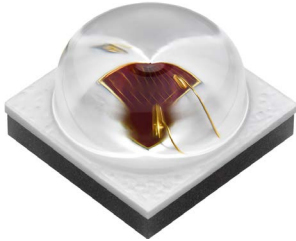


## XLamp® XP-E2 Horizon LEDs



### PRODUCT DESCRIPTION

The XLamp® XP-E2 Horizon LED has a horticulture-specific beam shape that spreads the light output of the LED more evenly over a bed of plants. Standard LED beam shapes send light directly out of the LED and can cause uneven lighting with short luminaire mounting heights. The two different shapes, Horizon70 and Horizon90, send their peak output 70 or 90 degrees total away from center to create more even distributions of light.

The XP-E2 Horizon LED is available in Horizon90 and Horizon70 options. In this document, the term XP-E2 Horizon denotes the XP-E2 Horizon LED without regard to its viewing angle. The terms Horizon90 and Horizon70 are used when necessary to differentiate the performance of the XP-E2 Horizon90 LED from the XP-E2 Horizon70 LED.

### FEATURES

- Available in far red
- ANSI-compatible chromaticity bins
- Maximum drive current: 1.5 A
- Low thermal resistance: as low as 8 °C/W
- Unlimited floor life at  $\leq 30$  °C/85% RH
- Reflow solderable - JEDEC J-STD-020C compatible
- Electrically neutral thermal path

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## CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		8	
Viewing angle (FWHM) - Horizon90	degrees		145	
Viewing angle (FWHM) - Horizon70	degrees		140	
2X peak vertical angle - Horizon90	degrees		90	
2X peak vertical angle - Horizon70	degrees		70	
Temperature coefficient of voltage	mV/°C		-1.0	
ESD classification (HBM per Mil-Std-883D)			Class 3B	
DC forward current	mA			1500
Reverse voltage	V			1
Forward voltage (@ 350 mA, 25 °C)	V		1.85	2.4
Forward voltage (@ 1000 mA, 25 °C)	V		2.15	
LED junction temperature	°C			150

## Note

- Thermal resistance measurement was performed per the JEDEC JESD51-14 standard. See the [Thermal Resistance Measurement application note](#) for more details.

FLUX CHARACTERISTICS ( $T_j = 25^\circ\text{C}$ )

The following tables provide order codes for XLamp XP-E2 Horizon LEDs. For a complete description of the order-code nomenclature, please see the Bin and Order Code Formats section (page 9).

Color	Minimum Radiant Flux (mW) @ 350 mA		Calculated Minimum PF <sub>FR</sub> (μmol/s)*	Peak Wavelength (nm)				Color Order Codes
				Minimum		Maximum		
	Group	Flux (mW)		Group	PWL (nm)	Group	PWL (nm)	
Horizon90 Far Red	27	375	2.2	F2	720	F5	740	XPEBFR-LF-0000-00A01
	28	400	2.34	F2	720	F5	740	XPEBFR-LF-0000-00B01
	29	425	2.49	F2	720	F5	740	XPEBFR-LF-0000-00C01

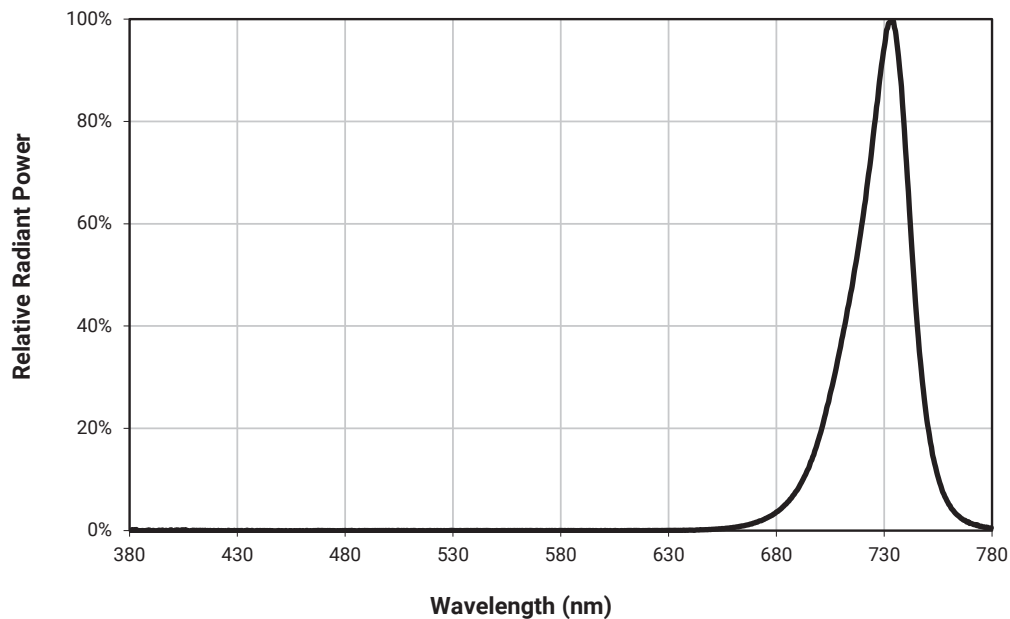
Color	Minimum Radiant Flux (mW) @ 350 mA		Calculated Minimum PF <sub>FR</sub> (μmol/s)*	Peak Wavelength (nm)				Color Order Codes
				Minimum		Maximum		
	Group	Flux (mW)		Group	PWL (nm)	Group	PWL (nm)	
Horizon70 Far Red	27	375	2.2	F2	720	F5	740	XPEBFR-LW-0000-00A01
	28	400	2.34	F2	720	F5	740	XPEBFR-LW-0000-00B01
	29	425	2.49	F2	720	F5	740	XPEBFR-LW-0000-00C01

