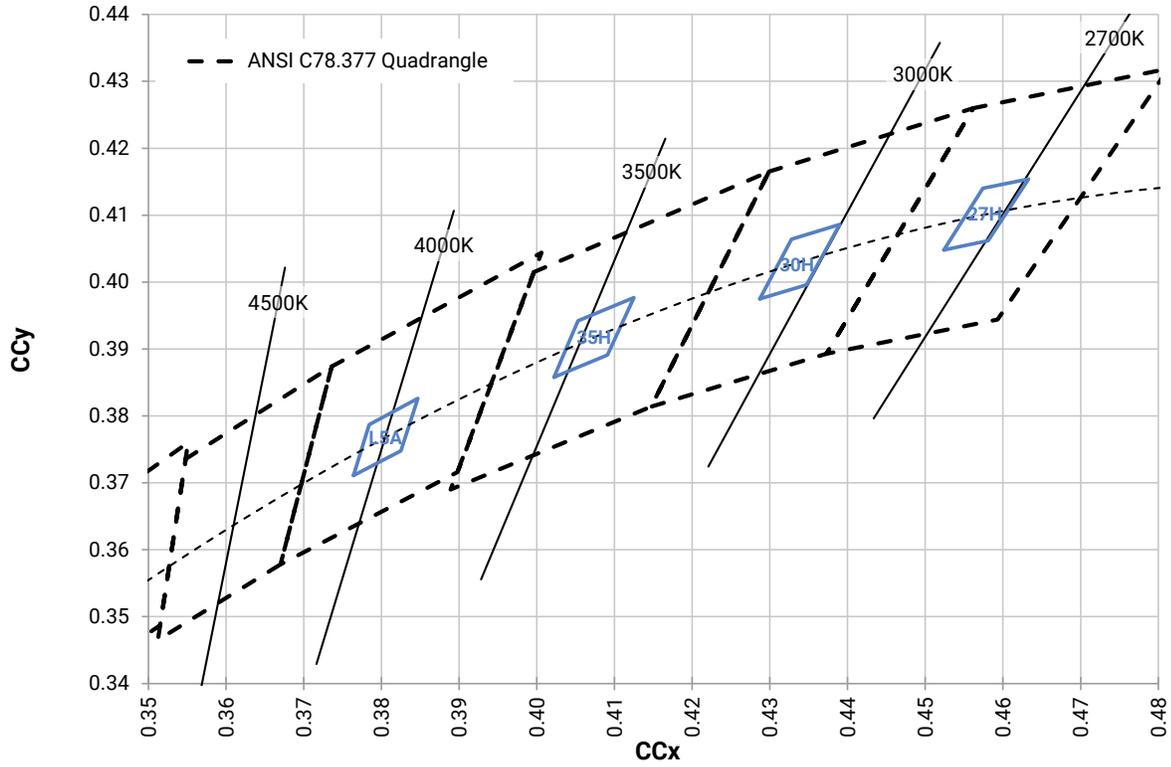
EasyWhite Color Temperatures – 3-Step Ellipse						
Bin Code	CCT	Center Point		Major Axis	Minor Axis	Rotation Angle (°)
		x	y	a	b	
31Q	3100 K	0.4236	0.3888	0.00848	0.00455	50.3
30Q	3000 K	0.4305	0.3935	0.00834	0.00408	53.2
30U	3000 K	0.4274	0.3837	0.00834	0.00408	53.2

