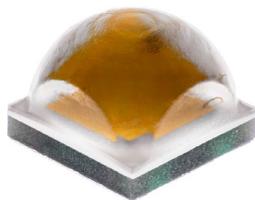
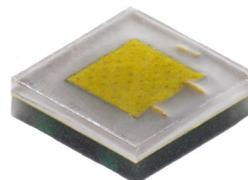


Cree® XLamp® XP-L LEDs



XP-L High Density LED



XP-L High Intensity LED

PRODUCT DESCRIPTION

XLamp® XP-L LEDs are available in two versions: High Density and High Intensity.

The XLamp® XP-L High Density (HD) LED is the highest performing discrete in Cree’s High Density (HD) class of LEDs, delivering the next generation of lumen output and efficacy in the compact 3.45 mm x 3.45 mm XP footprint. Cree’s HD LEDs, optimized to deliver maximum lumen output in a small form factor, enable lighting manufacturers to improve the performance of any lighting design, create smaller and less expensive systems, and develop new lighting solutions that were previously not possible.

The XLamp XP-L High Intensity (HI) LED is the first of Cree’s new class of High Intensity (HI) LEDs optimized to deliver maximum candela through secondary optics. Built on Cree’s breakthrough SC5 Technology™ Platform, the XP-L HI LED delivers 120 percent more candela than the XP-L HD LED through the same optic. The XP-L HI LED leverages the industry’s highest single-die performance and a new innovative primary optic design that radically reduces the optical source size to deliver both lumens and intensity.

FEATURES

- Available in white, 70-CRI white, 80-CRI white, 85 CRI white and 90-CRI white
- ANSI-compatible chromaticity bins
- Binned at 85 °C
- Maximum drive current: 3000 mA
- Low thermal resistance: 2.2 °C/W
- Wide viewing angle: 125° (XP-L High Density), 115° (XP-L High Intensity)
- 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)



TABLE OF CONTENTS

Characteristics	2
Flux Characteristics - XP-L High Density	3
Flux Characteristics - XP-L High Intensity	4
Relative Spectral Power Distribution	5
Relative Flux vs. Junction Temperature	5
Electrical Characteristics	6
Relative Flux vs. Current	6
Relative Chromaticity vs. Current	7
Relative Chromaticity vs. Temperature	8
Typical Spatial Distribution	9
Thermal Design	9
Reflow Soldering Characteristics	10
Notes	11
Mechanical Dimensions	13
Tape and Reel	15
Packaging	17

CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		2.2	
Viewing angle (FWHM) - XP-L High Density	degrees		125	
Viewing angle (FWHM) - XP-L High Intensity	degrees		115	
Temperature coefficient of voltage	mV/°C		-2	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA			3000
Reverse voltage	V			-5
Forward voltage (@ 1050 mA, 85 °C)	V		2.95	3.25
LED junction temperature	°C			150

FLUX CHARACTERISTICS - XP-L HIGH DENSITY ($I_F = 1050 \text{ mA}$, $T_J = 85 \text{ }^\circ\text{C}$)

The following table provides several base order codes for XLamp XP-L High Density LEDs. It is important to note that the base order codes listed here are a subset of the total available order codes for the product family. For more order codes, as well as a complete description of the order-code nomenclature, please consult the XLamp XP Family LED Binning and Labeling document.

Color	CCT Range		Minimum Luminous Flux (lm)			Calculated Minimum Luminous Flux (lm) @ 85 °C**			Order Code
	Min.	Max.	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	1500 mA	2000 mA	3000 mA	
Cool White	5000 K	8300 K	V5	460	521	623	784	1058	XPLAWT-00-0000-0000V5051
			V4	440	499	596	750	1012	XPLAWT-00-0000-0000V4051
			V3	420	476	568	716	966	XPLAWT-00-0000-0000V3051
Neutral White	3700 K	5000 K	V4	440	499	596	750	1012	XPLAWT-00-0000-000LV40E5
			V3	420	476	568	716	966	XPLAWT-00-0000-000LV30E5
			V2	400	453	541	682	920	XPLAWT-00-0000-000LV20E5
Warm White	2700 K	3500 K	U6	380	431	514	648	874	XPLAWT-00-0000-000LU60E7
			U5	360	408	487	614	828	XPLAWT-00-0000-000LU50E7
70-CRI White	4000 K	6000 K	V4	440	499	596	750	1012	XPLAWT-00-0000-000BV40E3
			V3	420	476	568	716	966	XPLAWT-00-0000-000BV30E3
80-CRI White	2700 K	4000 K	U6	380	431	514	648	874	XPLAWT-00-0000-000HU60E7
			U5	360	408	487	614	828	XPLAWT-00-0000-000HU50E7
85-CRI White	2700 K	3000 K	U3	320	363	433	545	736	XPLAWT-00-0000-000PU30E7
			U2	300	340	406	511	690	XPLAWT-00-0000-000PU20E7
90-CRI White	2700 K	3000 K	U3	320	363	433	545	736	XPLAWT-00-0000-000UU30E7
			U2	300	340	406	511	690	XPLAWT-00-0000-000UU20E7

Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and ± 2 on CRI measurements. See the Measurements section (page 11).
 - Typical CRI for Cool White (5000 K – 8300 K CCT) is 65.
 - Typical CRI for Neutral White (3700 K – 5000 K CCT) is 75.
 - Typical CRI for Warm White (2600 K – 3700 K CCT) is 80.
 - Minimum CRI for 70-CRI White is 70.
 - Minimum CRI for 85-CRI White is 85.
 - Minimum CRI for 80-CRI White is 80.
 - Minimum CRI for 90-CRI White is 90.
- * Flux values @ 25 °C are calculated and are for reference only.
- ** Calculated flux values at 1500 mA, 2000 mA and 3000 mA are for reference only.