## Note:

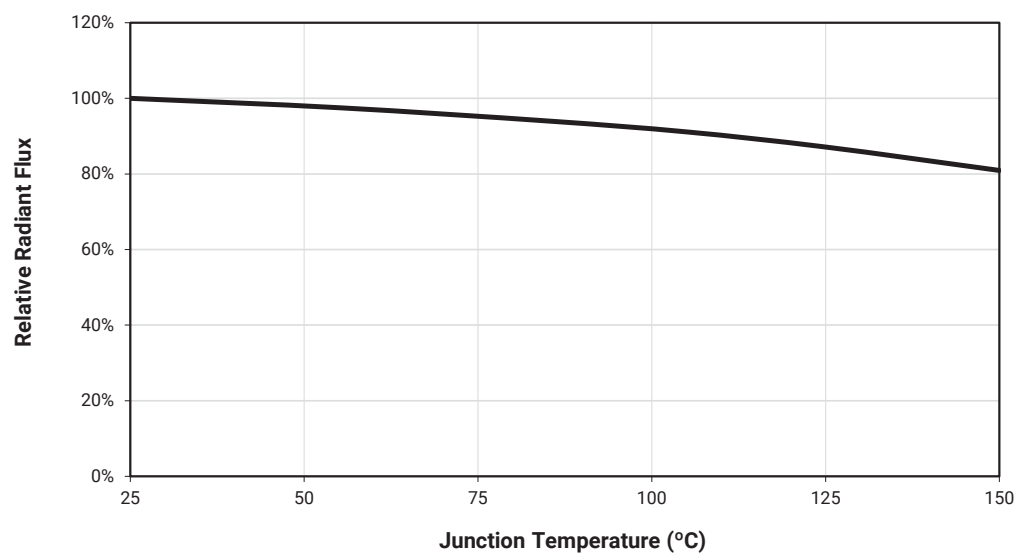
- Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements,  $\pm 2$  on CRI measurements and  $\pm 1$  on dominant wavelength measurements. See the Measurements section (page 11).
- XLamp XP-E2 Horizon LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.
- \* Calculated  $PF_{FR}$  values are for reference only.

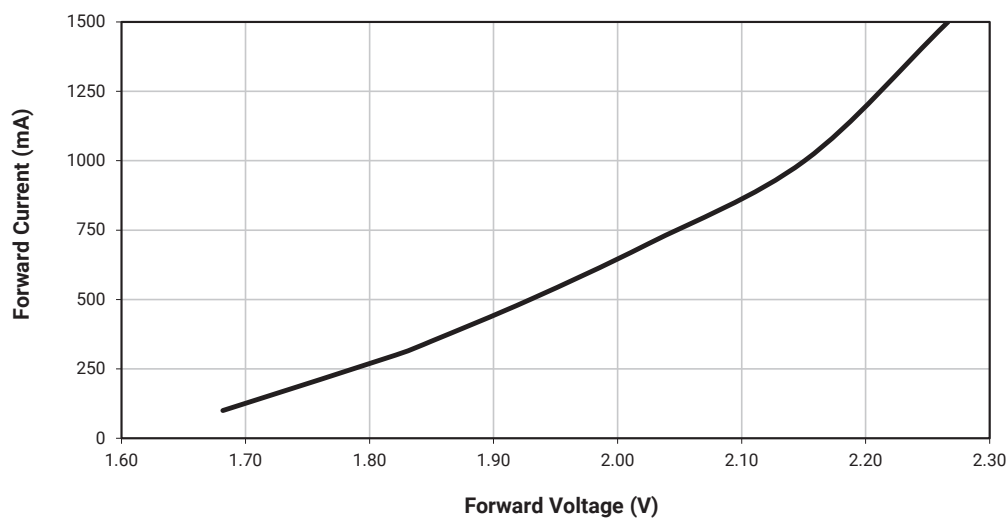
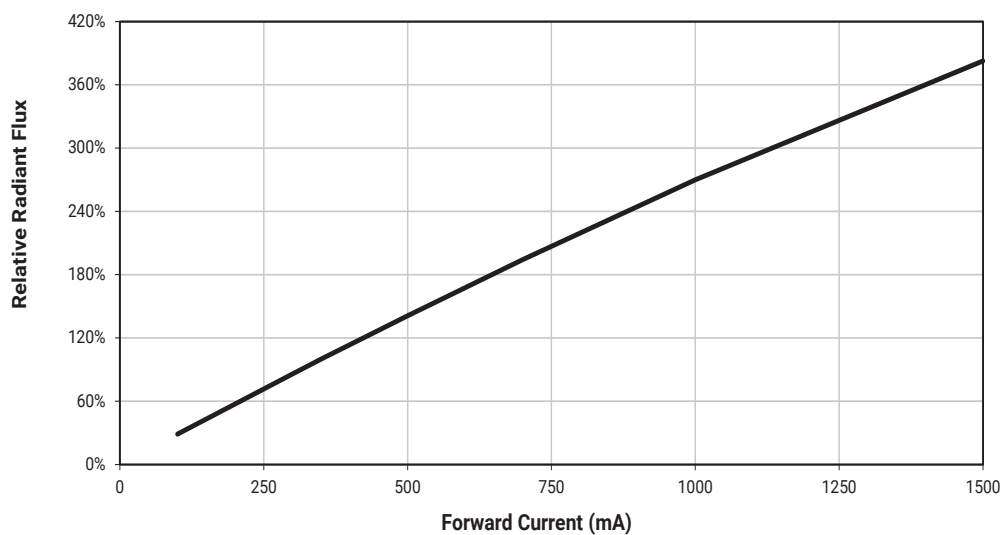
## RELATIVE SPECTRAL POWER DISTRIBUTION

