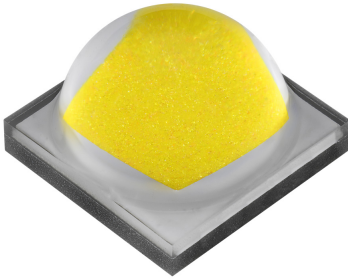


XLamp® XP-GP White LEDs



PRODUCT DESCRIPTION

XLamp® XP-G Prime LEDs are optimized for directional, high lumen lighting applications where efficacy and optical control are critical, such as roadway, industrial, and portable applications. The compact and proven 3.45 mm XP platform has an excellent ecosystem of optics and system solutions available, enabling lighting manufacturers to simplify their design process and shorten time to market.

With the same mechanical dimensions as the XP-G family, XP-G Prime is an easy drop-in for many high power LED designs. XP-G Prime provides higher efficacy and lumen output than competing high power LEDs.

FEATURES

- Available in 70-, 80- and 90-CRI white
- ANSI-compatible chromaticity bins
- 3-step and 5-step options
- Binned at 85 °C
- Maximum drive current: 2000 mA
- Low thermal resistance: 1.6 °C/W
- Wide viewing angle: 120°
- Unlimited floor life at ≤ 30 °C/85% RH
- Reflow solderable - JEDEC J-STD-020C
- Electrically neutral thermal path
- RoHS and REACH compliant
- UL® recognized component (E349212)



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XP-GP White

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CHARACTERISTICS – WHITE

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point $R_{\theta s}$ [◇]	°C/W	-	1.6	-
Viewing angle (FWHM)	degrees	-	120	-
Temperature coefficient of voltage	mV/°C	-	-1.3	-
DC forward current	mA	-	-	2000
Reverse voltage	V	-	-	1
Forward voltage (@ 700 mA, 85 °C)	V	-	2.9	3.1
ESD withstand voltage (JEDEC JS-001)		-	Class 3B	-
LED junction temperature	°C	-	-	150

◇ $R_{\theta s}$ Thermal resistance measurement was performed per the JEDEC JESD51-14 standard. See the [Thermal Resistance Measurement](#) application note for more details.

FLUX CHARACTERISTICS – WHITE ($T_J = 85\text{ }^{\circ}\text{C}$)

CCT	CRI	Min. Flux (lm) @ 700 mA		3-Step		5-Step	
		Flux Bin	Flux (85 °C)	Group	Order Code	Group	Order Code
6500K	70	D2	360			1E	XPGPWT-01-0000-00000BS1E
	80	C3	320				XPGPWT-01-0000-00000HN1E
		C4	330				XPGPWT-01-0000-00000HP1E
	90	B4	280				XPGPWT-01-0000-00000UJ1E
		B5	290				XPGPWT-01-0000-00000UK1E
5700K	70	D2	360			2E	XPGPWT-01-0000-00000BS2E
	80	C3	320				XPGPWT-01-0000-00000HN2E
		C4	330				XPGPWT-01-0000-00000HP2E
	90	B5	290				XPGPWT-01-0000-00000UK2E
		C1	300				XPGPWT-01-0000-00000UL2E
5000K	70	D2	360			3E	XPGPWT-01-0000-00000BS3E
	80	C4	330				XPGPWT-01-0000-00000HP3E
		C5	340				XPGPWT-01-0000-00000HQ3E
	90	B5	290				XPGPWT-01-0000-00000UK3E
		C1	300				XPGPWT-01-0000-00000UL3E
4500K	70	D2	360			4E	XPGPWT-01-0000-00000BS4E
	80	C3	320				XPGPWT-01-0000-00000HN4E
		C4	330				XPGPWT-01-0000-00000HP4E
	90	B5	290				XPGPWT-01-0000-00000UK4E
		C1	300				XPGPWT-01-0000-00000UL4E

- Cree LED maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity measurements and ± 2 on CRI measurements.
- XLamp XP-GP LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified without advance notice.

FLUX CHARACTERISTICS – WHITE ($T_J = 85\text{ }^{\circ}\text{C}$)

CCT	CRI	Min. Flux (lm) @ 700 mA		3-Step		5-Step	
		Flux Bin	Flux (85 °C)	Group	Order Code	Group	Order Code
4000K	70	D2	360	5G	XPGPWT-01-0000-00000BS5G	5E	XPGPWT-01-0000-00000BS5E
		D3	370		XPGPWT-01-0000-00000BT5G		XPGPWT-01-0000-00000BT5E
	80	C3	320		XPGPWT-01-0000-00000HN5G		XPGPWT-01-0000-00000HN5E
		C4	330		XPGPWT-01-0000-00000HP5G		XPGPWT-01-0000-00000HP5E
	90	B5	290		XPGPWT-01-0000-00000UK5G		XPGPWT-01-0000-00000UK5E
		C1	300		XPGPWT-01-0000-00000UL5G		XPGPWT-01-0000-00000UL5E
3500K	70	C5	340	6G		6E	XPGPWT-01-0000-00000BQ6E
		D1	350				XPGPWT-01-0000-00000BR6E
	80	C2	310		XPGPWT-01-0000-00000HM6G		XPGPWT-01-0000-00000HM6E
		C3	320		XPGPWT-01-0000-00000HN6G		XPGPWT-01-0000-00000HN6E
	90	B2	260		XPGPWT-01-0000-00000UF6G		XPGPWT-01-0000-00000UF6E
		B3	270		XPGPWT-01-0000-00000UG6G		XPGPWT-01-0000-00000UG6E
3000K	70	C5	340	7G	XPGPWT-01-0000-00000BQ7G	7E	XPGPWT-01-0000-00000BQ7E
		D1	350		XPGPWT-01-0000-00000BR7G		XPGPWT-01-0000-00000BR7E
	80	C2	310		XPGPWT-01-0000-00000HM7G		XPGPWT-01-0000-00000HM7E
		C3	320		XPGPWT-01-0000-00000HN7G		XPGPWT-01-0000-00000HN7E
	90	B1	250		XPGPWT-01-0000-00000UE7G		XPGPWT-01-0000-00000UE7E
		B2	260		XPGPWT-01-0000-00000UF7G		XPGPWT-01-0000-00000UF7E

