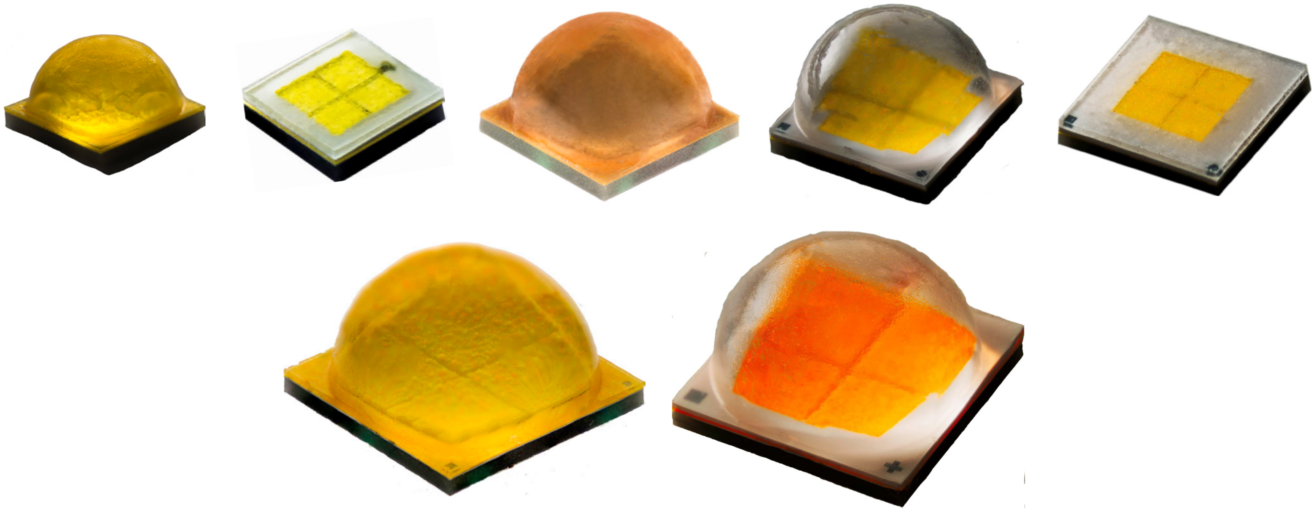
XLamp® XHP Family LEDs



INTRODUCTION

This application note applies to XLamp® XHP Family LEDs, which have order codes in the following format.

XHPxxx-xx-xxxx-xxxxxxxxx

This application note explains how XLamp XHP Family LEDs and assemblies containing these LEDs should be handled during manufacturing. Please read the entire document to understand how to properly handle XLamp XHP Family LEDs.

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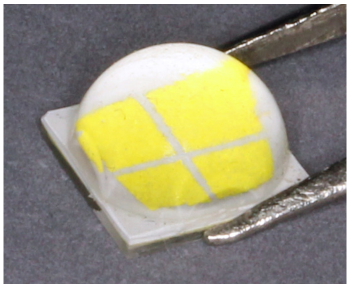
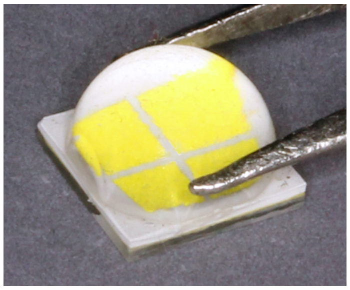
HANDLING XLAMP® XHP FAMILY LEDS

Manual Handling

Use tweezers to grab XLamp XHP Family LEDs at the base. Do not touch the lens with the tweezers. Do not touch the lens with fingers. Do not push on the lens. Excessive force on the lens could damage the LED.

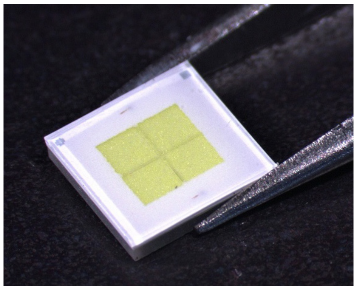
✓ CORRECT

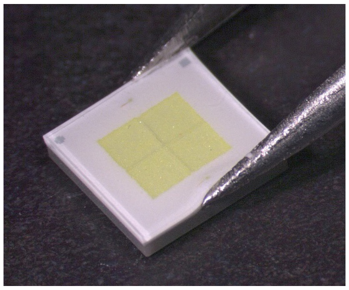




🚫 WRONG

✓ CORRECT





🚫 WRONG

Cree LED recommends the following at all times when handling XLamp XHP Family LEDs or assemblies containing these LEDs:

- Avoid putting mechanical stress on the LED lens.
- Never touch the optical surface with fingers or sharp objects. The LED lens surface could be soiled or damaged, which would affect the optical performance of the LED.
- Cree LED recommends always handling XHP Family LEDs with appropriate ESD grounding.
- Cree LED recommends handling XHP Family LEDs wearing clean, lint-free gloves.

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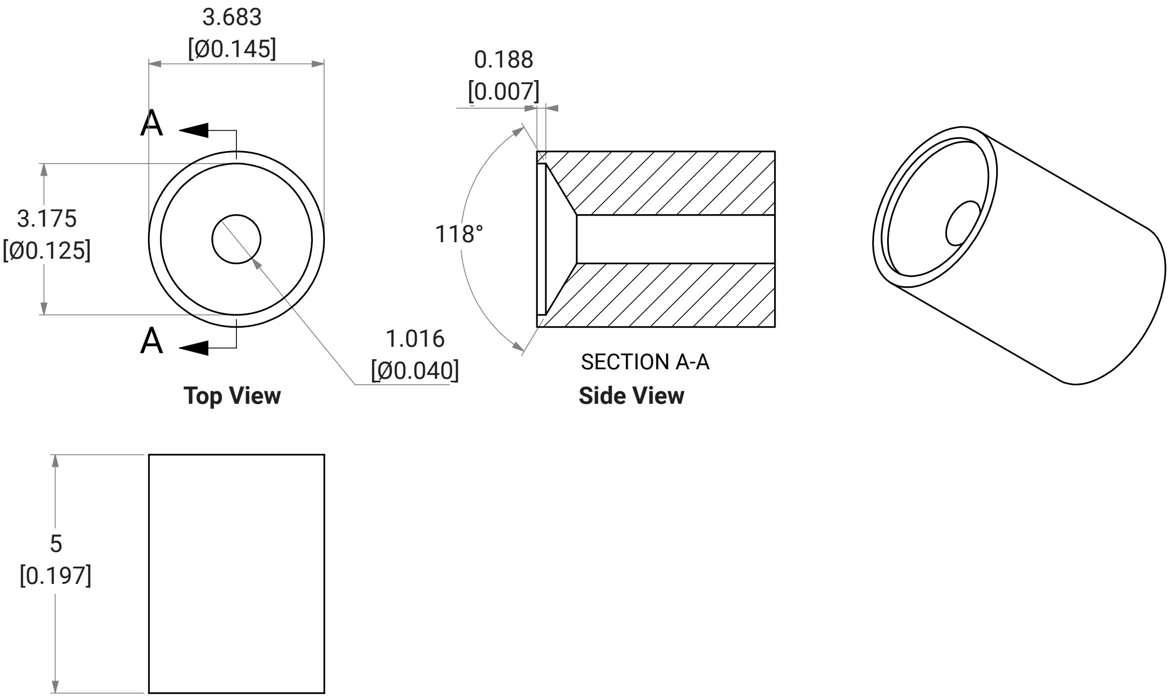
HANDLING XLAMP® XHP FAMILY LEDS - CONTINUED