Horizon90, Horizon70

RELATIVE FLUX VS. JUNCTION TEMPERATURE ( $I_F = 350$  mA)

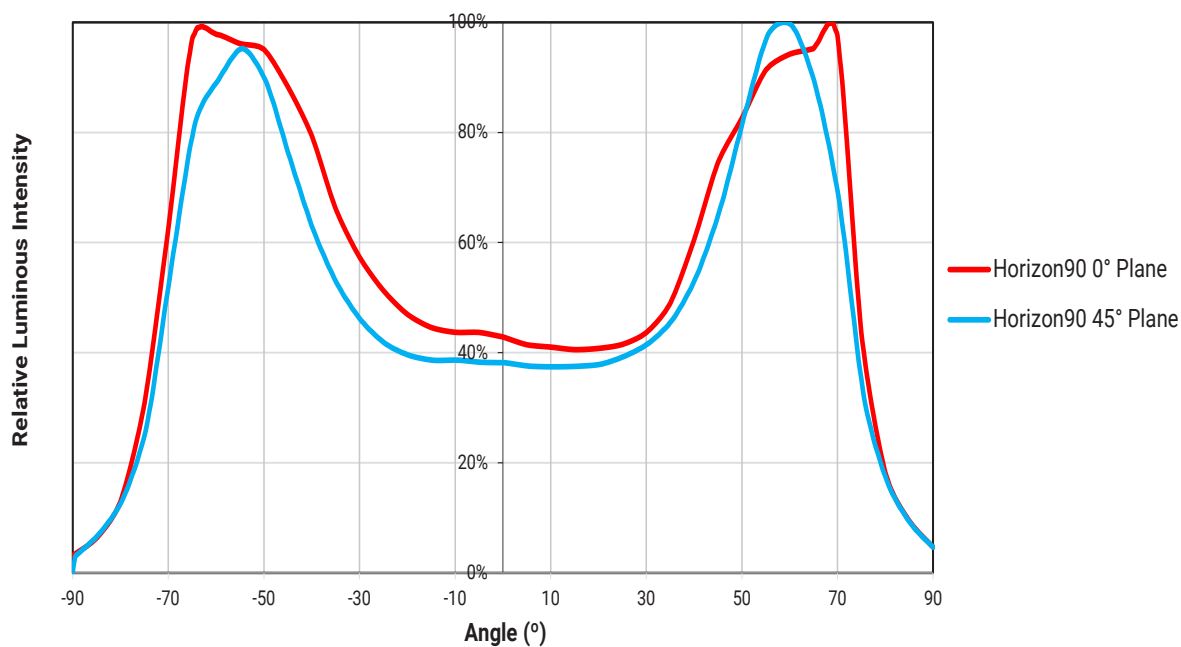
Horizon90, Horizon70



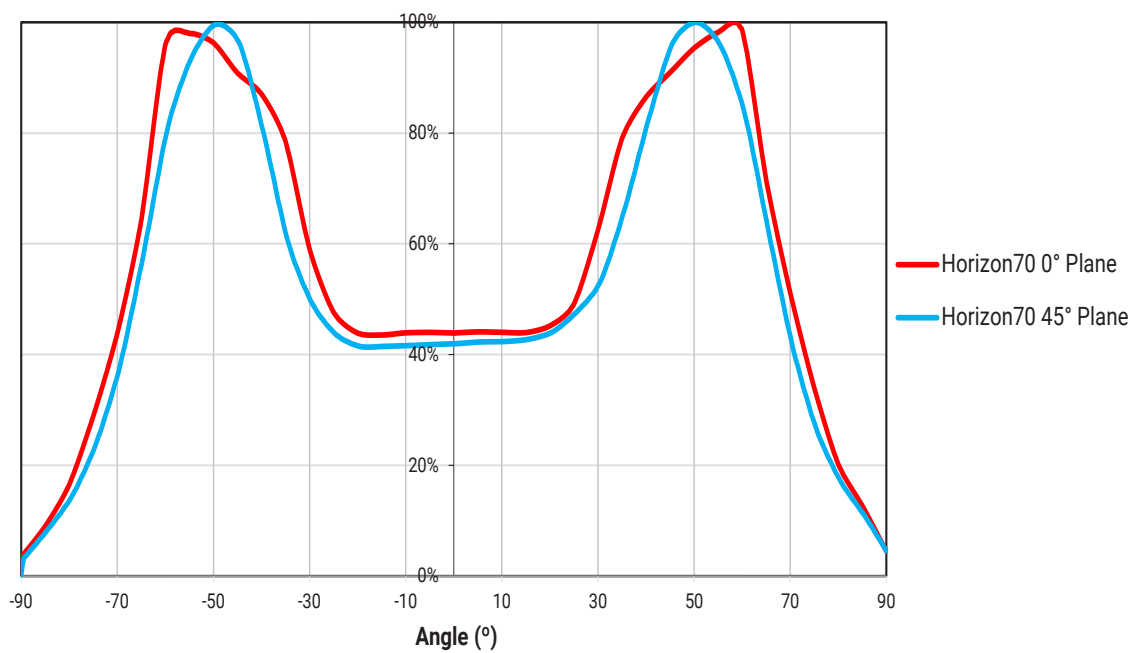
**ELECTRICAL CHARACTERISTICS ( $T_j = 25\text{ }^{\circ}\text{C}$ )****Horizon90, Horizon70****RELATIVE FLUX VS. CURRENT ( $T_j = 25\text{ }^{\circ}\text{C}$ )****Horizon90, Horizon70**

## TYPICAL SPATIAL DISTRIBUTION

## Horizon90

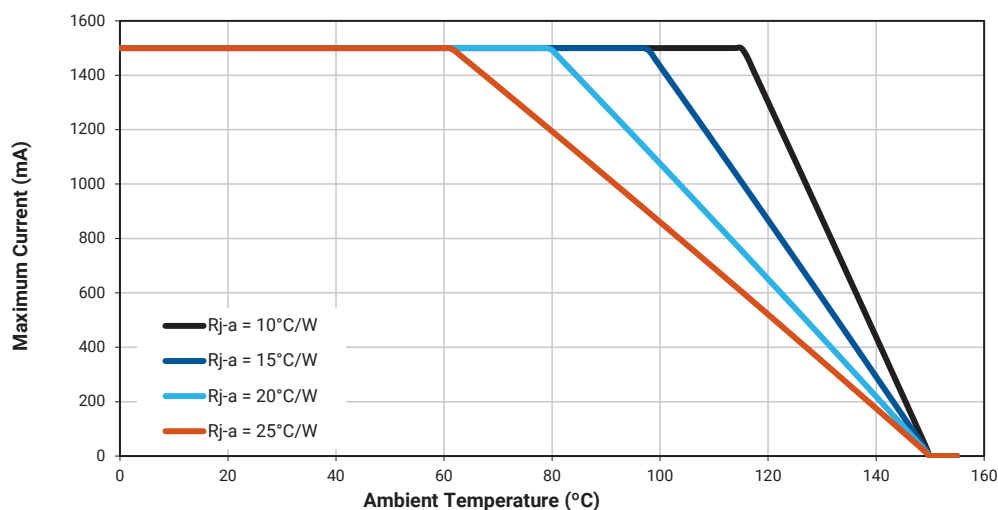


## Horizon70



## THERMAL DESIGN

### Horizon90, Horizon70



## PERFORMANCE GROUPS - RADIANT FLUX ( $T_j = 25^\circ\text{C}$ )

XLamp XP-E2 Horizon LEDs are tested for radiant flux and sorted into one of the following radiant-flux bins:

Group	Minimum Radiant Flux (mW) @ 350 mA	Maximum Radiant Flux (mW) @ 350 mA
27	375	400
28	400	425
29	425	450

## PERFORMANCE GROUPS - PEAK WAVELENGTH

XLamp XP-E2 Horizon LEDs are tested for peak wavelength (PWL) and sorted into one of the PWL bins defined below.