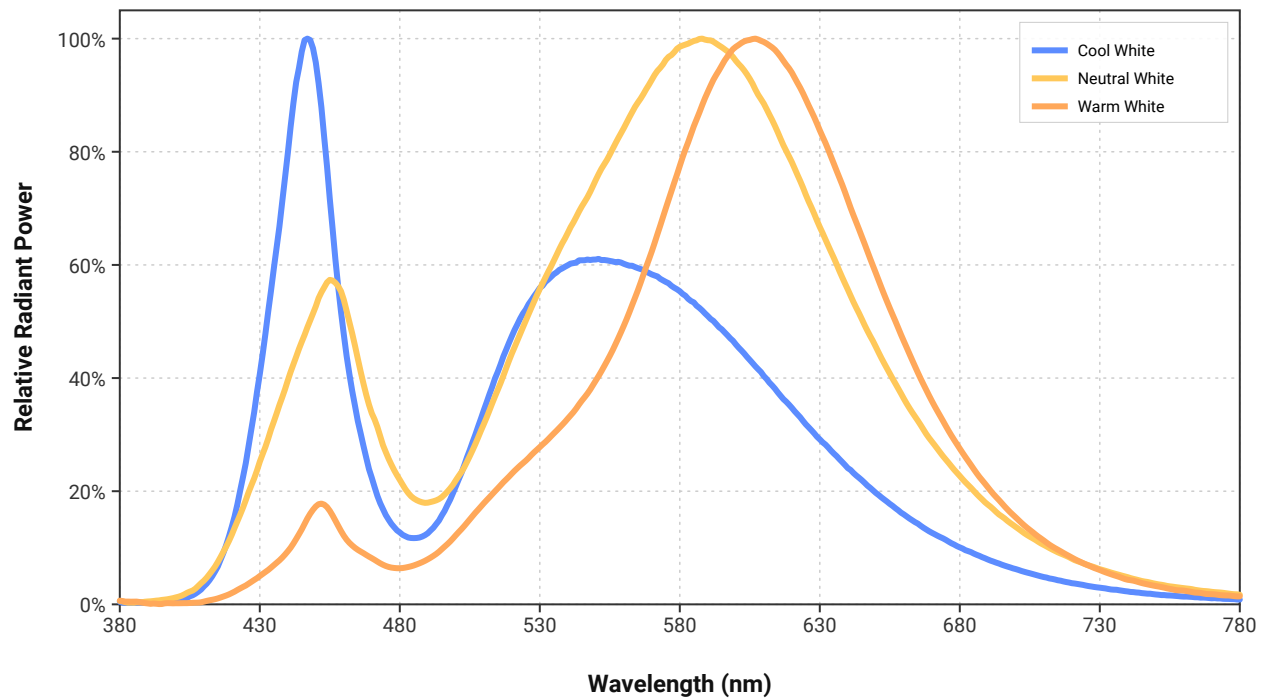
- Cree LED maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity measurements and ± 2 on CRI measurements.
- XLamp XP-GP LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified without advance notice.

FLUX CHARACTERISTICS – WHITE ($T_j = 85\text{ }^{\circ}\text{C}$)

CCT	CRI	Min. Flux (lm) @ 700 mA		3-Step		5-Step	
		Flux Bin	Flux (85 °C)	Group	Order Code	Group	Order Code
2700K	70	C4	330	8G		8E	XPGPWT-01-0000-00000BP8E
		C5	340				XPGPWT-01-0000-00000BQ8E
	80	B5	290		XPGPWT-01-0000-00000HK8G		XPGPWT-01-0000-00000HK8E
		C1	300		XPGPWT-01-0000-00000HL8G		XPGPWT-01-0000-00000HL8E
	90	A5	240		XPGPWT-01-0000-00000UD8G		XPGPWT-01-0000-00000UD8E
		B1	250		XPGPWT-01-0000-00000UE8G		XPGPWT-01-0000-00000UE8E

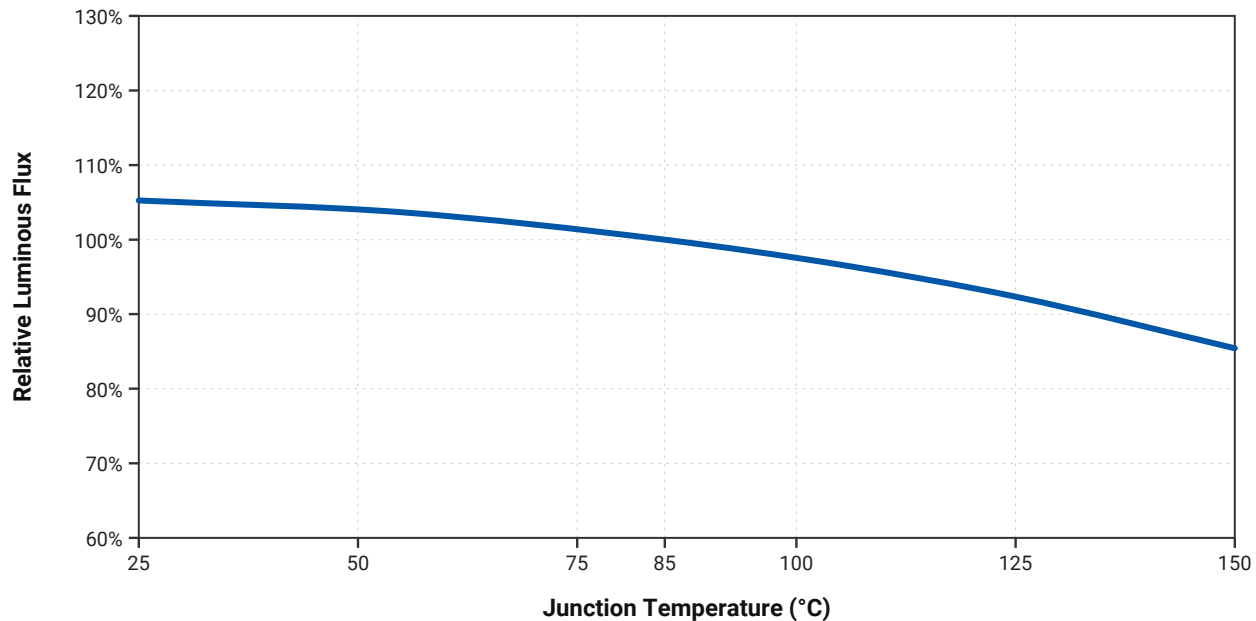
- Cree LED maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity measurements and ± 2 on CRI measurements.
- XLamp XP-GP LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified without advance notice.