FLUX CHARACTERISTICS - XP-L HIGH INTENSITY ($I_F = 1050 \text{ mA}$, $T_J = 85 \text{ }^\circ\text{C}$)

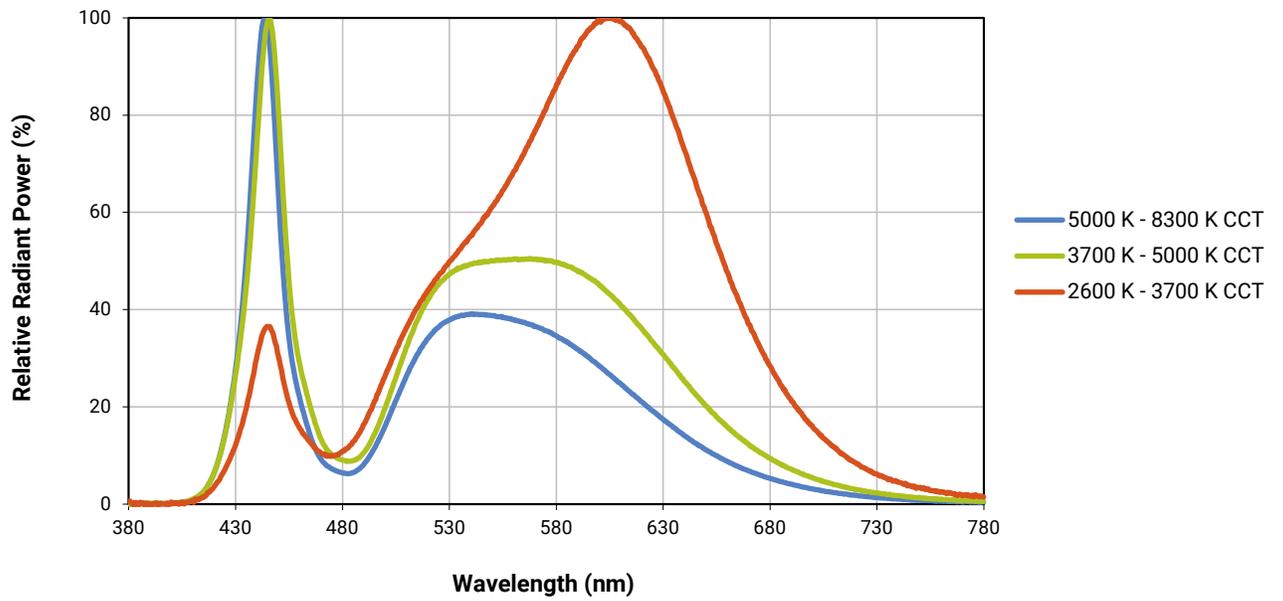
The following table provides several base order codes for XLamp XP-L High Intensity LEDs. It is important to note that the base order codes listed here are a subset of the total available order codes for the product family. For more order codes, as well as a complete description of the order-code nomenclature, please consult the XLamp XP Family LED Binning and Labeling document.

Color	CCT Range		Minimum Luminous Flux (lm)			Calculated Minimum Luminous Flux (lm) @ 85 °C**			Order Code
	Min.	Max.	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	1500 mA	2000 mA	3000 mA	
Cool White	5000 K	8300 K	V2	400	453	541	682	920	XPLAWT-H0-0000-0000V2051
			U6	380	431	514	648	874	XPLAWT-H0-0000-0000U6051
			U5	360	408	487	614	828	XPLAWT-H0-0000-0000U5051
Neutral White	3700 K	5000 K	V2	400	453	541	682	920	XPLAWT-H0-0000-0000LV20E5
			U6	380	431	514	648	874	XPLAWT-H0-0000-0000LU60E5
			U5	360	408	487	614	828	XPLAWT-H0-0000-0000LU50E5
Warm White	2700 K	3500 K	U4	340	385	460	579	782	XPLAWT-H0-0000-0000LU40E7
			U3	320	363	433	545	736	XPLAWT-H0-0000-0000LU30E7
			U2	300	340	406	511	690	XPLAWT-H0-0000-0000LU20E7
70-CRI White	4000 K	6000 K	V2	400	453	541	682	920	XPLAWT-H0-0000-0000BV20E3
			U6	380	431	514	648	874	XPLAWT-H0-0000-0000BU60E3
			U5	360	408	487	614	828	XPLAWT-H0-0000-0000BU50E3
80-CRI White	2700 K	4000 K	U4	340	385	460	579	782	XPLAWT-H0-0000-0000HU40E7
			U3	320	363	433	545	736	XPLAWT-H0-0000-0000HU30E7
			U2	300	340	406	511	690	XPLAWT-H0-0000-0000HU20E7
85-CRI White	2700 K	3000 K	T6	280	317	379	477	644	XPLAWT-H0-0000-0000PT60E7
			T5	260	295	352	443	598	XPLAWT-H0-0000-0000PT50E7
			T4	240	268	324	408	552	XPLAWT-H0-0000-0000PT40E7
90-CRI White	2700 K	3000 K	T6	280	317	379	477	644	XPLAWT-H0-0000-0000UT60E7
			T5	260	295	352	443	598	XPLAWT-H0-0000-0000UT50E7
			T4	240	268	324	408	552	XPLAWT-H0-0000-0000UT40E7

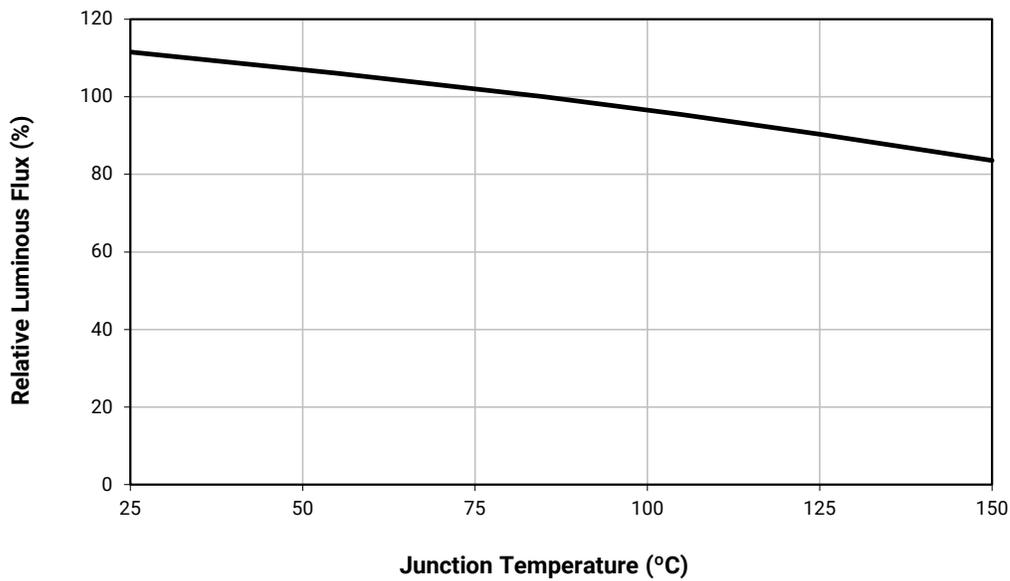
Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements, ± 0.005 on chromaticity (CCx, CCy) measurements and ± 2 on CRI measurements. See the Measurements section (page 11).
 - Typical CRI for Cool White (5000 K – 8300 K CCT) is 65.
 - Typical CRI for Neutral White (3700 K – 5000 K CCT) is 75.
 - Typical CRI for Warm White (2600 K – 3700 K CCT) is 80.
 - Minimum CRI for 70-CRI White is 70.
 - Minimum CRI for 85-CRI White is 85.
 - Minimum CRI for 80-CRI White is 80.
 - Minimum CRI for 90-CRI White is 90.
- * Flux values @ 25 °C are calculated and are for reference only.
- ** Calculated flux values at 1500 mA, 2000 mA and 3000 mA are for reference only.