Whenever possible, Cree LED recommends the use of one of the following pick & place tools to remove XLamp XHP Family LEDs from the factory tape & reel packaging. The following diagrams show examples of pick & place tools to remove XLamp XHP Family LEDs from the factory tape & reel packaging. Cree LED and several of Cree LED's customers have had good success using nozzles fabricated from 95a urethane.

XHP35.2 High Density

All dimensions in mm [in]
Tolerance: ±0.025 [0.001]



Top View

Side View

Side View

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REV 8

3

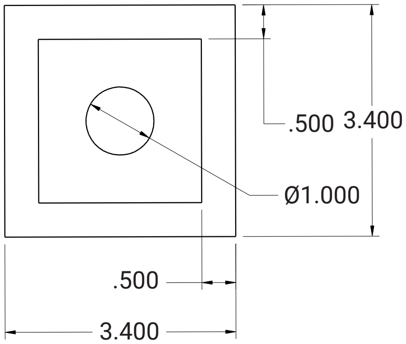
HANDLING XLAMP® XHP FAMILY LEDS - CONTINUED

XHP35.2 High Intensity

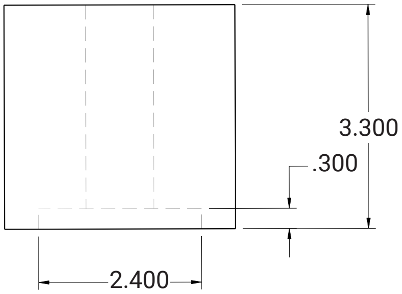
Cree LED recommends using a spring-relieved pick and place nozzle with a spring constant of 0.05 lb-ft (0.07 N-m).

All dimensions in mm [in]

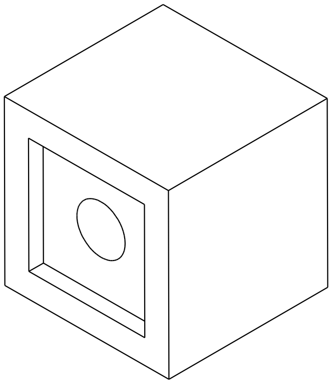
Tolerance: ±0.001



Top View

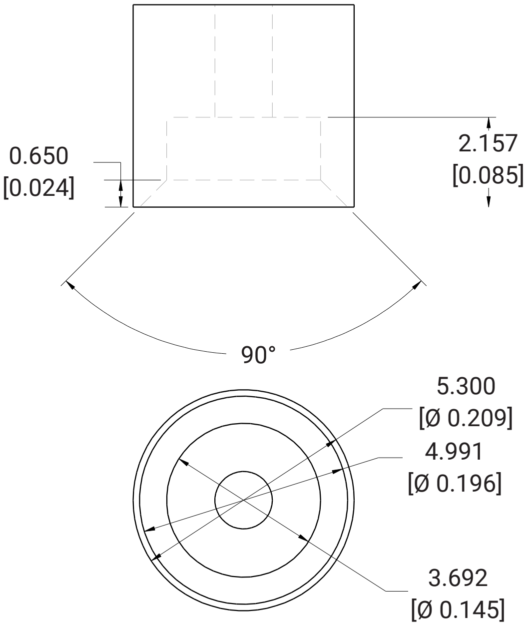


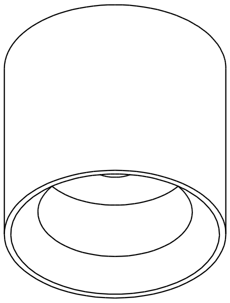
Side View



XHP50.2, XHP50.3 High Density

All dimensions in mm [in]





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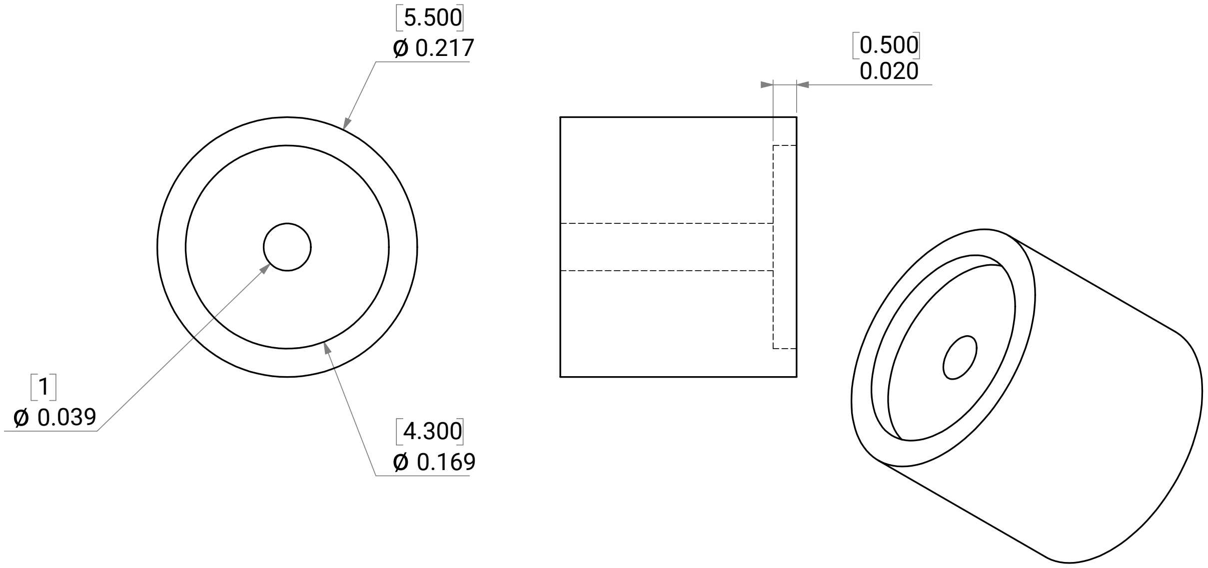
HANDLING XLAMP® XHP FAMILY LEDS - CONTINUED