RELATIVE SPECTRAL POWER DISTRIBUTION - WHITE

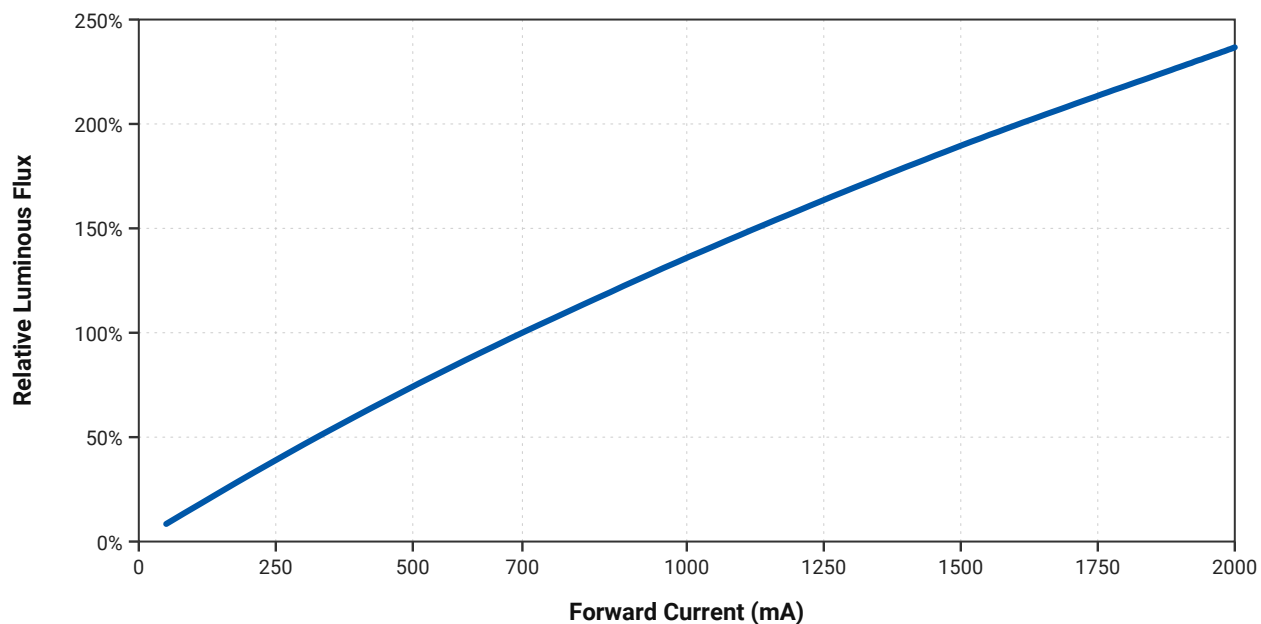


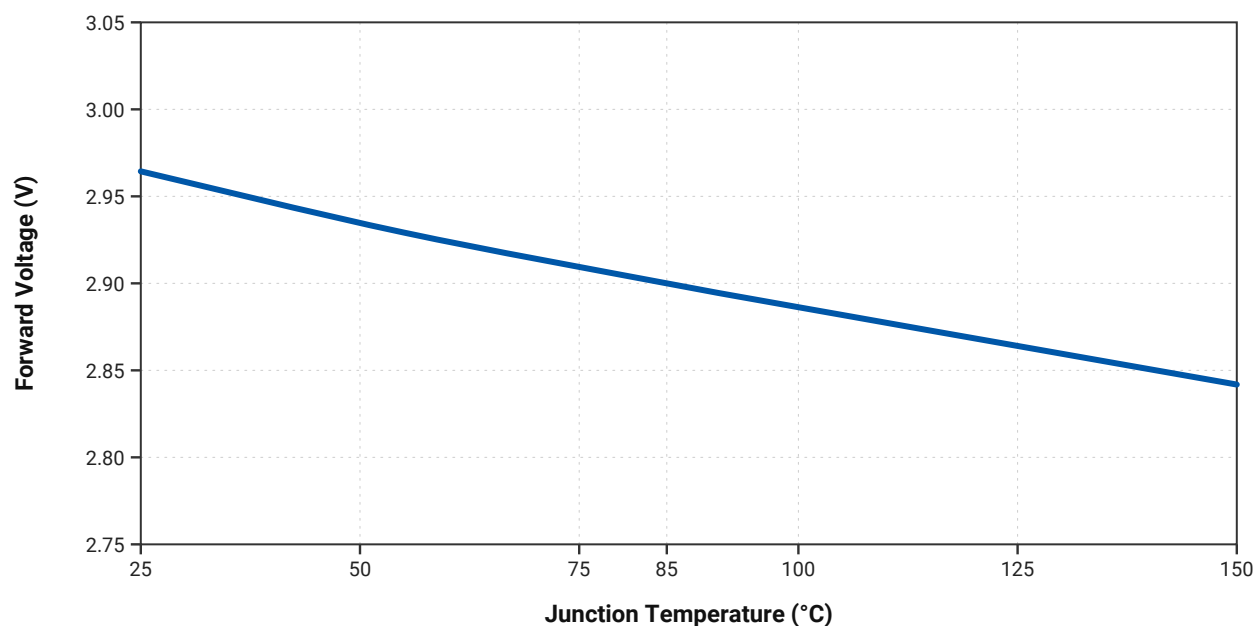
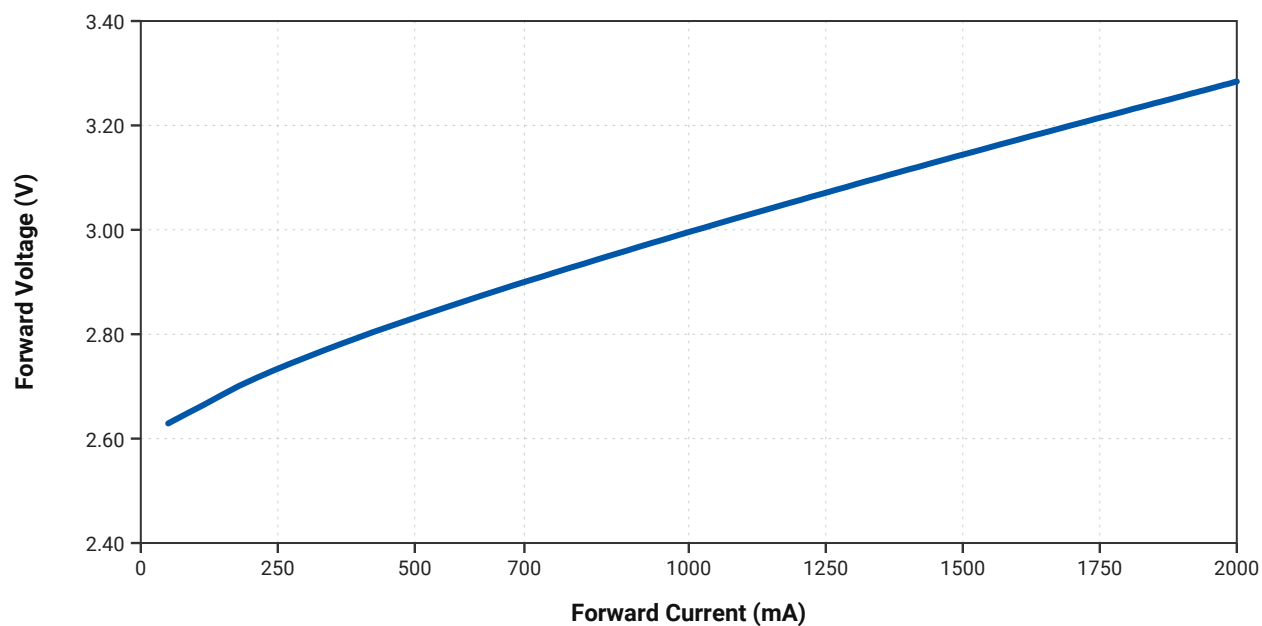
RELATIVE FLUX VS. JUNCTION TEMPERATURE – WHITE