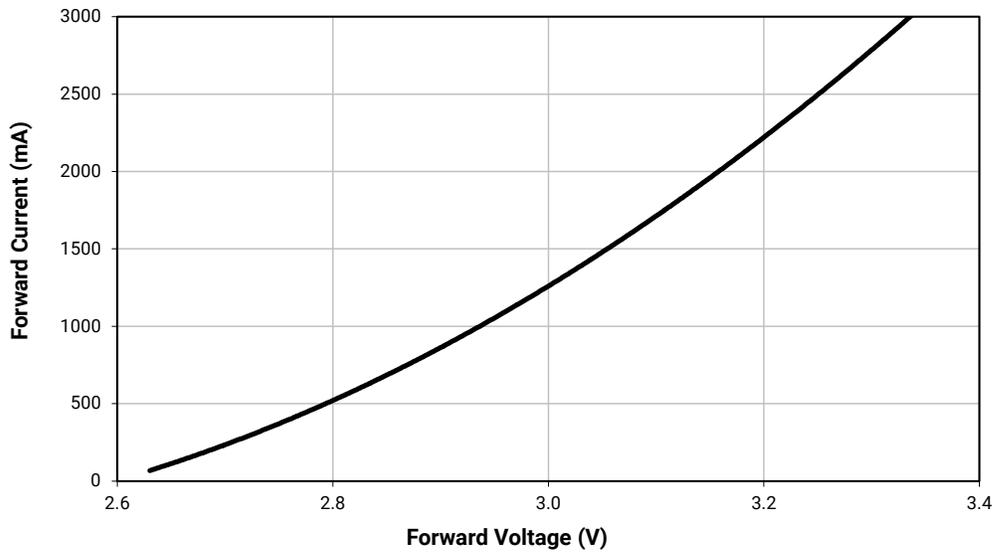
RELATIVE SPECTRAL POWER DISTRIBUTION



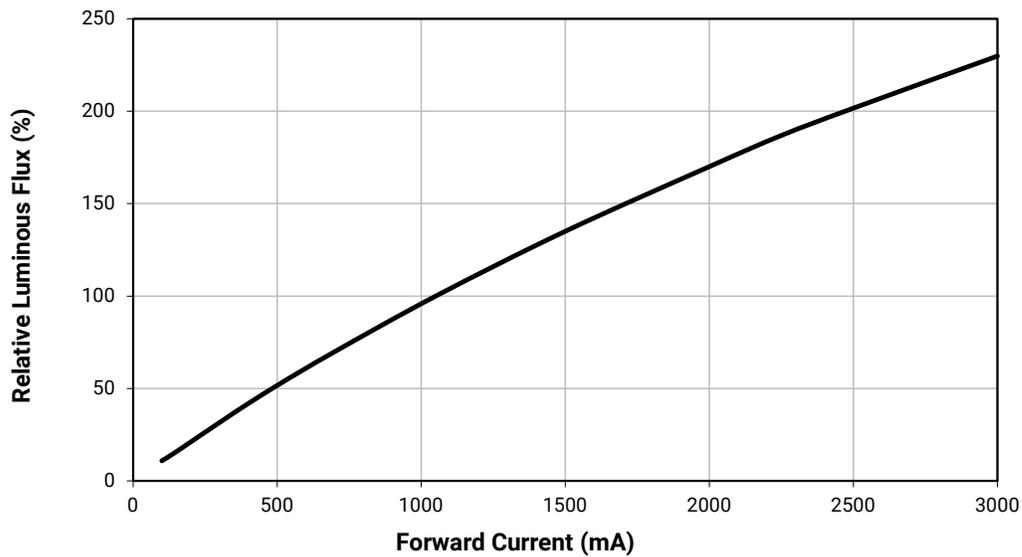
RELATIVE FLUX VS. JUNCTION TEMPERATURE ($I_F = 1050$ mA)



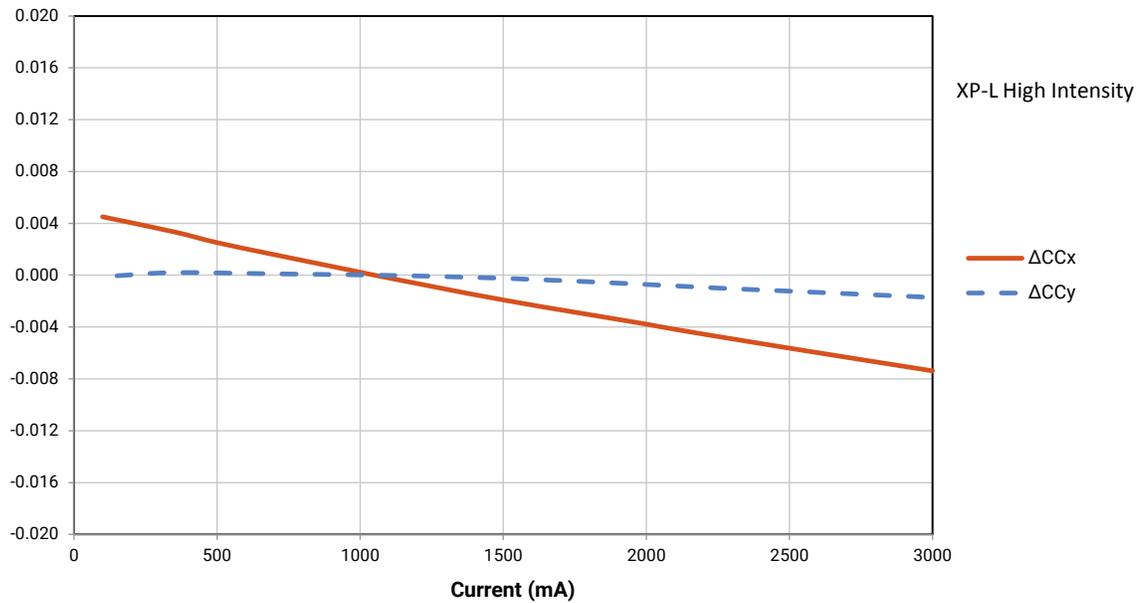
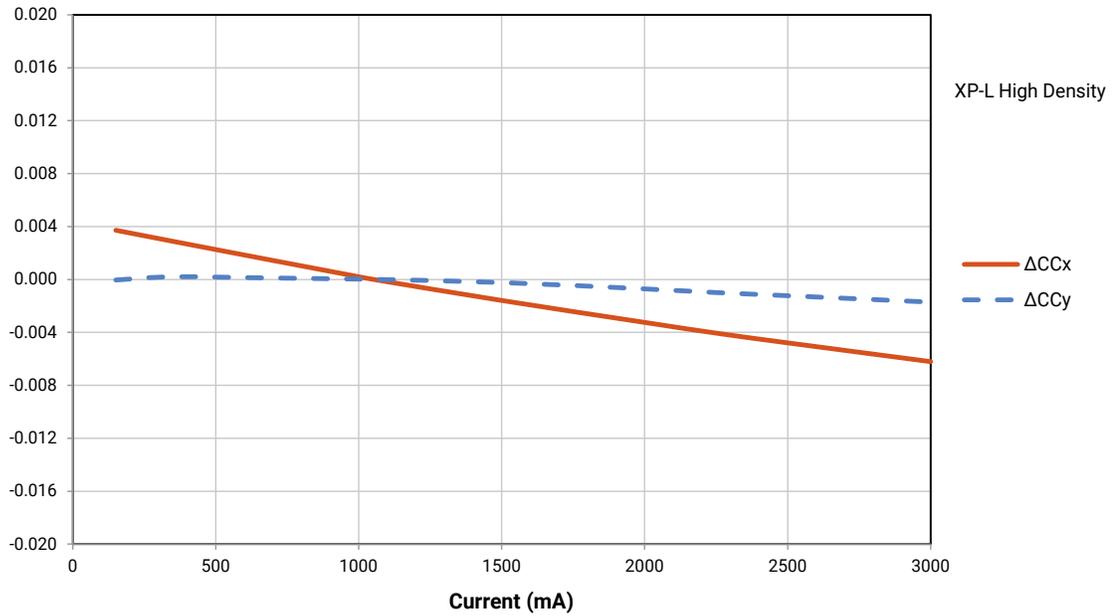
ELECTRICAL CHARACTERISTICS ($T_j = 85\text{ }^\circ\text{C}$)