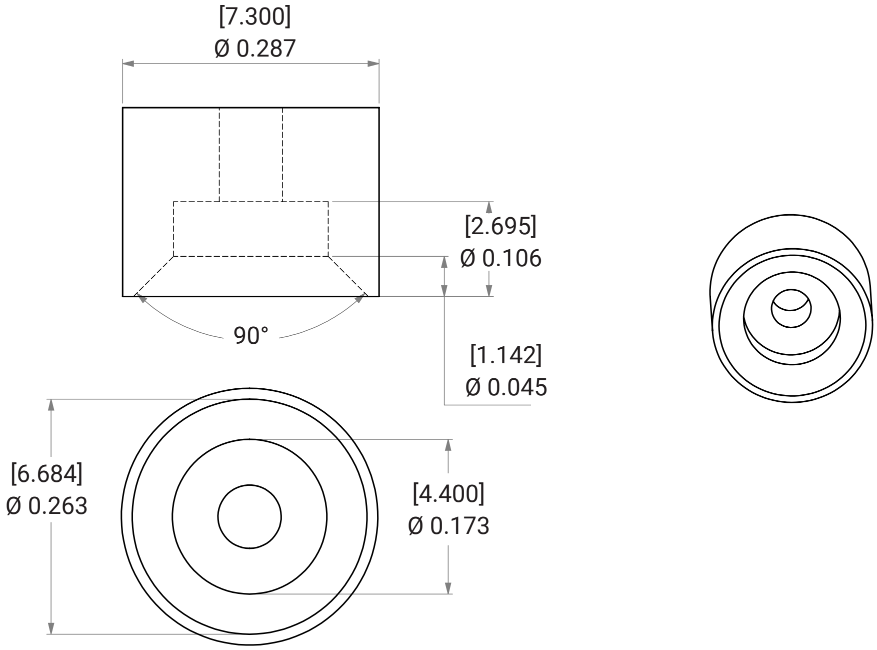
XHP50.3 High Intensity

All dimensions in mm [in]



XHP70.2, XHP70.3

All dimensions in mm [in]



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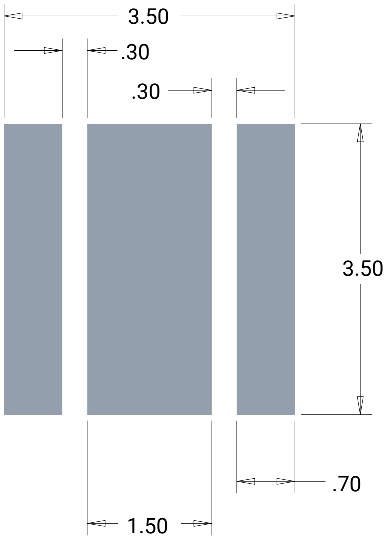
CIRCUIT BOARD PREPARATION & LAYOUTS

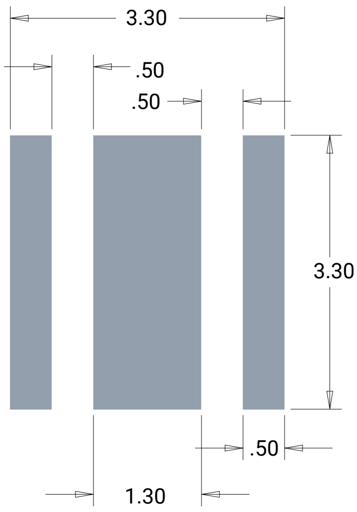
Printed circuit boards (PCBs) should be prepared and/or cleaned according to the manufacturer's specifications before placing or soldering XLamp XHP Family LEDs onto the PCB.

The diagrams below show the recommended PCB solder pad layouts for XLamp XHP Family LEDs. All dimensions are ±.13 mm unless otherwise indicated.

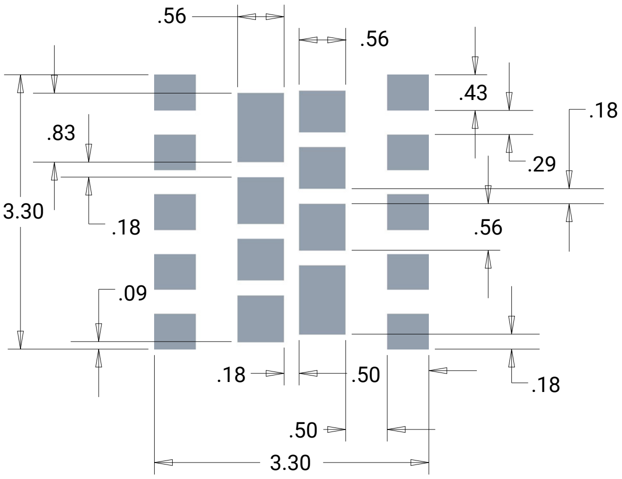
XHP35.2



Recommended Copper Layout



Recommended Solder Pad (Solder Resist Pattern)



Recommended Stencil Openings*

Notes:

- Cree LED recommends using thermal pad kickouts to maximize component thermal performance.
- Cree LED recommends using white solder mask material to minimize system optical loss.

* This stencil has been tested and optimized for the avoidance of voiding when using ALPHA® LUMET® P30 Maxrel solder paste. For other solder pastes, a "window pane" design for the thermal pad stencil may result in a lower voiding percentage. Contact your local Cree LED Field Applications Engineer for consultation regarding your specific application.