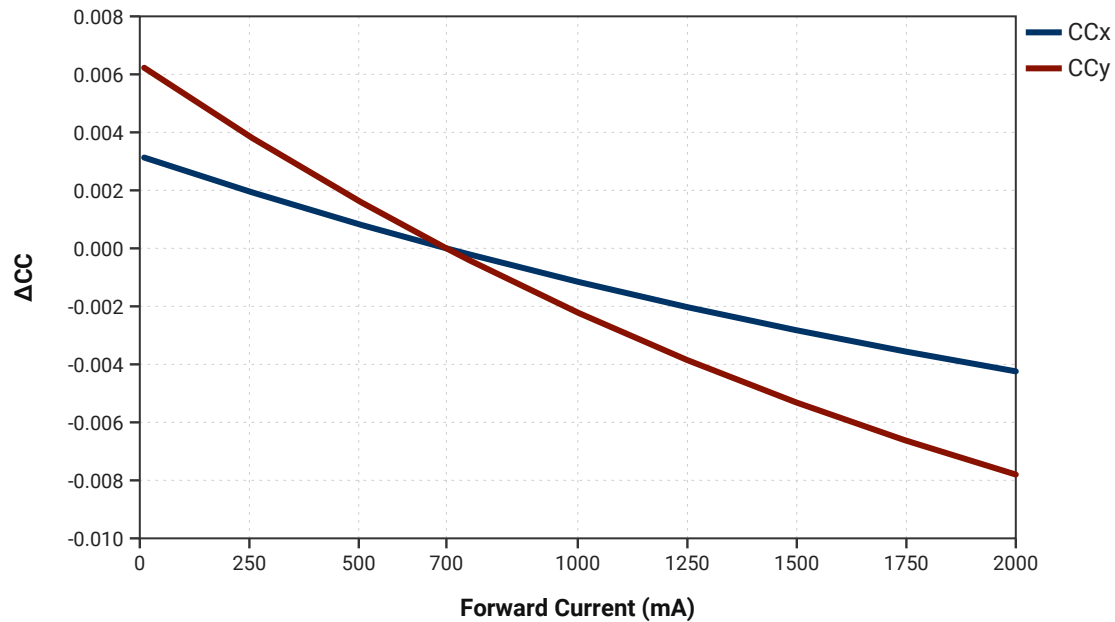
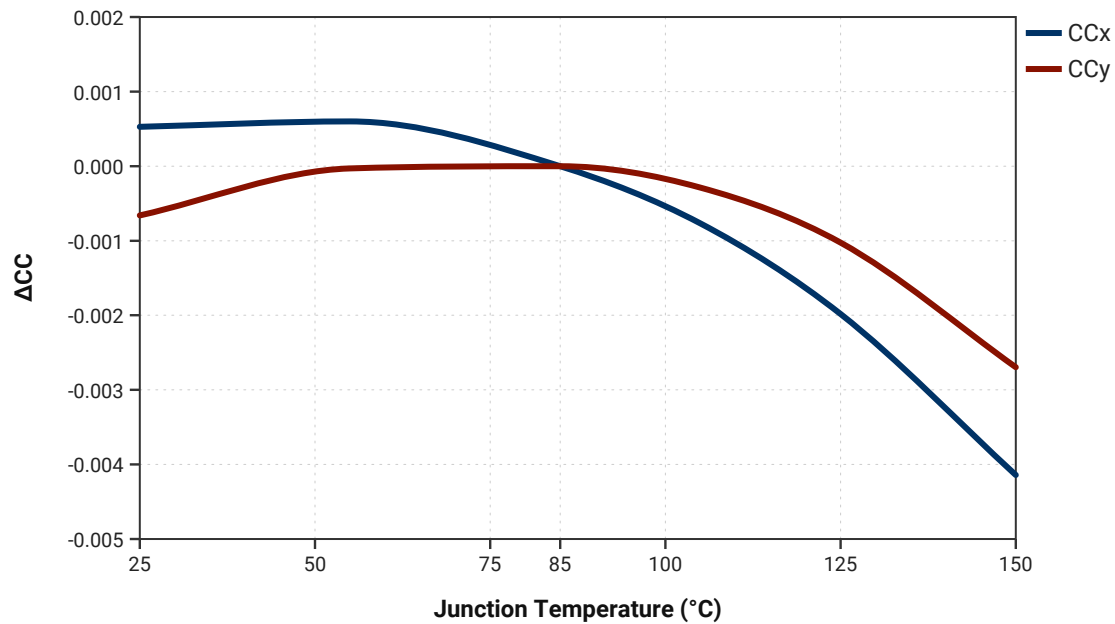
Binning condition: $T_j = 85^\circ\text{C}$; 3 V, $I_F = 700\text{ mA}$



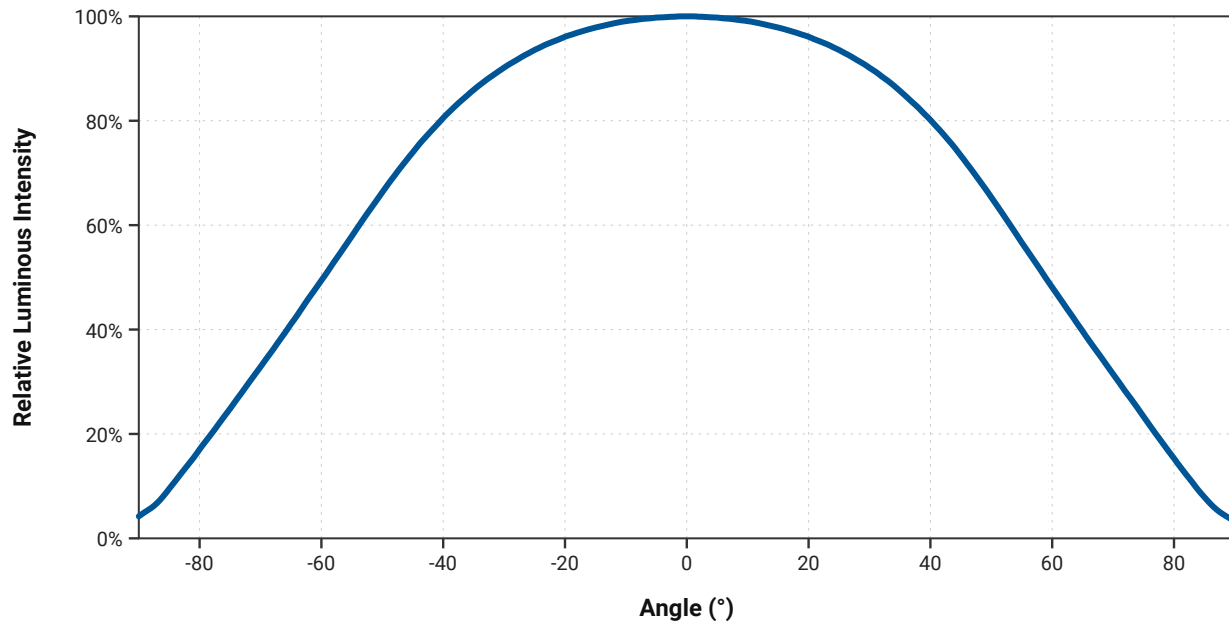
RELATIVE FLUX VS. FORWARD CURRENT – WHITE ($T_j = 85^\circ\text{C}$)



FORWARD VOLTAGE VS. JUNCTION TEMPERATURE – WHITE ($I_F = 700\text{ mA}$)**FORWARD VOLTAGE VS. FORWARD CURRENT – WHITE ($T_J = 85\text{ °C}$)**

CCX / CCY VS. FORWARD CURRENT – WHITE ($T_J = 85^\circ\text{C}$)CCX / CCY VS. JUNCTION TEMPERATURE – WHITE ($I_F = 700\text{ mA}$)