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



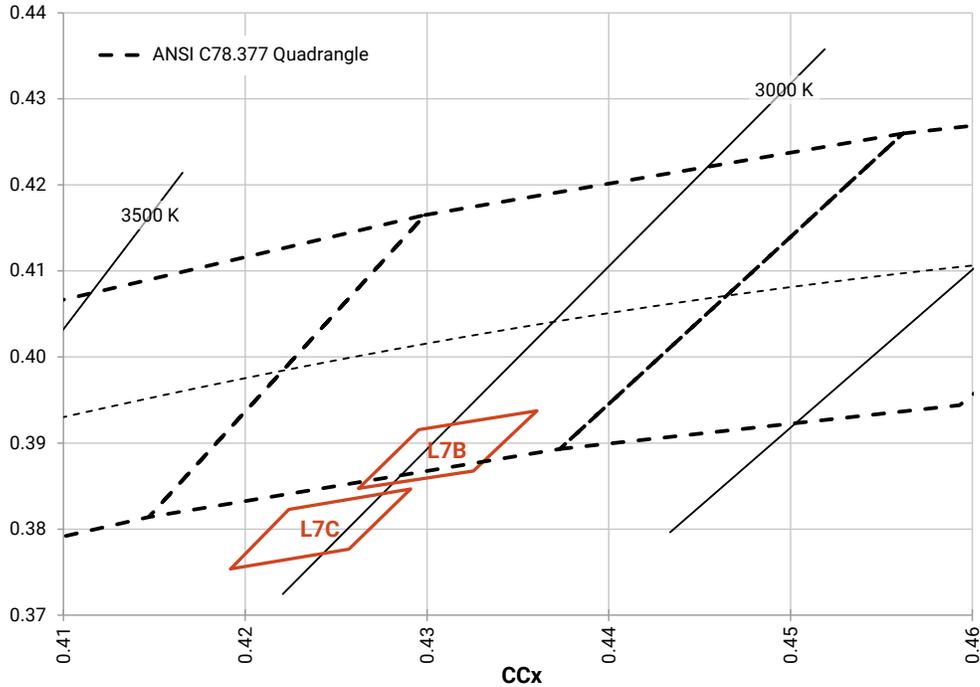
CREE PREMIUM COLOR BINS PLOTTED ON THE 1931 CIE COLOR SPACE ($T_j = 85\text{ }^\circ\text{C}$)

Fidelity (2-step)

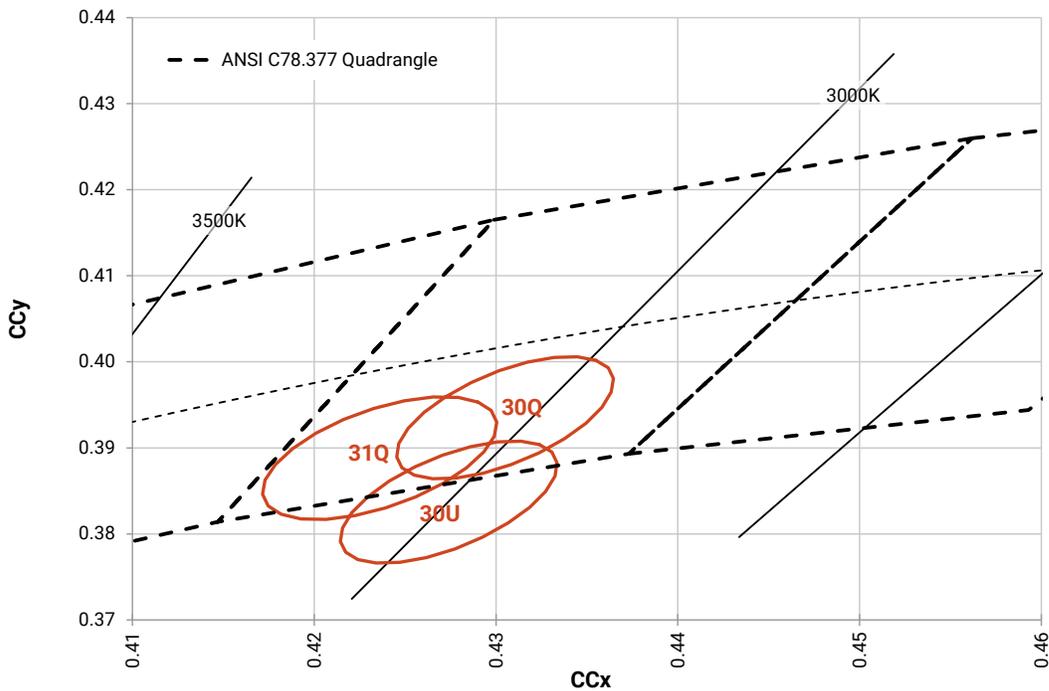


CREE PREMIUM COLOR BINS PLOTTED ON THE 1931 CIE COLOR SPACE ($T_j = 85^\circ\text{C}$) - CONTINUED

Speciality (2-step)