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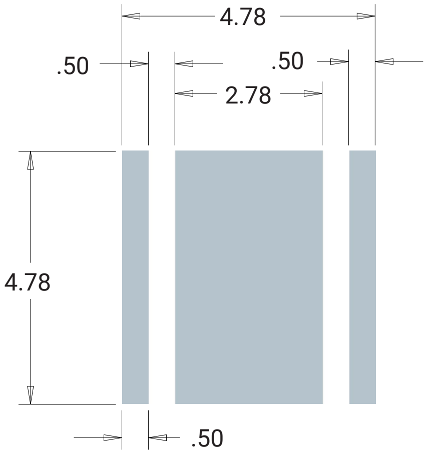
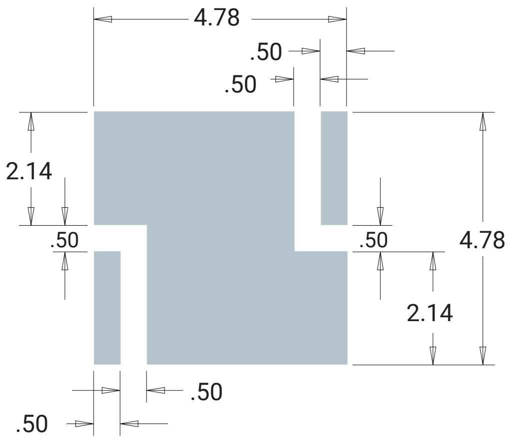
CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

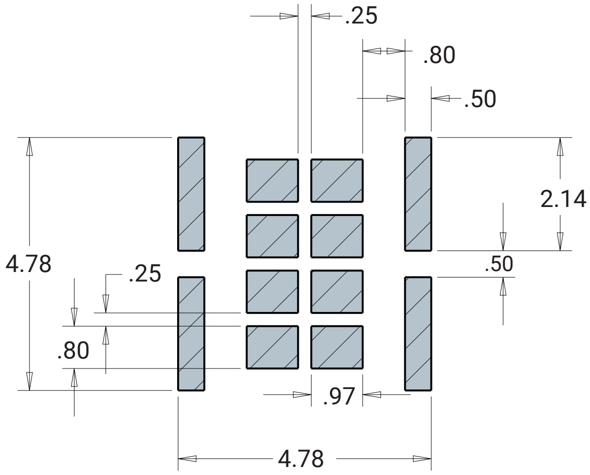
XHP50.2



Recommended PCB Solder Pad 6 V Configuration
(thermal pad is electrically isolated)



Recommended PCB Solder Pad 12 V Configuration
(thermal pad is connected to anode and cathode and is not electrically isolated)



Recommended Stencil Pattern
6 V & 12 V Configurations
(hatched area is open)

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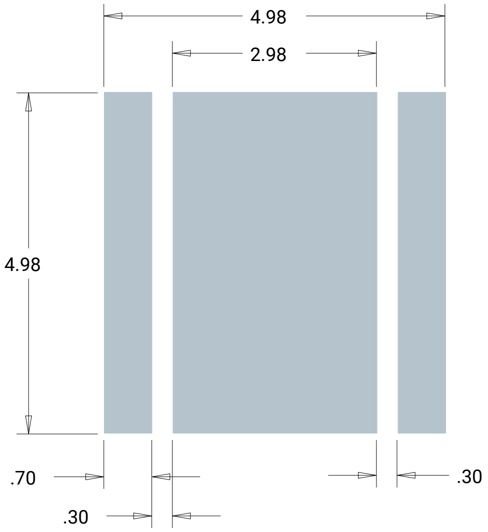
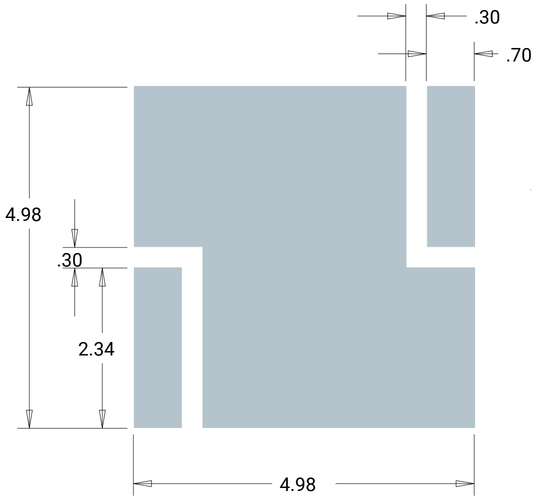
CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

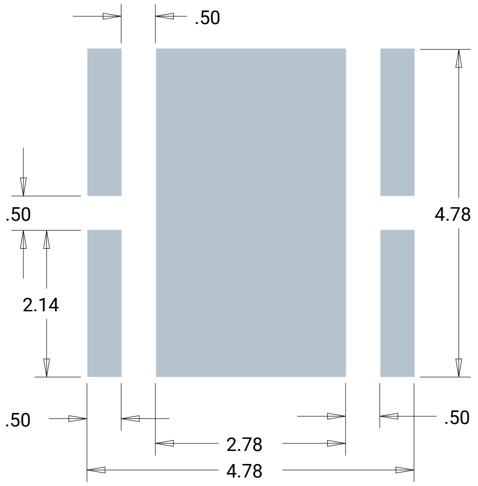
XHP50.3



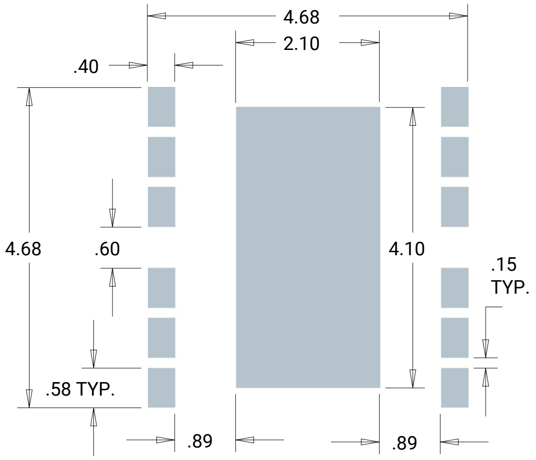
Recommended PCB Solder Pad
3 V or 6 V Configuration
Depending on Vf Class
(thermal pad is electrically isolated)