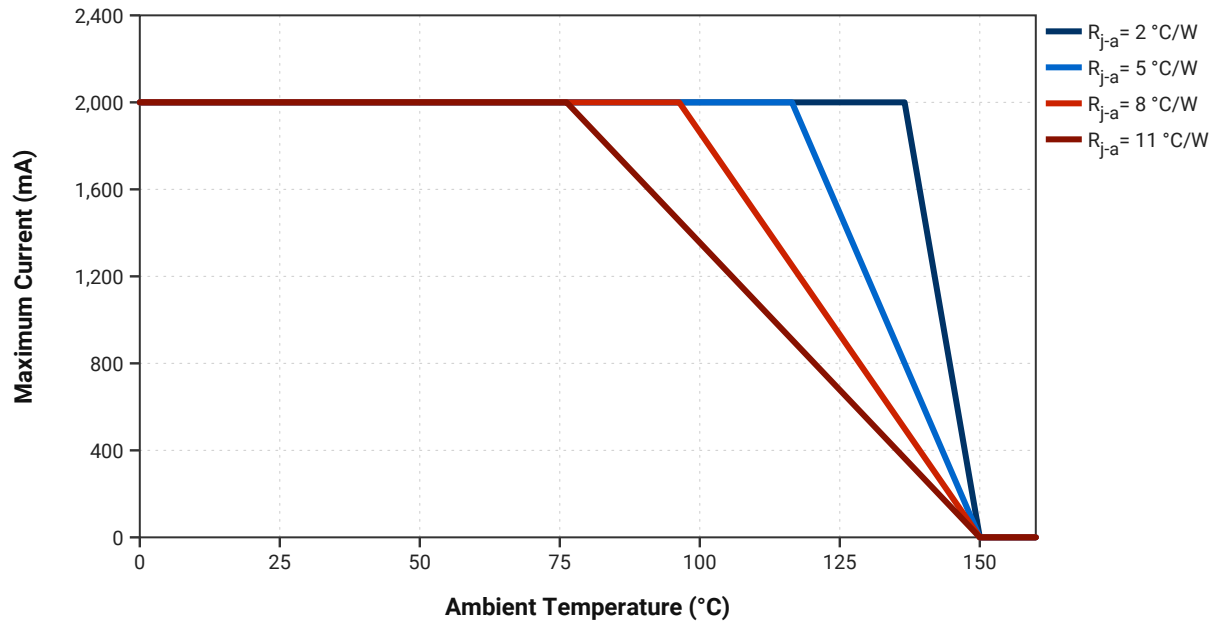
TYPICAL SPATIAL DISTRIBUTION



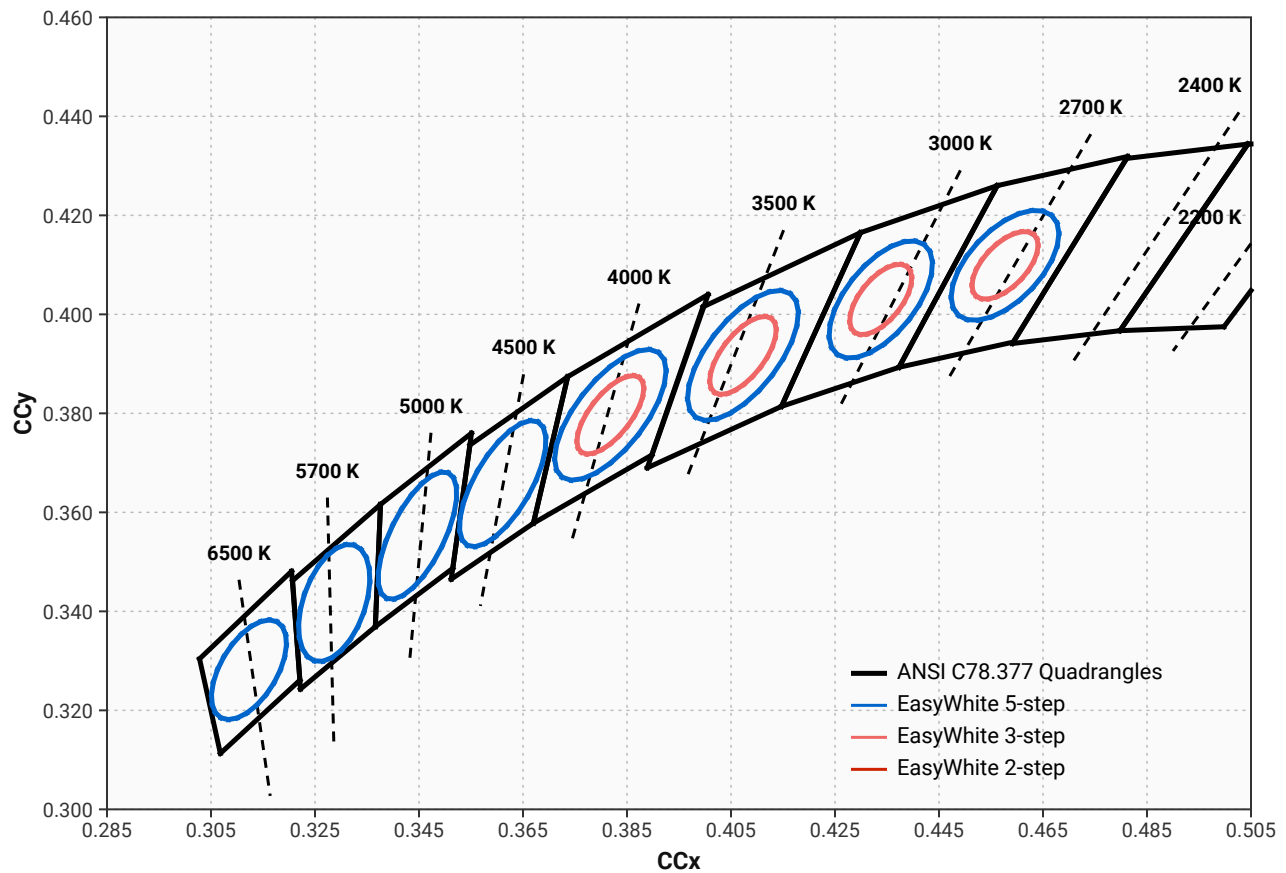
THERMAL DESIGN – WHITE

The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.

Please refer to the Characteristics table on [page 3](#) for this product's thermal resistance and maximum junction temperature.



CHROMATICITY BINS – EASYWHITE BINS



PERFORMANCE GROUPS

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

Color Bin (3-Step MacAdam Ellipses)						
Bin Code	CCT (K)	Center x	Center y	Major Axis (a)	Minor Axis (b)	Rotation (°)
5G	4000	0.3818	0.3797	0.0094	0.0040	53.70
6G	3500	0.4073	0.3917	0.0093	0.0041	54.00
7G	3000	0.4338	0.4030	0.0083	0.0041	53.20
8G	2700	0.4577	0.4099	0.0083	0.0042	48.50

Color Bin (5-Step MacAdam Ellipses)						
Bin Code	CCT (K)	Center x	Center y	Major Axis (a)	Minor Axis (b)	Rotation (°)
1E	6500	0.3123	0.3282	0.0111	0.0055	61.00
2E	5700	0.3287	0.3417	0.0123	0.0060	72.00
3E	5000	0.3447	0.3553	0.0140	0.0052	65.00
4E	4500	0.3611	0.3658	0.0142	0.0055	61.50
5E	4000	0.3818	0.3797	0.0157	0.0067	53.70
6E	3500	0.4073	0.3917	0.0155	0.0069	54.00
7E	3000	0.4338	0.4030	0.0139	0.0068	53.20
8E	2700	0.4577	0.4099	0.0135	0.0070	48.50

PERFORMANCE GROUPS

XLamp XP-GP White LEDs tested for luminous flux are placed into one of the following luminous flux groups.