Color	PWL Group	Minimum PWL (nm) @ 350 mA	Maximum PWL (nm) @ 350 mA
Far Red	F2	720	725
	F3	725	730
	F4	730	735
	F5	735	740

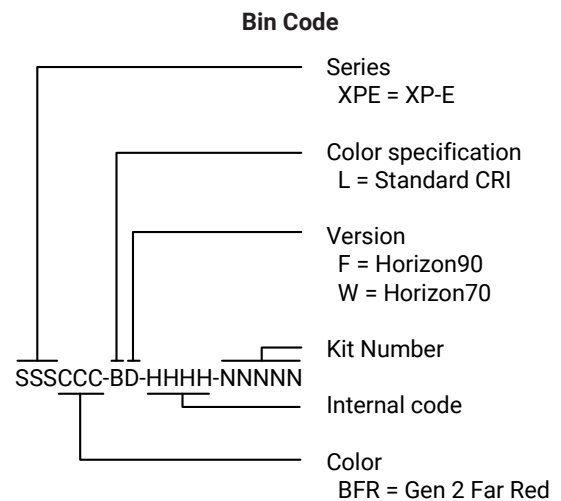
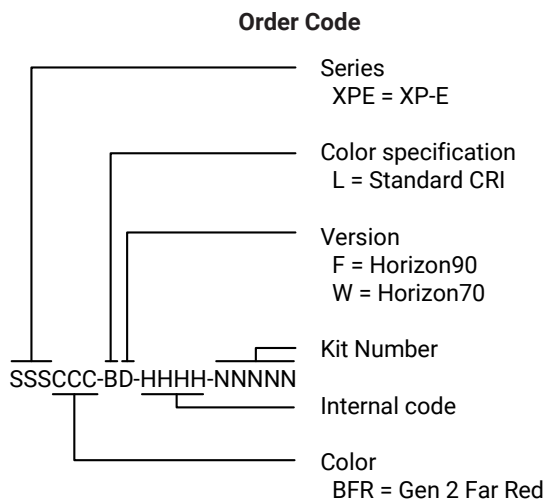
## PERFORMANCE GROUPS - FORWARD VOLTAGE

XLamp XP-E2 Horizon LEDs are tested for forward voltage and sorted into one of the forward voltage bins defined below.

Forward Voltage Group	Minimum Forward Voltage (V) @ 350 mA	Maximum Forward Voltage (V) @ 350 mA
A	1.5	1.75
B	1.75	2.0
C	2.0	2.25
D	2.25	2.5

## BIN AND ORDER CODE FORMATS

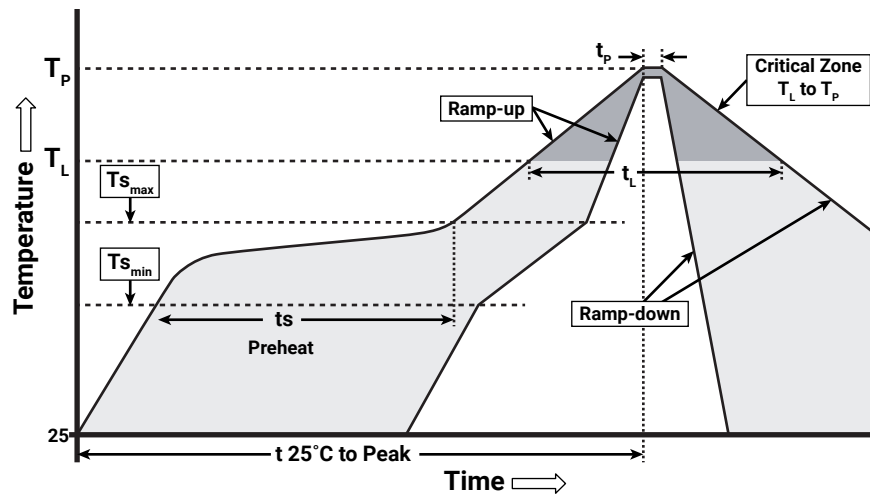
XP-E2 Horizon bin codes and order codes are configured in the following manner:



## REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp XP-E2 Horizon 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.



IPC/JEDEC J-STD-020C

Profile Feature	Lead-Free Solder
Average Ramp-Up Rate ( $T_{s\_max}$ to $T_p$ )	1.2 °C/second
Preheat: Temperature Min ( $T_{s\_min}$ )	120 °C
Preheat: Temperature Max ( $T_{s\_max}$ )	170 °C
Preheat: Time ( $t_{s\_min}$ to $t_{s\_max}$ )	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 Temperature ( $t_p$ )	20-40 seconds
Ramp-Down Rate	1 - 6 °C/second
Time 25 °C to Peak Temperature	4 minutes max.

Note: All temperatures refer to topside of the package, measured on the package body surface.