Recommended PCB Solder Pad
12 V Configuration
(thermal pad is connected to anode and cathode
and is not electrically isolated)



Recommended Solder Resist Pattern
6 V & 12 V Configurations



Recommended Stencil Pattern
6 V & 12 V Configurations
(shaded area is open)

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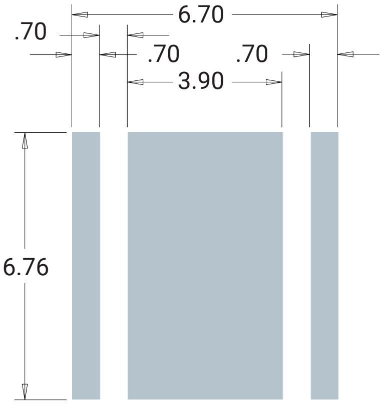
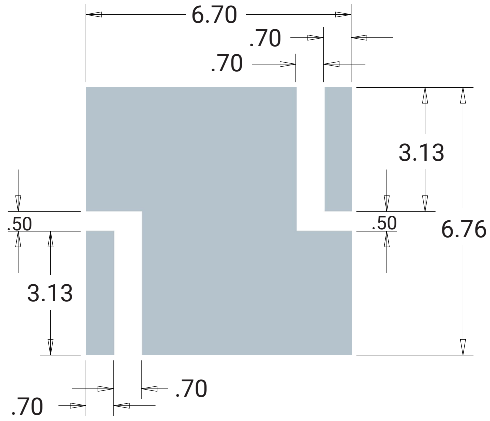
CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

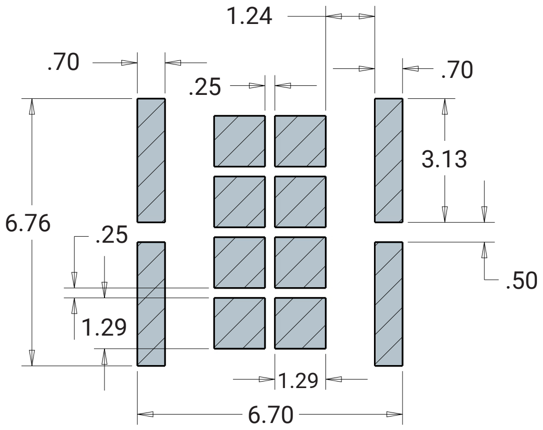
XHP70.2



Recommended PCB Solder Pad 6 V Configuration (thermal pad is electrically isolated)



Recommended PCB Solder Pad 12 V Configuration (thermal pad is connected to anode and cathode and is not electrically isolated)



Recommended Stencil Pattern
6 V & 12 V Configurations
(hatched area is open)

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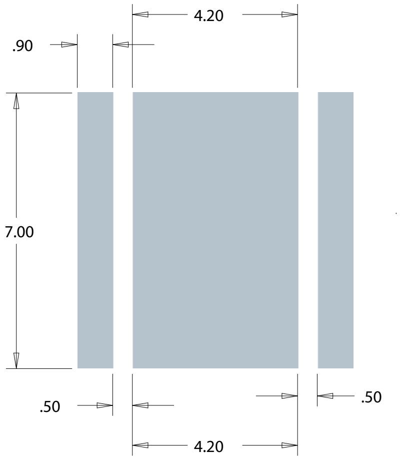
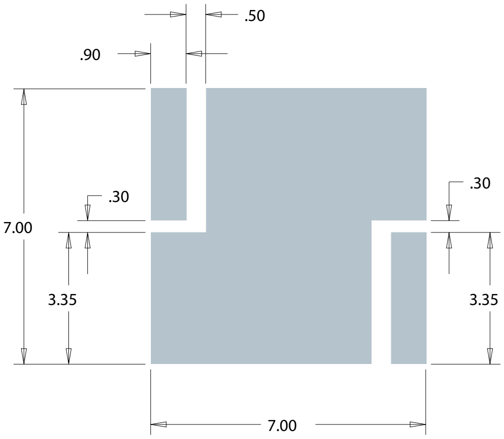
CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

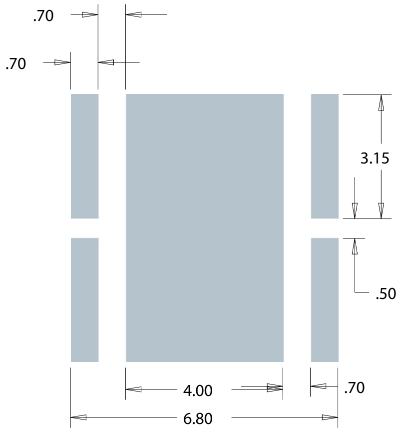
XHP70.3



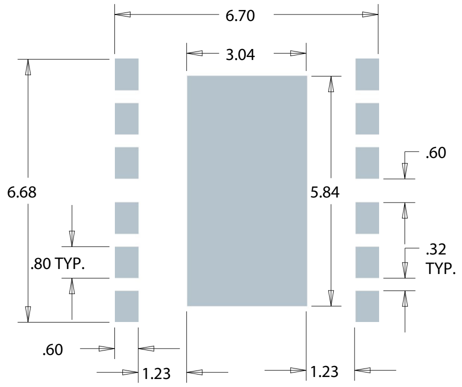
Recommended PCB Solder Pad 6 V Configuration
(thermal pad is electrically isolated)



Recommended PCB Solder Pad 12 V Configuration
(thermal pad is connected to anode and cathode and is not electrically isolated)



Recommended Solder Pad
(Solder Resist Pattern)
6 V & 12 V Configurations
(solid area is open)



Recommended Stencil Openings
6 V & 12 V Configurations
(solid area is open)

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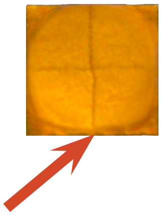
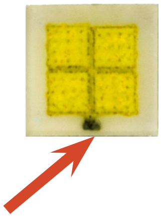
CASE TEMPERATURE (T_s) MEASUREMENT POINT

XLamp XHP Family LED case temperature (T_s) should be measured on the PCB surface, as close to the LED's thermal pad as possible. This measurement point is shown in the picture below.