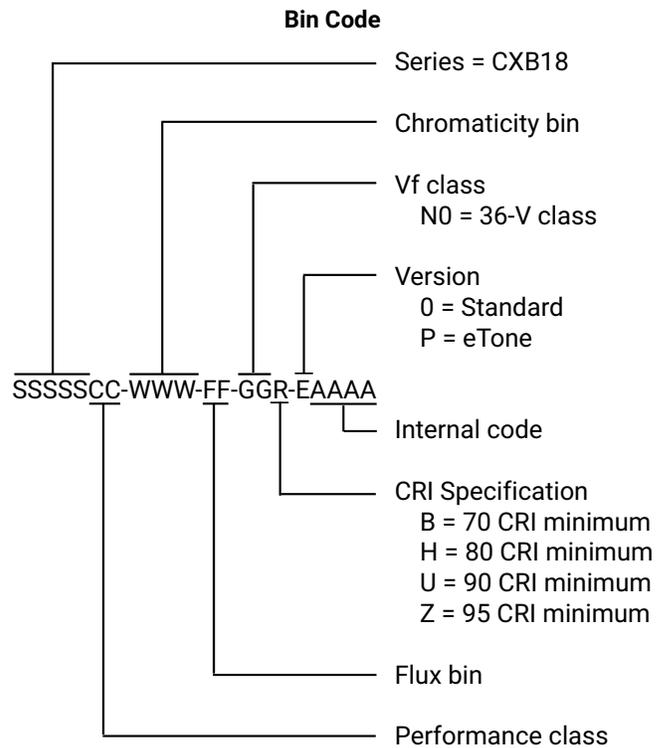
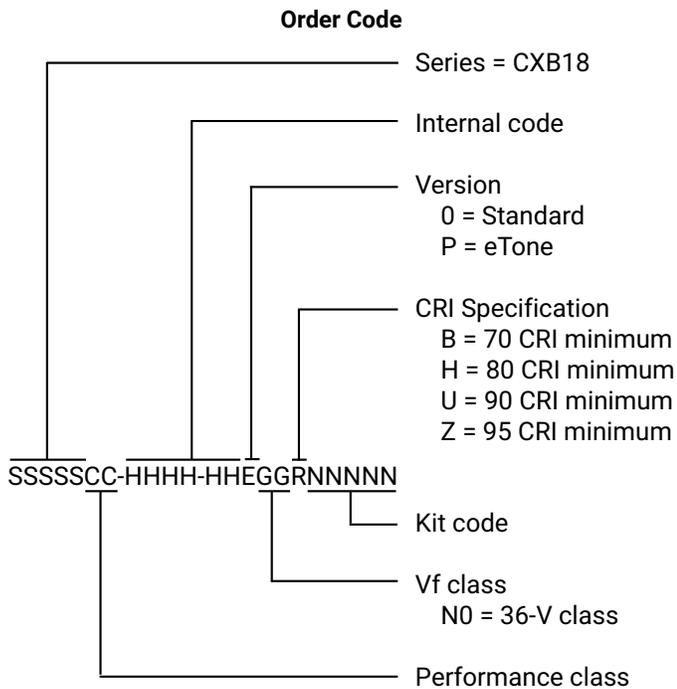


Speciality (3-step)



BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows:



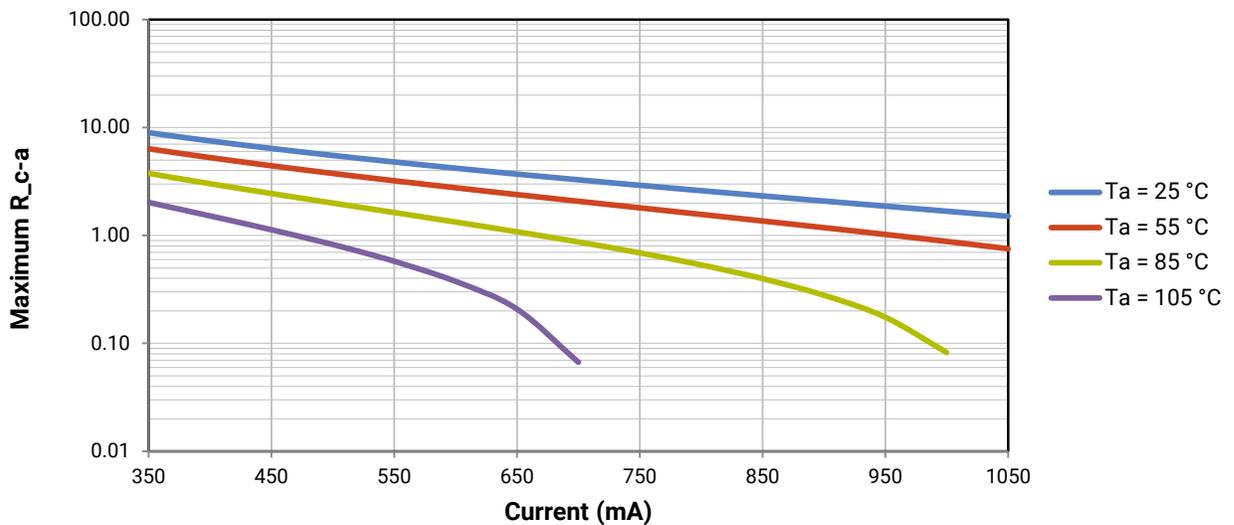
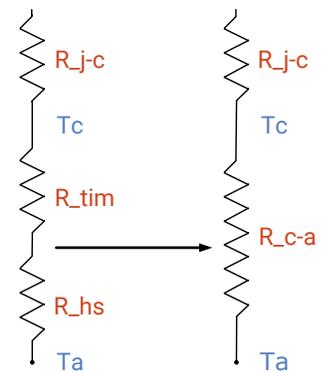
THERMAL DESIGN