## NOTES

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### 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 XP-E2 Horizon LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of  $\leq 30$  °C/85% relative humidity (RH). Regardless of the storage condition, Cree LED recommends sealing any unsoldered LEDs in the original MBP.

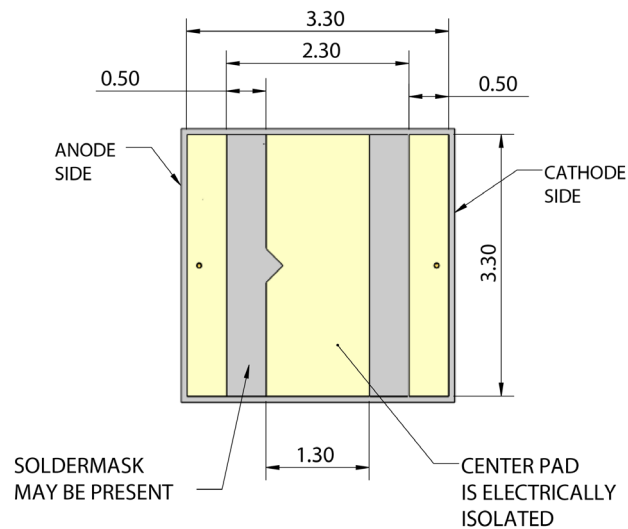
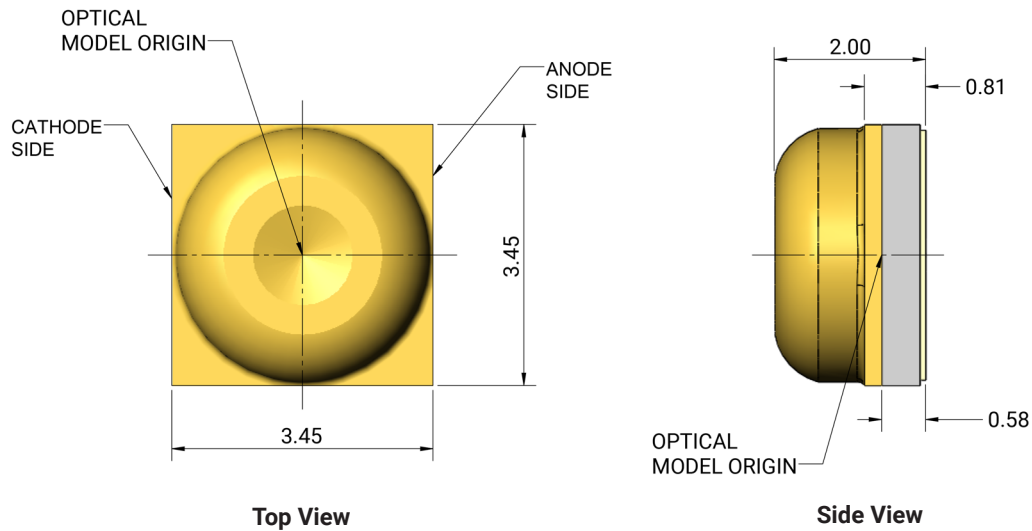
### Vision Advisory

**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](#).

## MECHANICAL DIMENSIONS

Thermal vias, if present, are not shown on these drawings.

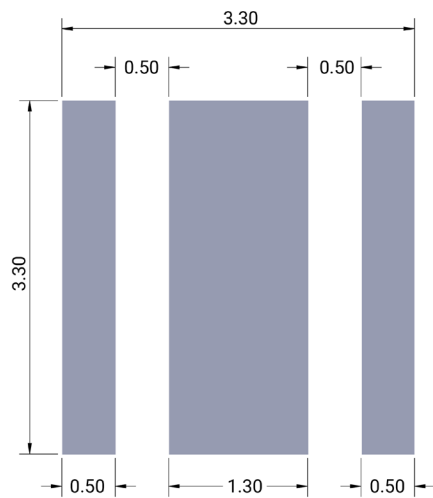
All measurements are  $\pm 0.13$  mm unless otherwise indicated.



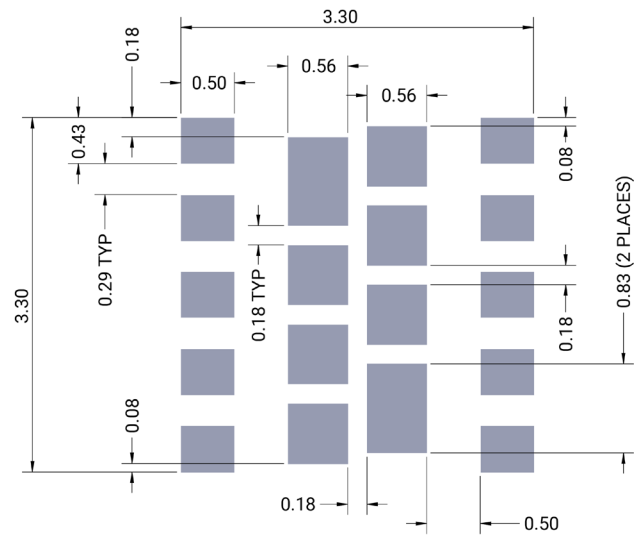
## MECHANICAL DIMENSIONS - CONTINUED

Thermal vias, if present, are not shown on these drawings.