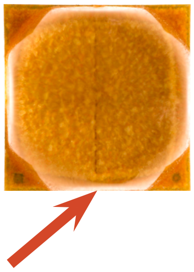
XHP35.2 High Density



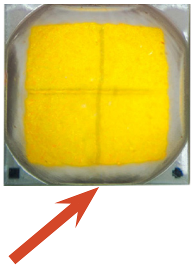
XHP35.2 High Intensity



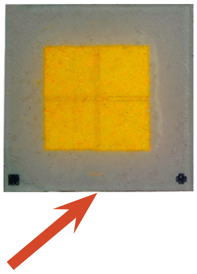
XHP50.2



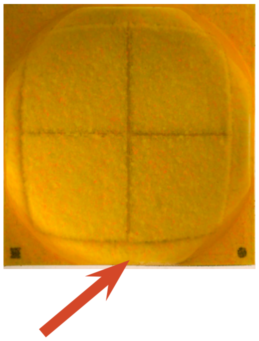
XHP50.3 High Density



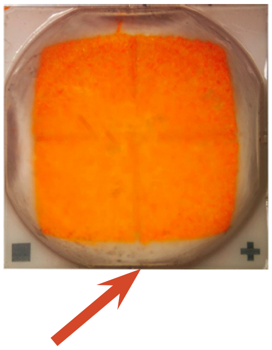
XHP50.3 High Itensity



XHP70.2



XHP70.3



It is not required to use a solder footprint for the thermal pad that is larger than the XLamp XHP Family LED itself. In testing, Cree LED has found such a solder pad to have insignificant impact on the resulting T_s measurement.

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NOTES ON SOLDERING XLAMP® XHP FAMILY LEDS

XLamp XHP Family LEDs are designed to be reflow soldered to a PCB. Reflow soldering may be done by a reflow oven or by placing the PCB on a hotplate and following the reflow soldering profile listed on page 14.

✓ CORRECT

✓ CORRECT

🚫 WRONG

Do not wave solder XLamp XHP Family LEDs. Do not hand solder XLamp XHP Family LEDs.

Solder Paste Type

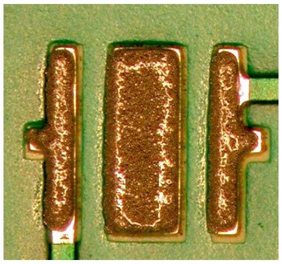
Cree LED strongly recommends using “no clean” solder paste with XLamp XHP Family LEDs so that cleaning the PCB after reflow soldering is not required. Cree LED uses Kester® R276 solder paste internally.

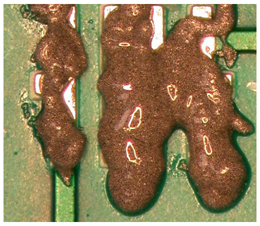
Cree LED recommends the following solder paste compositions: SnAgCu (tin/silver/copper) and SnAg (tin/silver).

Solder Paste Thickness

The choice of solder and the application method will dictate the specific amount of solder. For the most consistent results, an automated dispensing system or a solder stencil printer is recommended. Cree LED has seen positive results using solder thickness that results in a 4-mil (102-µm) bond line, i.e., the solder joint thickness after reflow soldering.

✓ CORRECT





🚫 WRONG

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NOTES ON SOLDERING XLAMP® XHP FAMILY LEDS - CONTINUED

After Soldering

After soldering, allow XLamp XHP Family LEDs to return to room temperature before subsequent handling. Premature handling of the device, especially around the lens, could result in damage to the LED.

Cree LED recommends verifying the solder process by checking the consistency of the solder bond of several trial PCBs after reflow. After shearing selected devices from the circuit board the solder should appear completely re-flowed (no solder grains evident). The solder areas should show minimum evidence of voids on the backside of the package and the PCB.

Cleaning PCBs After Soldering

Cree LED recommends using “no clean” solder paste so that flux cleaning is not necessary after reflow soldering. If PCB cleaning is necessary, Cree LED recommends the use of isopropyl alcohol (IPA).

Do not use ultrasonic cleaning.

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 XHP Family 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 LED recommends sealing any unsoldered LEDs in the original MBP.

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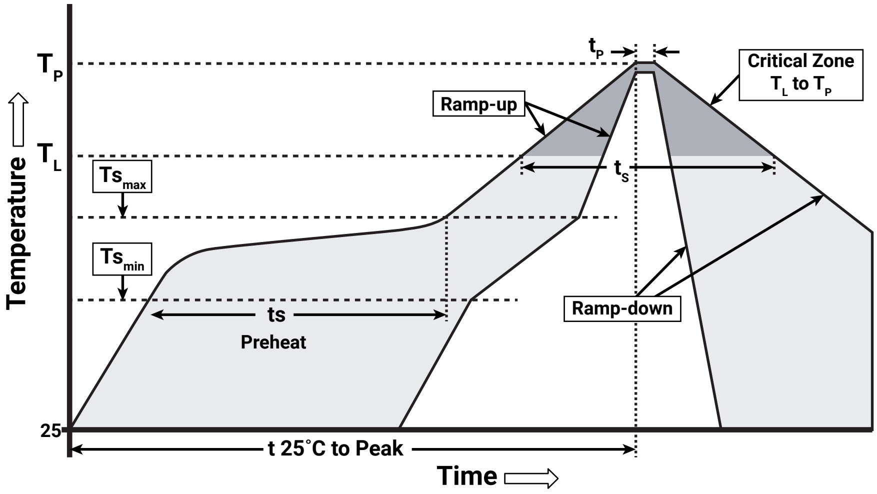
XLAMP® XHP FAMILY LED REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp XHP Family 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 (Ts_{max} to Tp)	1.2 °C/second
Preheat: Temperature Min (Ts_{min})	120 °C
Preheat: Temperature Max (Ts_{max})	170 °C
Preheat: Time (ts_{min} to ts_{max})	65-150 seconds
Time Maintained Above: Temperature (T_L)	217 °C
Time Maintained Above: Time (t_L)	45-90 seconds
Peak/Classification Temperature (Tp)	235 - 245 °C
Time Within 5 °C of Actual Peak Temperature (tp)	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.