Group Code	Min Luminous Flux (lm)	Max Luminous Flux (lm)
A4	230	240
A5	240	250
B1	250	260
B2	260	270
B3	270	280
B4	280	290
B5	290	300
C1	300	310
C2	310	320
C3	320	330
C4	330	340
C5	340	350
D1	350	360
D2	360	370
D3	370	380
D4	380	390
D5	390	400

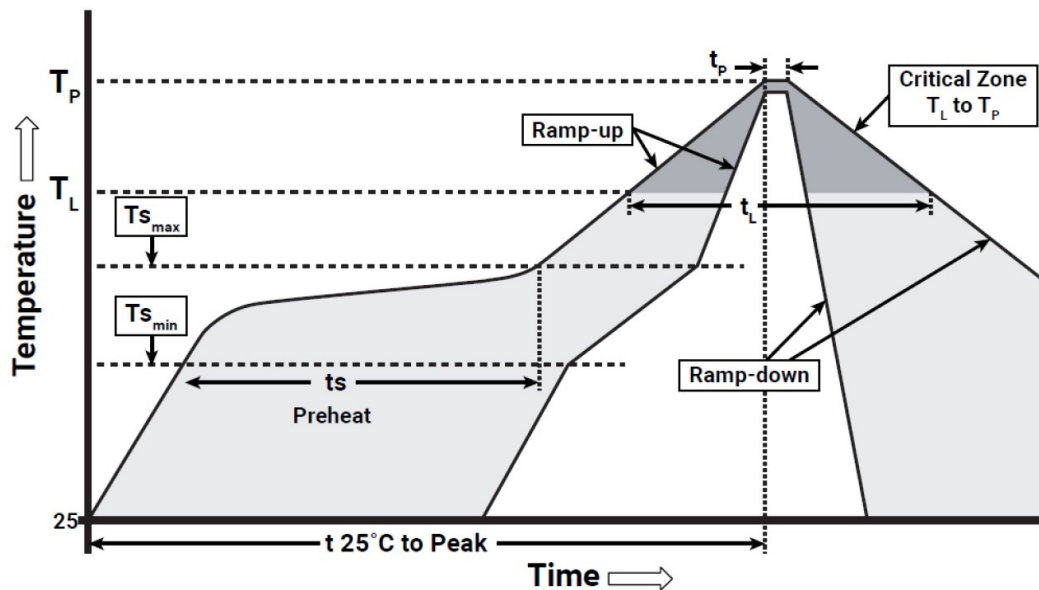
PERFORMANCE GROUPS

XLamp XP-GP White LEDs are tested and placed into one of the following voltage bin groups.

Group Code	Minimum Vf (V)	Maximum Vf (V)
0	-	3.10
1	2.70	2.80
2	2.80	2.90
3	2.90	3.00
4	3.00	3.10

REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp XP-GP LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline, Cree LED recommends that users follow the recommended soldering profile provided by the manufacturer of the solder paste used, and therefore it is the lamp or luminaire manufacturer's responsibility to determine applicable soldering requirements. Note that this general guideline may not apply to all PCB designs and configurations of reflow soldering equipment.



Profile Feature	Lead-Free Solder
Average Ramp-Up Rate (T _{smax} to T _p)	1.2 °C/second
Preheat: Temperature Min (T _{smin})	120 °C
Preheat: Temperature Max (T _{smax})	170 °C
Preheat: Time (t _{smin} to t _{smax})	65 - 150 seconds
Time Maintained Above: Temperature (T _L)	217 °C
Time Maintained Above: Time (t _L)	45 - 90 seconds
Peak/Classification Temperature (T _p)	235 - 245 °C
Time Within 5 °C of Actual Peak (t _p)	20 - 40 seconds
Ramp-Down Rate (max)	6 °C/second
JEDEC Compatible	Yes

ORDER CODE DESCRIPTION

SSSSCC - BD - HHHH - NNNNVRFGG

SSSS - Series		CC - Color		B - Internal Code	
XP GP	XP-GP	WT	White	Internal / product-defined	
D - Reel Size		HHHH - Internal Code		NNNN - Internal Code	
1	1000	Internal / product-defined		Internal / product-defined	
V - Voltage Configuration		R - CRI		F - Luminous Flux Bin	
See performance groups		B	70 minimum	See performance groups	
		H	80 minimum		
		U	90 minimum		
GG - Chromaticity Kit					
See performance groups					

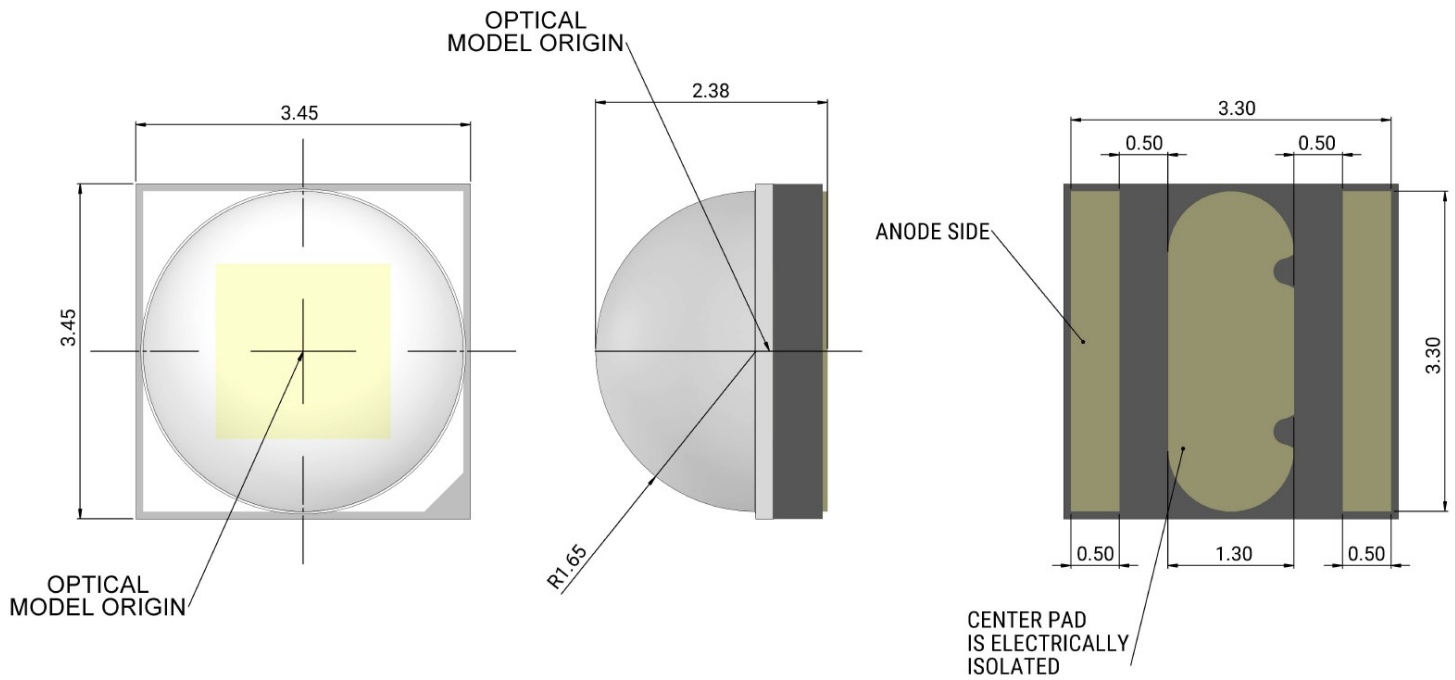
BIN CODE DESCRIPTION

SSSSCC - E - WWW - FFF - VR - AAAA

SSSS - Series		CC - Color		E - Internal Code
XP GP	XP-GP	WT	White	Internal / product-defined
WWW - Chromaticity Kit		FFF - Luminous Flux Bin		V - Voltage Configuration
See performance groups		See performance groups		See performance groups
R - CRI		AAAA - Internal Code		
B	70 minimum	Internal / product-defined		
H	80 minimum			
U	90 minimum			

MECHANICAL DIMENSIONS

XP-GP has a backside thermal pad that is electrically isolated.