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 (T_c). 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 3 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 CXB1820 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, 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.

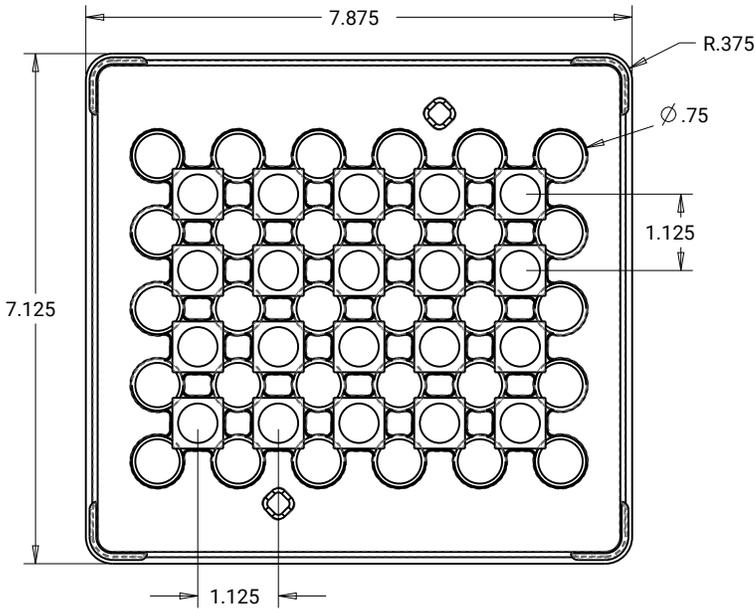
Vision Advisory

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](#).

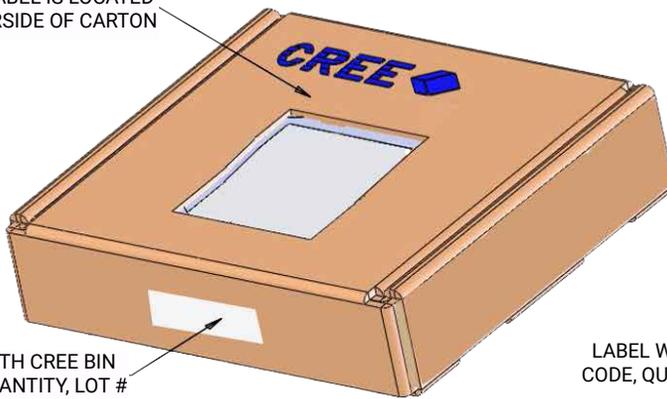
PACKAGING

Cree CXB1820 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.

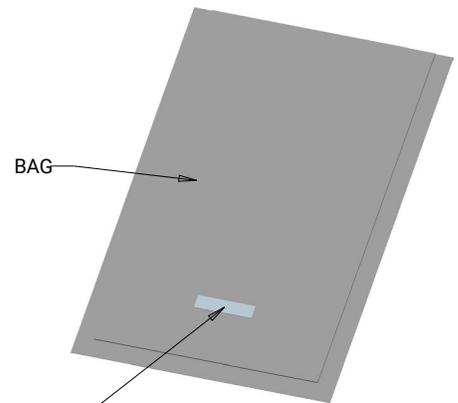
Dimensions are in inches.
Tolerances: $\pm .13$
 $x^\circ \pm 1^\circ$



PATENT LABEL IS LOCATED ON UNDERSIDE OF CARTON



LABEL WITH CREE BIN CODE, QUANTITY, LOT #



BAG

LABEL WITH CREE BIN CODE, QUANTITY, LOT #