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CHEMICALS & CONFORMAL COATINGS

Below are representative lists of chemicals and materials to be used or avoided in LED manufacturing activities. For a complete and current list of recommended chemicals, conformal coatings and harmful chemicals consult Cree LED's Chemical Compatibility Application Note. The video at www.youtube.com/watch?v=t24bf9D_1SA illustrates the process Cree LED has developed for testing the compatibility of chemicals and materials with LEDs. You should also consult your regional Cree LED Field Applications Engineer.

Recommended Cleaning Solutions

Cree LED has found the following chemicals to be safe to use with XHP Family LEDs.

- Water
- Isopropyl alcohol (IPA)

Chemicals Tested as Harmful

In general, subject to the specifics in Cree LED's Chemical Compatibility Application Note, Cree LED has found certain chemicals to be harmful to XHP Family LEDs. Cree LED recommends not using these chemicals anywhere in an LED system containing XLamp XHP Family LEDs. The fumes from even small amounts of the chemicals may damage the LEDs.

- Chemicals that might outgas aromatic hydrocarbons (e.g., toluene, benzene, xylene)
- Methyl acetate or ethyl acetate (i.e., nail polish remover)
- Cyanoacrylates (i.e., "Superglue")
- Glycol ethers (including Radio Shack® Precision Electronics Cleaner - dipropylene glycol monomethyl ether)
- Formaldehyde or butadiene (including Ashland® PLIOBOND® adhesive)

Hermetically Sealing Luminaires

For proper LED operation and to avoid potential lumen depreciation and/or color shift, LEDs of all types must operate in an environment that contains oxygen. Simply allowing the LEDs to ventilate to air is sufficient; no extraordinary measures are required. Hermetically sealing LEDs in an enclosed space is not recommended.

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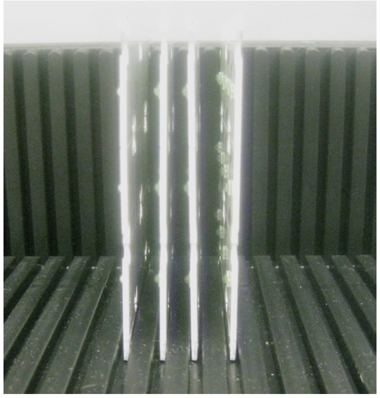
ASSEMBLY STORAGE & HANDLING

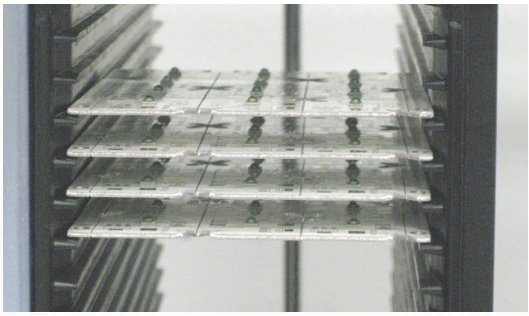
Do not stack PCBs or assemblies containing XLamp XHP Family LEDs so that anything rests on the LED lens. Force applied to the LED lens may result in the lens being knocked off. PCBs or assemblies containing XLamp XHP Family LEDs should be stacked in a way to allow at least 1-cm clearance above the LED lens.

Do not use bubble wrap directly on top of XLamp XHP Family LEDs. Force from the bubble wrap can potentially damage the LED.

✓

CORRECT



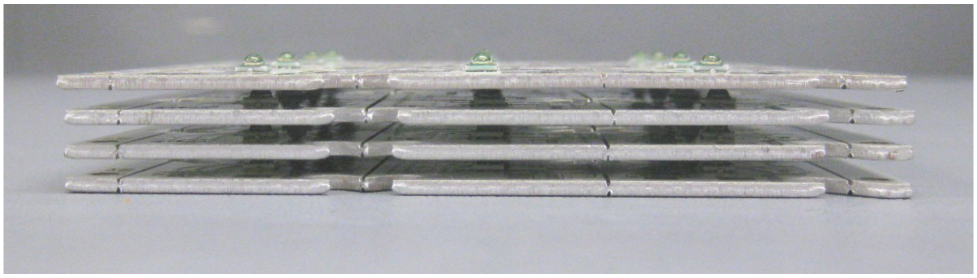


✓

CORRECT

⊘

WRONG



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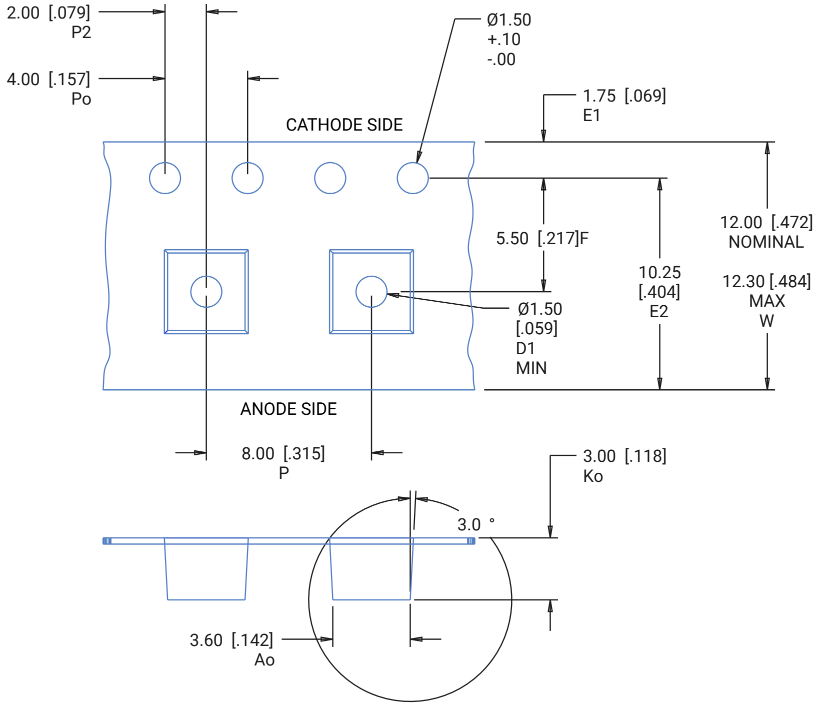
TAPE AND REEL

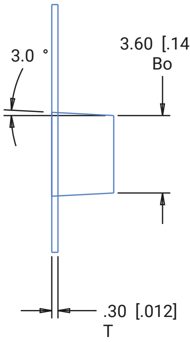
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

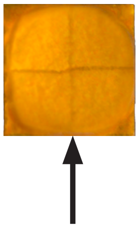
All dimensions are ±.13 mm unless otherwise indicated.