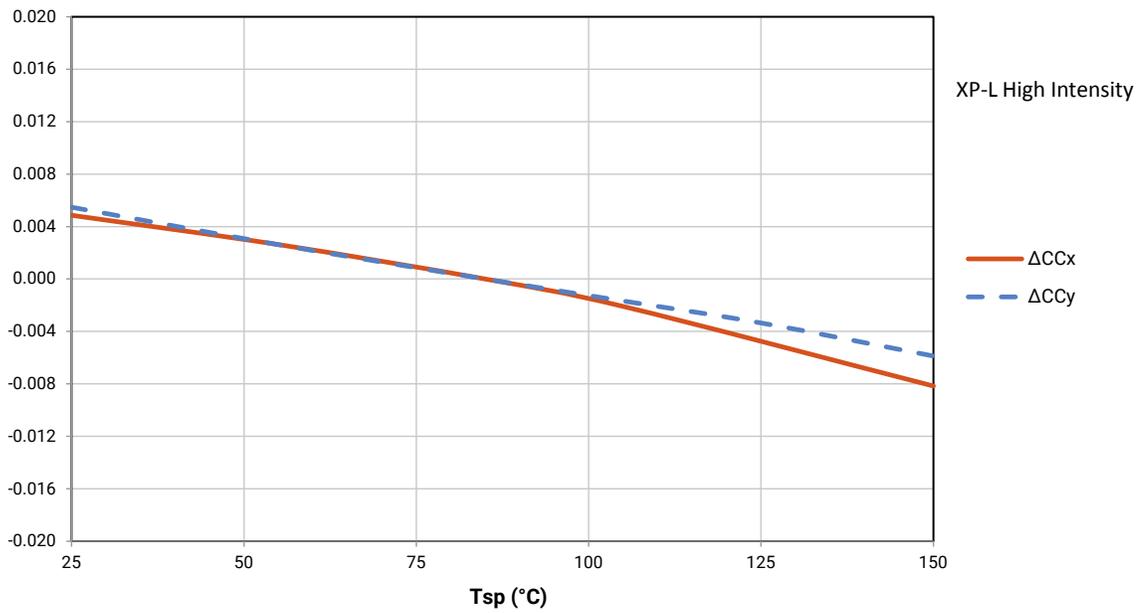
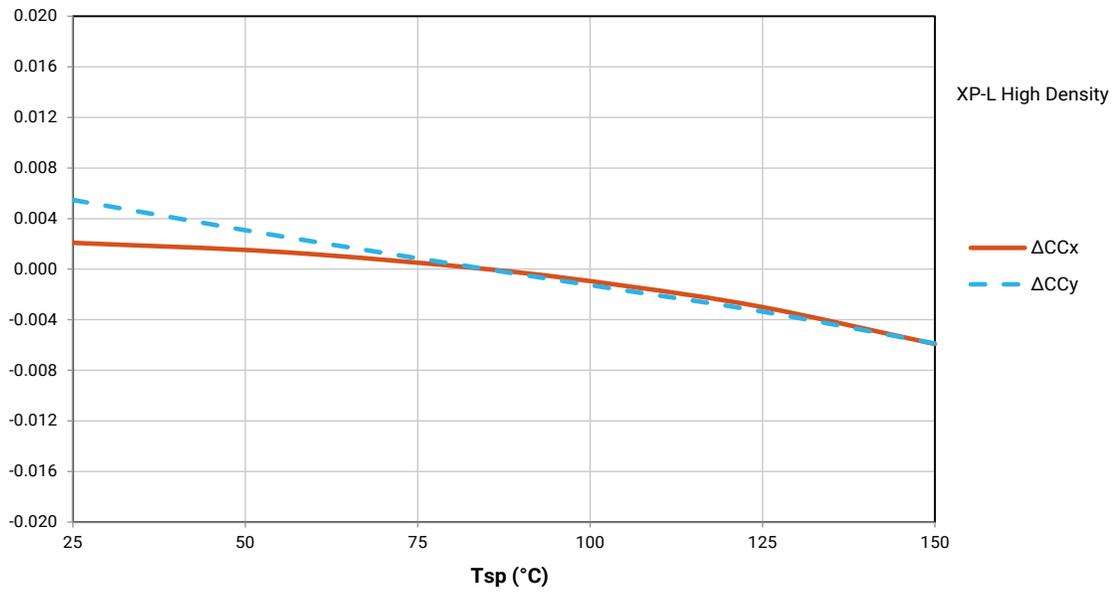
RELATIVE FLUX VS. CURRENT ($T_j = 85\text{ }^\circ\text{C}$)