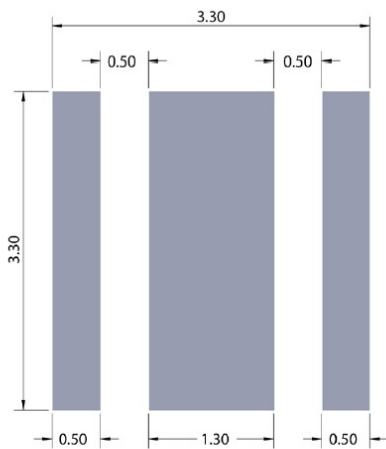


Color	Width / Length	Height	Substrate Thickness	Lens Radius / Lens Height
White	3.45	2.38	0.50	1.65

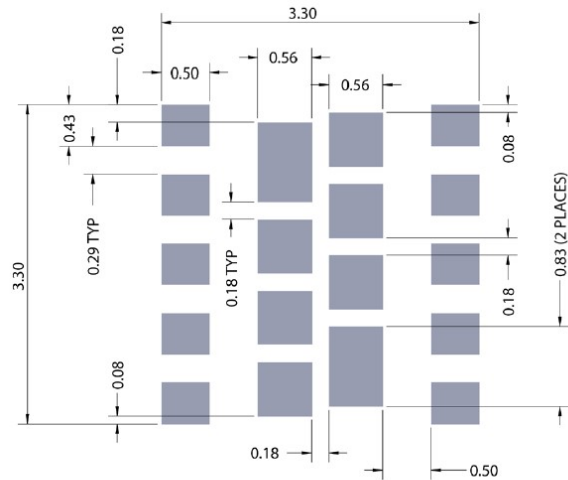
* Dimensions are +/- 0.13 unless otherwise noted.

MECHANICAL DIMENSIONS (CONTINUED)