All measurements are  $\pm 13$  mm unless otherwise indicated.



### Recommended PCB Footprint



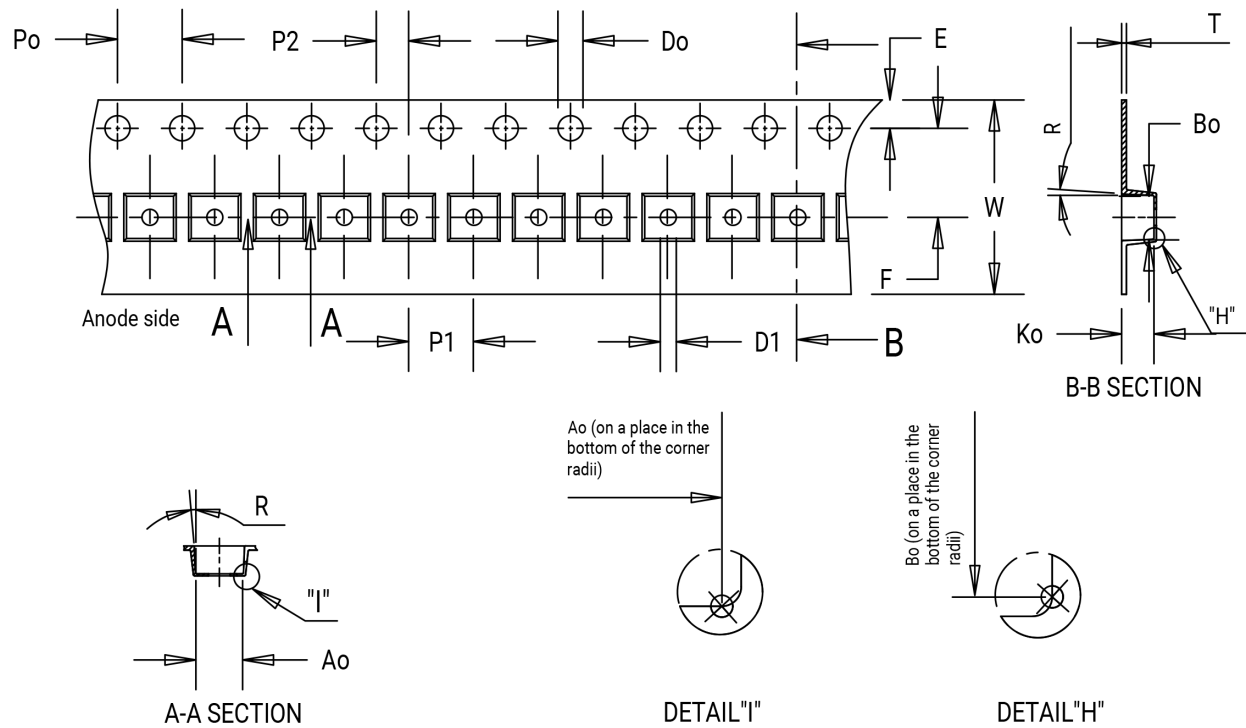
### Recommended Stencil Opening

## TAPE AND REEL

All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

All dimensions in mm.

All measurements are  $\pm 0.15$  mm unless otherwise indicated.

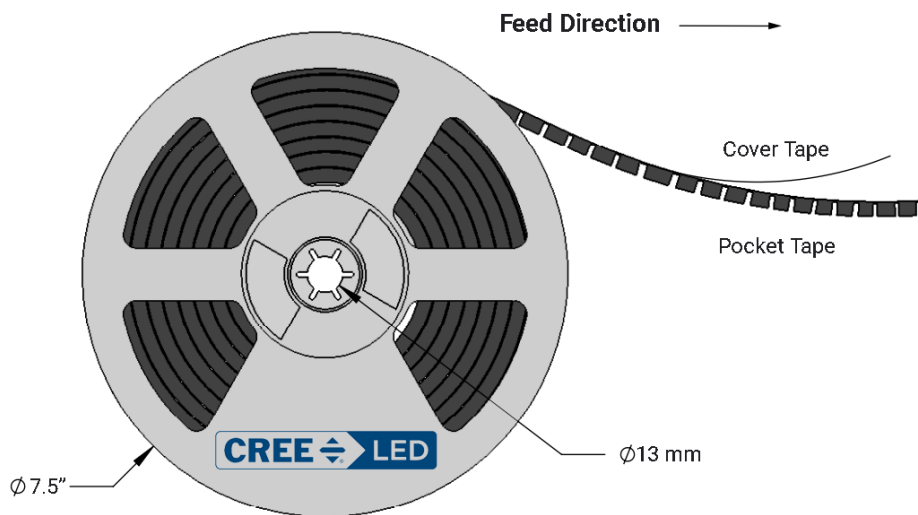
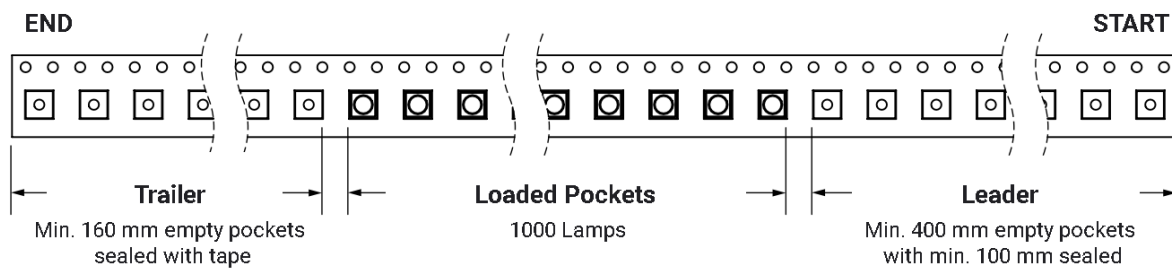