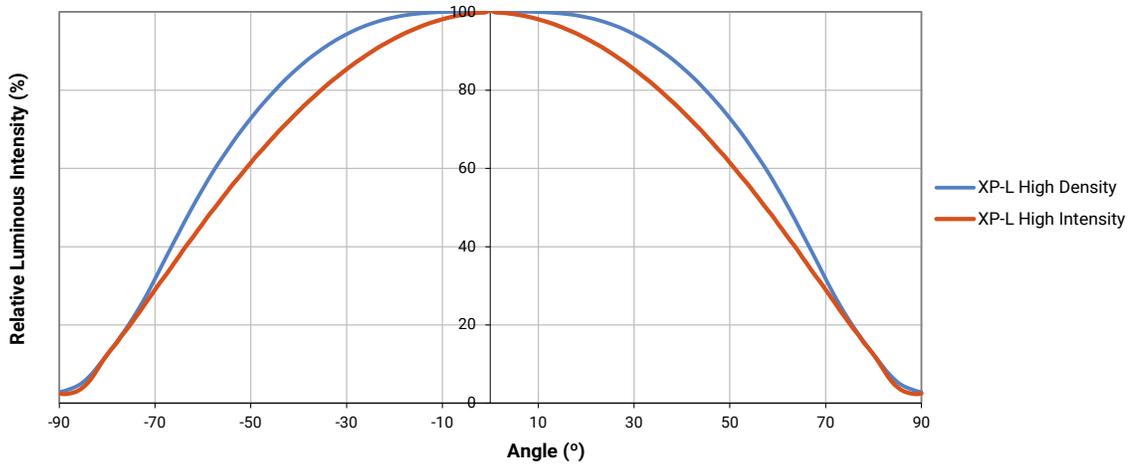
RELATIVE CHROMATICITY VS. CURRENT (WARM WHITE)



RELATIVE CHROMATICITY VS. TEMPERATURE (WARM WHITE)

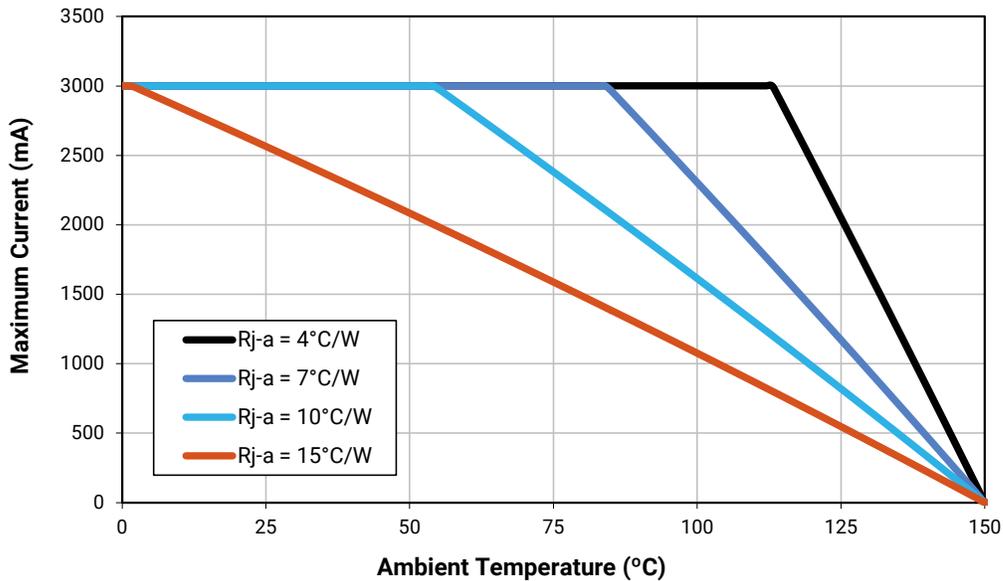


TYPICAL SPATIAL DISTRIBUTION



THERMAL DESIGN

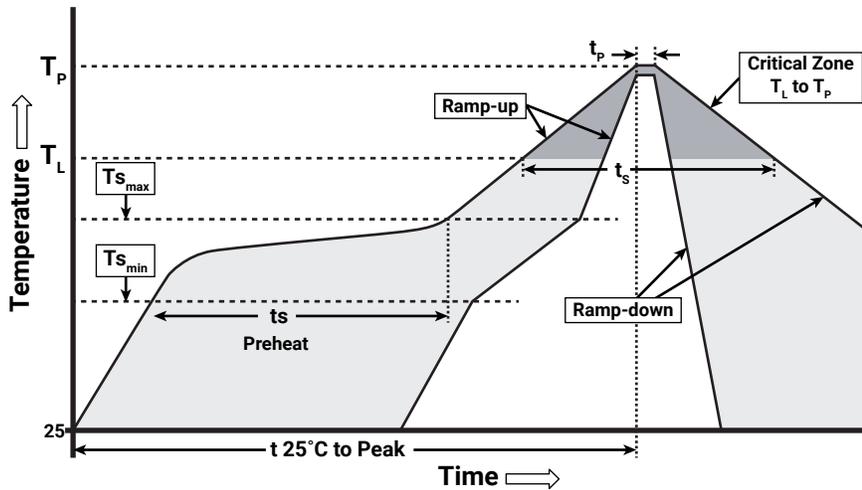
The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.



REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XP-L LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline, Cree recommends that users follow the recommended soldering profile provided by the manufacturer of solder paste used.

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-Based Solder	Lead-Free Solder
Average Ramp-Up Rate ($T_{s_{max}}$ to T_p)	3 °C/second max.	3 °C/second max.
Preheat: Temperature Min ($T_{s_{min}}$)	100 °C	150 °C
Preheat: Temperature Max ($T_{s_{max}}$)	150 °C	200 °C
Preheat: Time ($t_{s_{min}}$ to $t_{s_{max}}$)	60-120 seconds	60-180 seconds
Time Maintained Above: Temperature (T_L)	183 °C	217 °C
Time Maintained Above: Time (t_L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (T_p)	215 °C	260 °C
Time Within 5 °C of Actual Peak Temperature (t_p)	10-30 seconds	20-40 seconds
Ramp-Down Rate	6 °C/second max.	6 °C/second max.
Time 25 °C to Peak Temperature	6 minutes max.	8 minutes max.

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

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.

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.

Moisture Sensitivity

Cree 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-L LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of ≤ 30 °C/85% relative humidity (RH). Regardless of the storage condition, Cree 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 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 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.

NOTES - CONTINUED

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](#).