PCB / Stencil Drawing



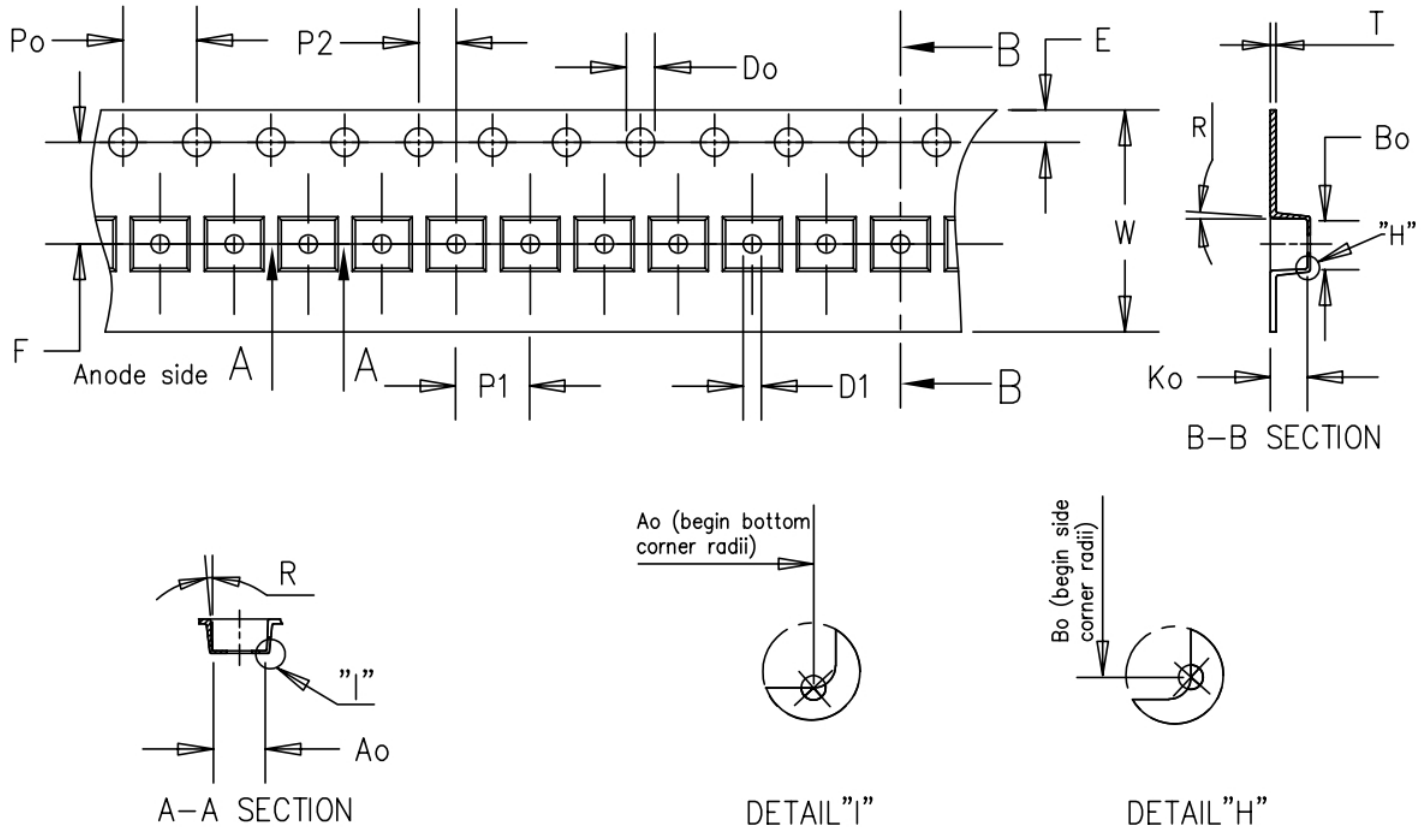
Recommended PCB Footprint



Recommended Stencil Openings*

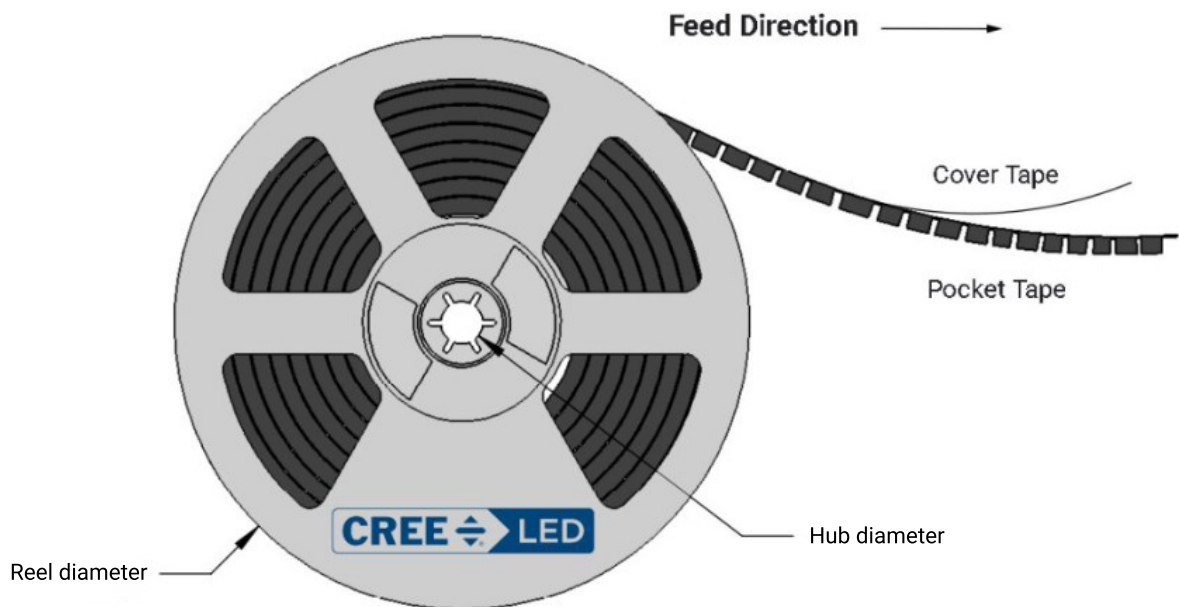
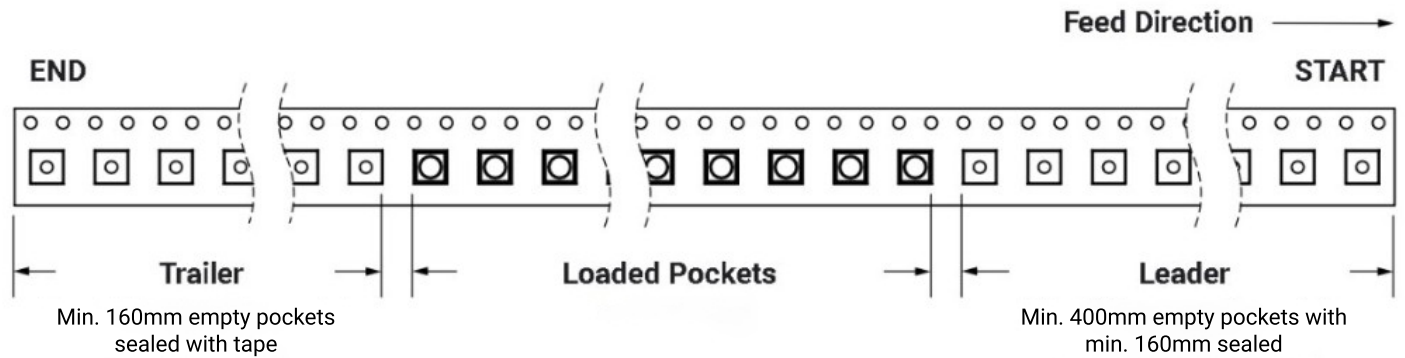
TAPE AND REEL

All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard. Except as noted, all dimensions are in mm, and measurement tolerances unless indicated otherwise: .xx = ± 0.15 mm.



White											
A_0	B_0	K_0	P_0	P_1	P_2	T	E	F	D_0	D_1	W
3.70	3.70	2.65	4.00	8.00	2.00	0.30	1.75	5.50	1.55	1.50	12.00

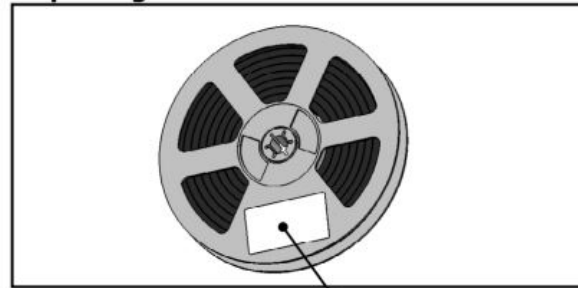
REEL SPECIFICATIONS



Parameter	Value
Hub Diameter	13 mm
Reel Diameter	7.5 inches
Pockets per Reel (Loaded)	1000
Leader (mm)	400
Trailer (mm)	160

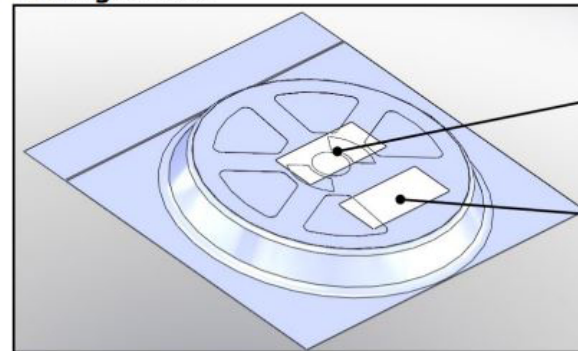
PACKAGING

Unpackaged Reel



Label with Cree LED Bin Code, Quantity, Reel ID

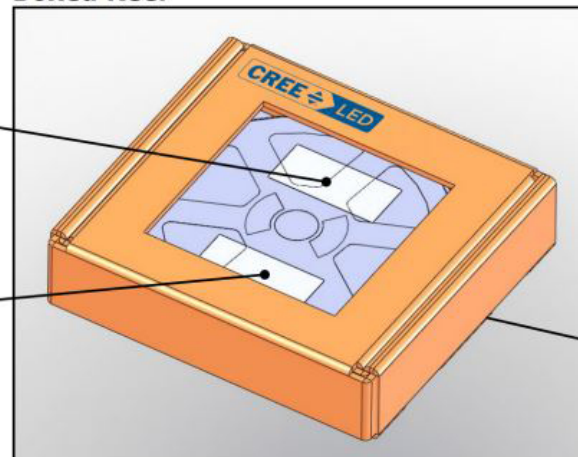
Packaged Reel



Label with Cree LED Order Code, Quantity, Reel ID, PO#

Label with Cree LED Bin Code, Quantity, Reel ID

Boxed Reel



Label with Cree LED Order Code, Quantity, Reel ID, PO#

Label with Cree LED Bin Code, Quantity, Reel ID

Patent Label (on bottom of box)

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

Lumen Maintenance

Cree LED 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 LED'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.

Moisture Sensitivity

Cree LED recommends keeping XLamp LEDs in the provided, resealable moisture-barrier packaging (MBP) until immediately prior to soldering. Unopened MBPs that contain XLamp LEDs do not need special storage for moisture sensitivity.

Once the MBP is opened, XLamp XPGPrime LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of $\leq 30^{\circ}\text{C}/85\%$ relative humidity (RH). Regardless of storage condition, Cree LED recommends sealing any unsoldered LEDs in the original MBP.

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 LED representative or from the [Product Ecology](#) section of the Cree LED 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 LED representative to ensure you get the most up-to-date REACH SVHC Declaration. REACH banned substance information (REACH Article 67) is also available upon request.

NOTES (CONTINUED)

UL® Recognized Component

This product meets the requirements to be considered a UL Recognized Component with Level 1 enclosure consideration. The LED package or a portion thereof has not been investigated as a fire enclosure or 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.