Item	$A_0$	$B_0$	$K_0$	$P_0$	$P_1$	$P_2$	$T$	$E$	$F$	$D_0$	$D_1$	$W$	$R$
Dim.	3.70	3.70	2.40	4.00	8.00	2.00	0.30	1.75	5.50	1.55	1.50	12.00	5°

## TAPE AND REEL - CONTINUED

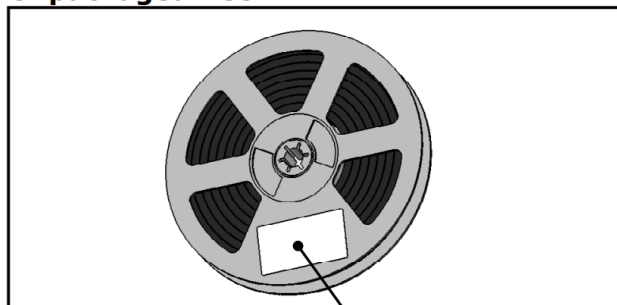
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

All dimensions in mm.



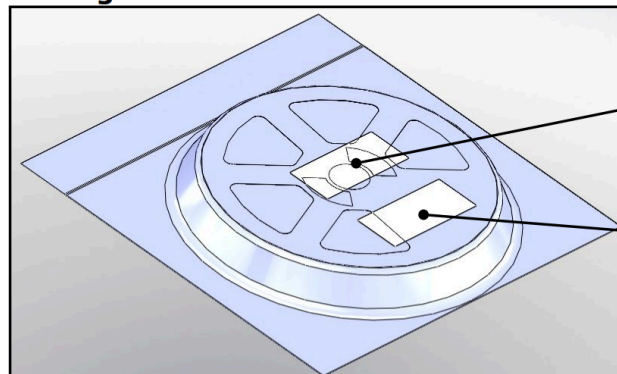
## PACKAGING

## Unpackaged Reel



Label with Cree LED Bin  
Code, Quantity, Reel ID

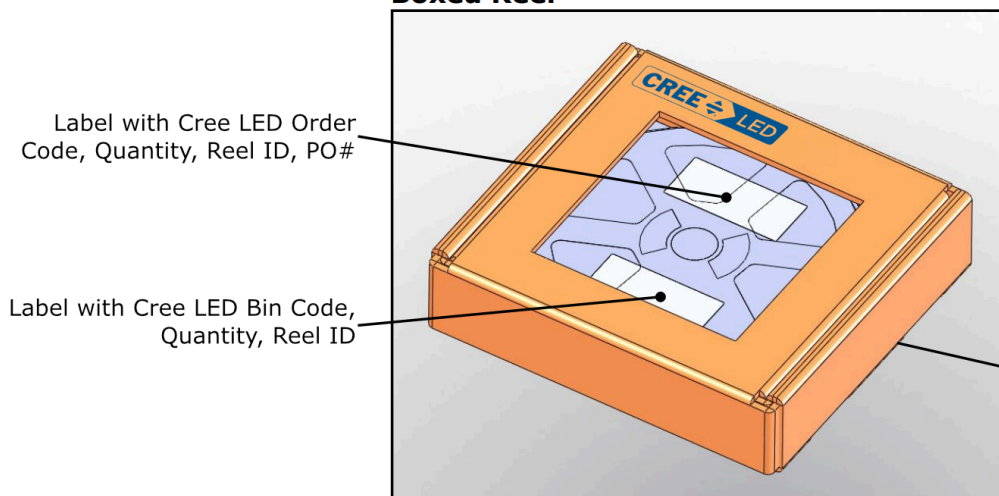
## Packaged Reel



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)