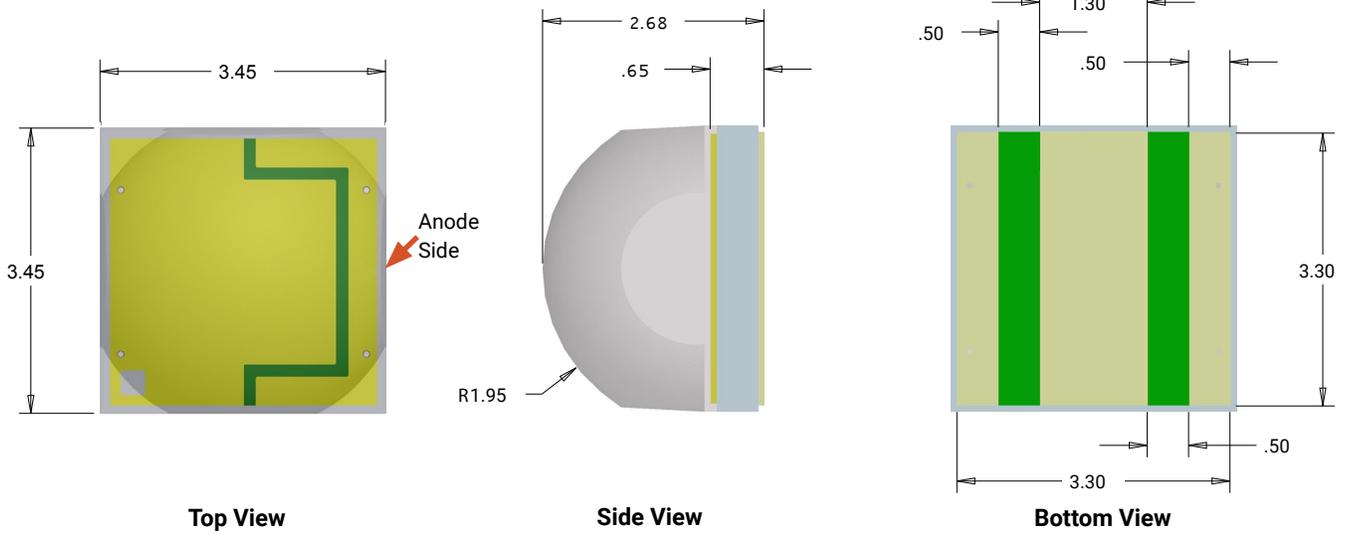
MECHANICAL DIMENSIONS

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

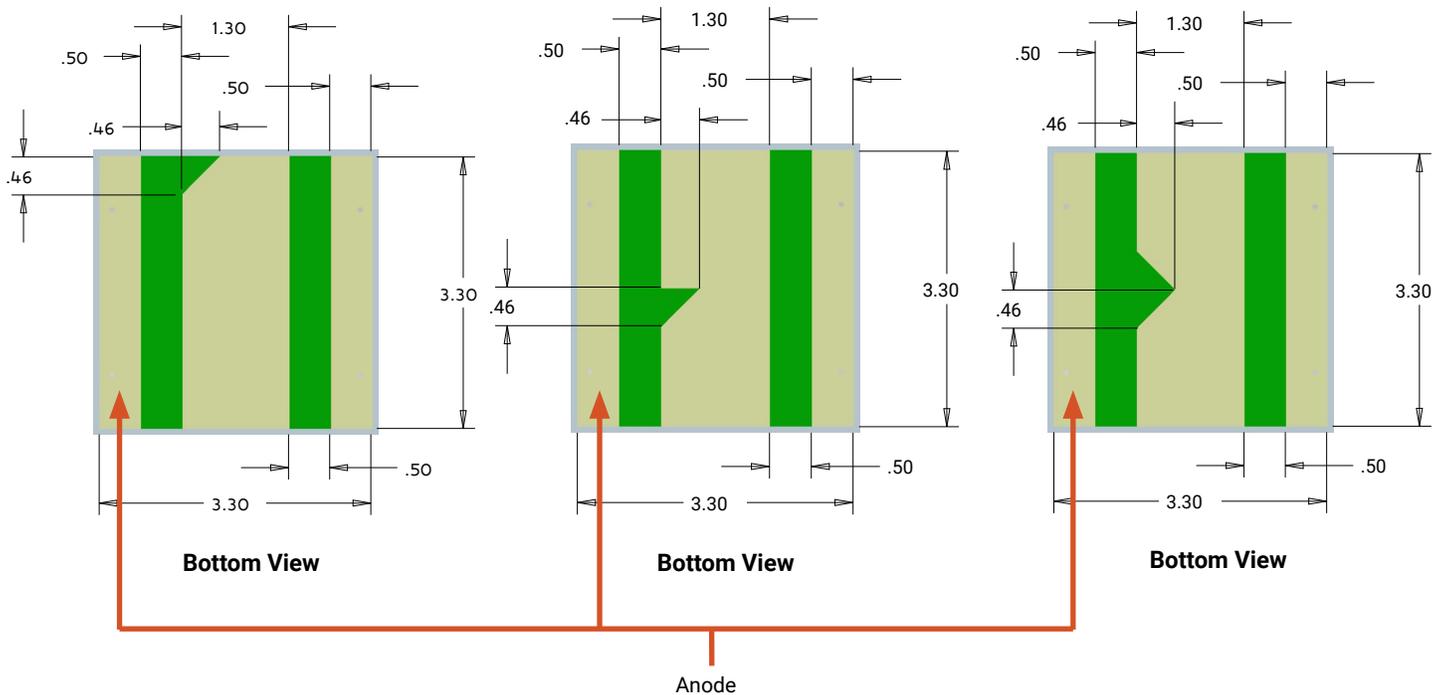
XP-L High Density

XPLAWT-00-xxxx-xxxxxxxxxx

High Density



Alternate bottom views of the XP-L High Density LED are shown in the diagrams below.

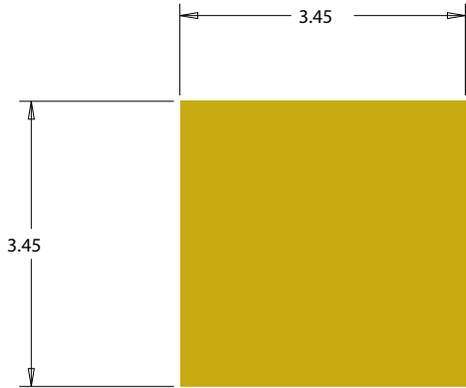


MECHANICAL DIMENSIONS - CONTINUED

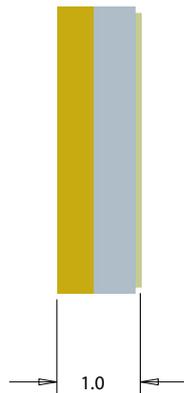
XP-L High Intensity

XPLAWT-H0-xxxx-xxxxxxxxxx

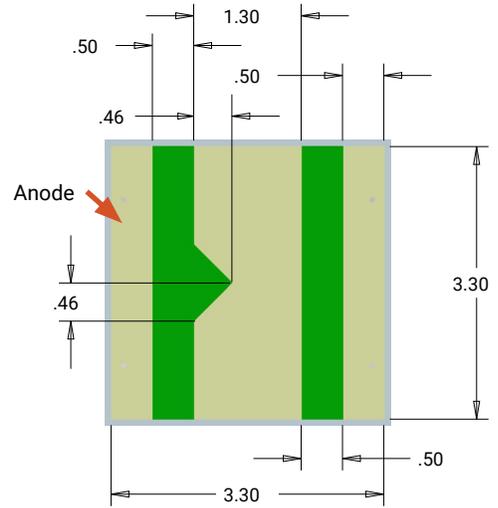
High Intensity



Top View

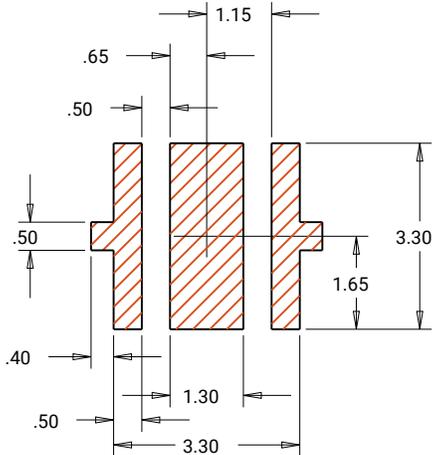


Side View

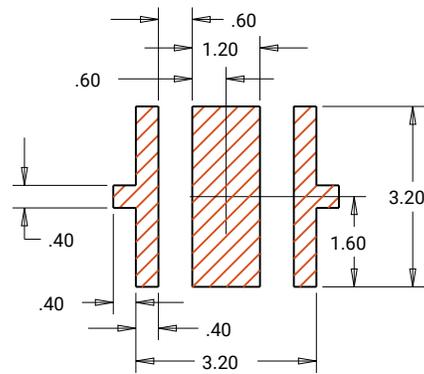


Bottom View

XP-L



Recommended PCB Solder Pad



**Recommended Stencil Pattern
(Hatched Area Is Open)**

TAPE AND REEL

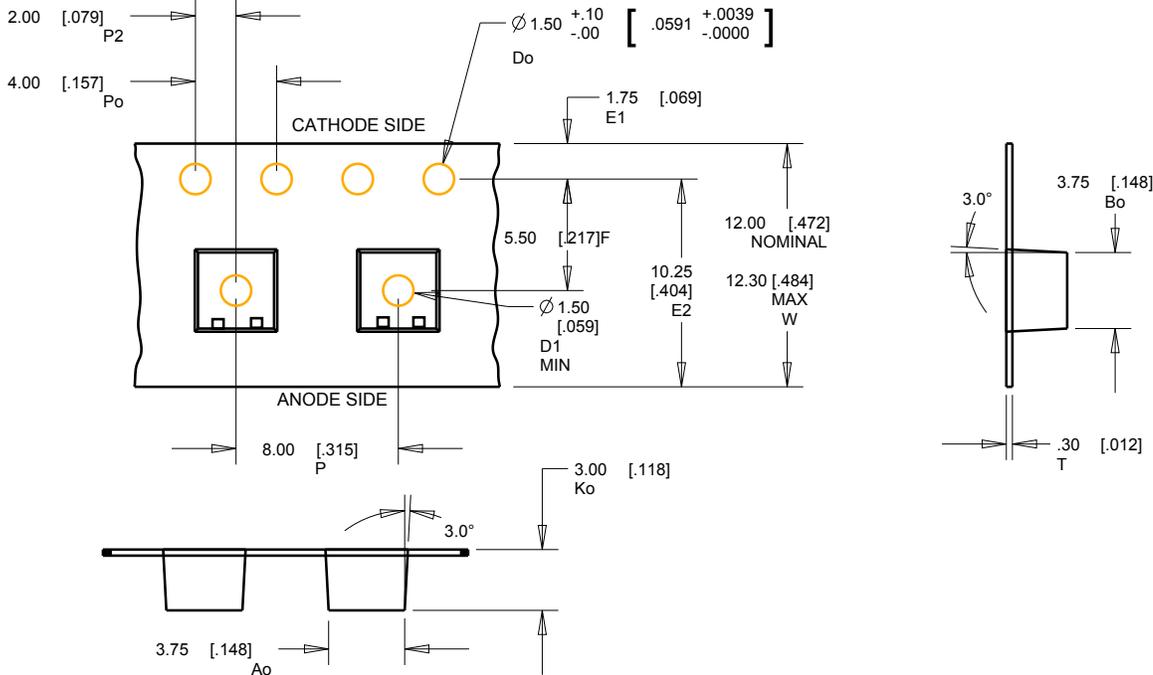
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

All dimensions in mm [inches]

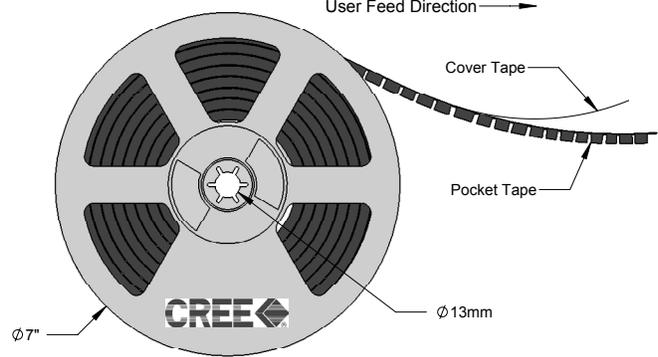
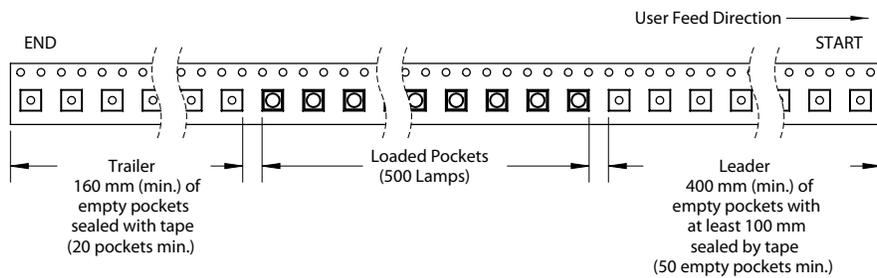
XP-L High Density

XPLAWT-00-xxxx-xxxxxxxxxx

High Density



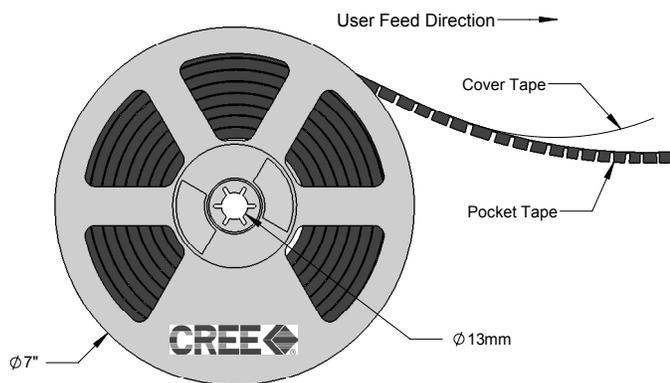
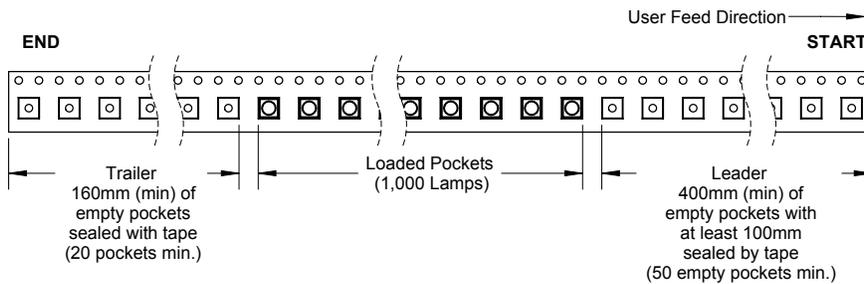
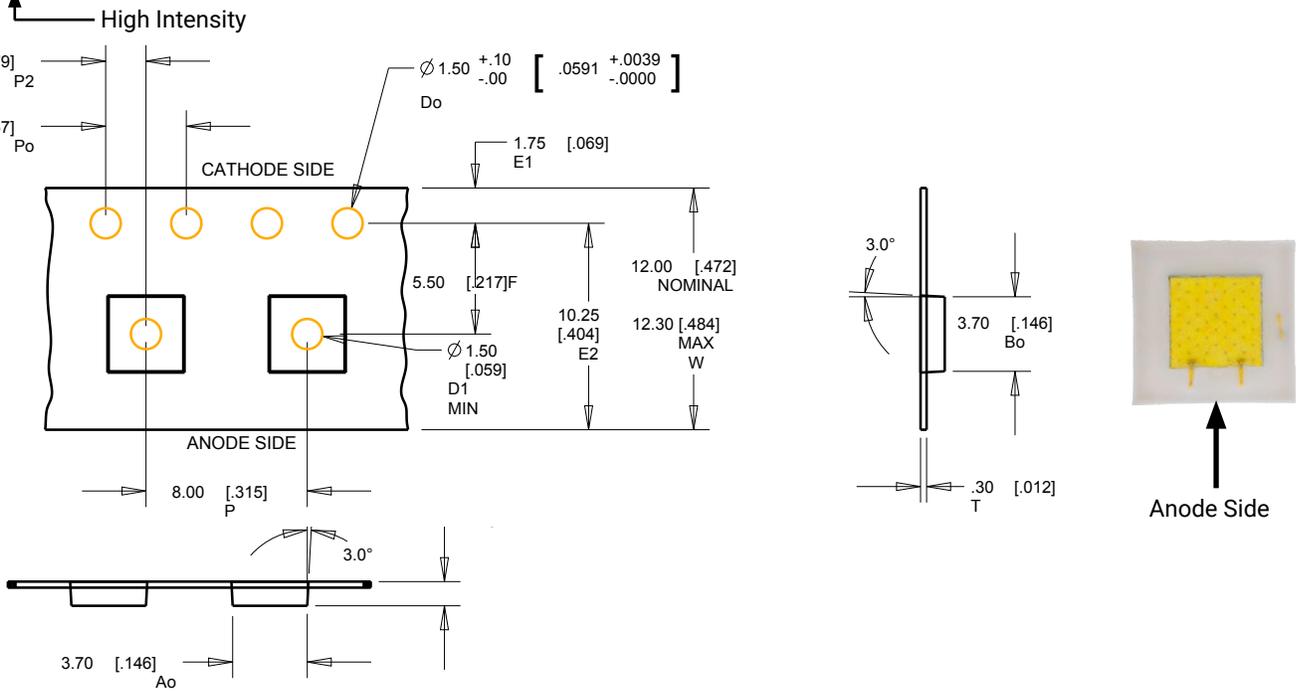
Anode Side



TAPE AND REEL - CONTINUED

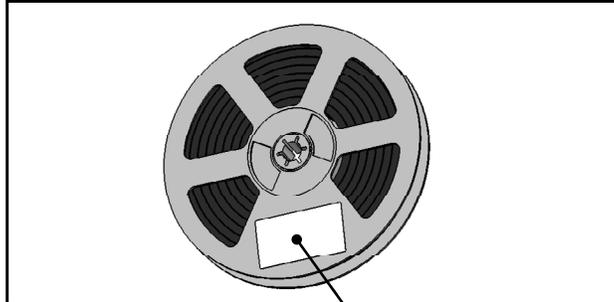
XP-L High Intensity

XPLAWT-H0-xxxx-xxxxxxxxxx



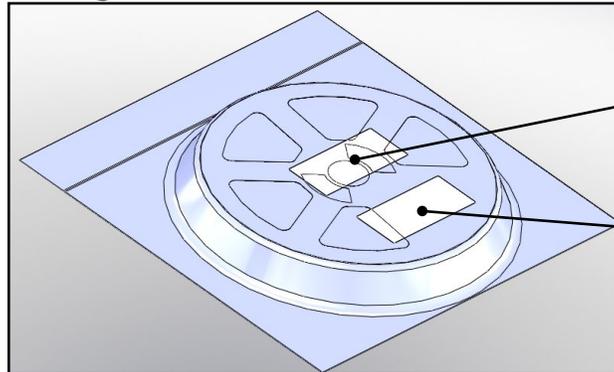
PACKAGING

Unpackaged Reel



Label with Cree Bin Code,
Quantity, Reel ID

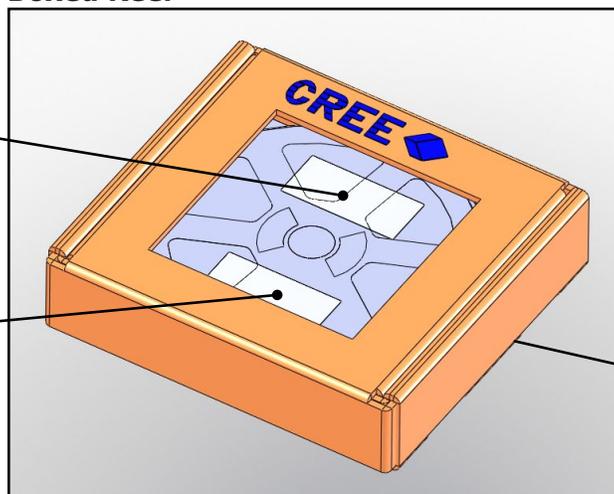
Packaged Reel



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

Label with Cree Bin Code,
Quantity, Reel ID

Boxed Reel



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

Label with Cree Bin Code,
Quantity, Reel ID

Patent Label
(on bottom of box)