XHP35.2 High Density

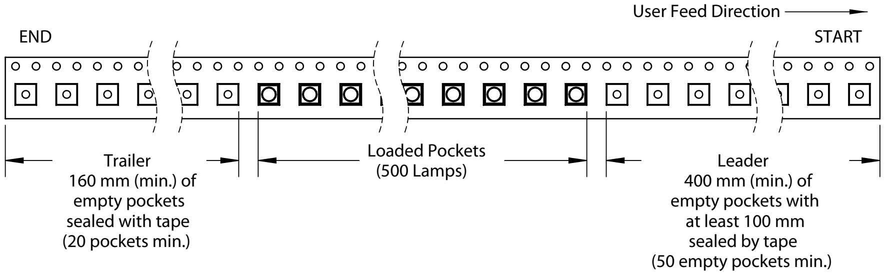
POCKET SIZE	
Ao -	3.60 mm [.142"]
Bo -	3.60 mm [.142"]
Ko -	3.00 mm [.118"]

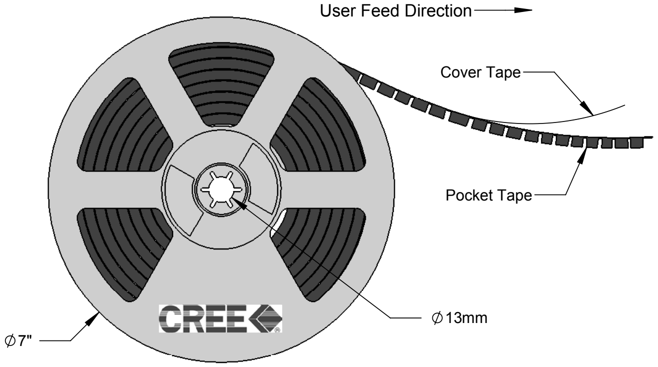






XHP35.2 High Density Anode Side





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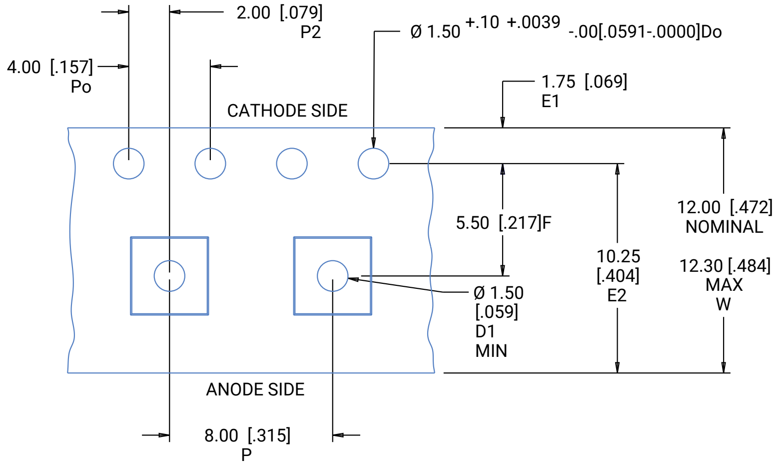
TAPE AND REEL - CONTINUED

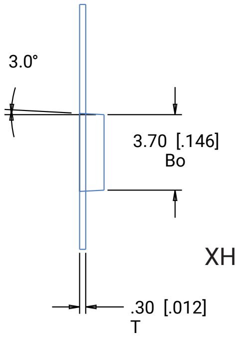
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

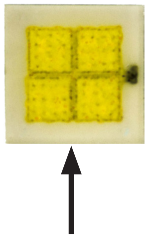
All dimensions are ±.13 mm unless otherwise indicated.

XHP35.2 High Intensity

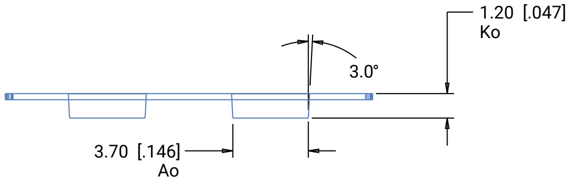
POCKET SIZE	
Ao -	3.70 mm [.146"]
Bo -	3.70 mm [.146"]
Ko -	1.20 mm [.047"]

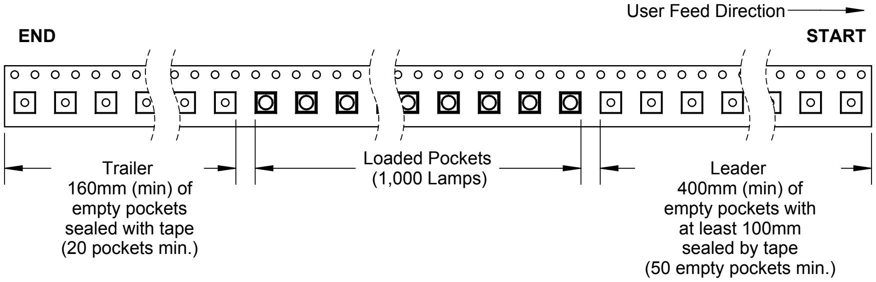


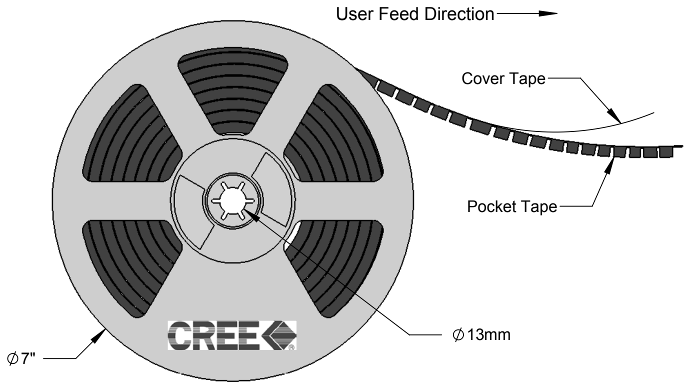




XHP35.2 High Intensity
Anode Side







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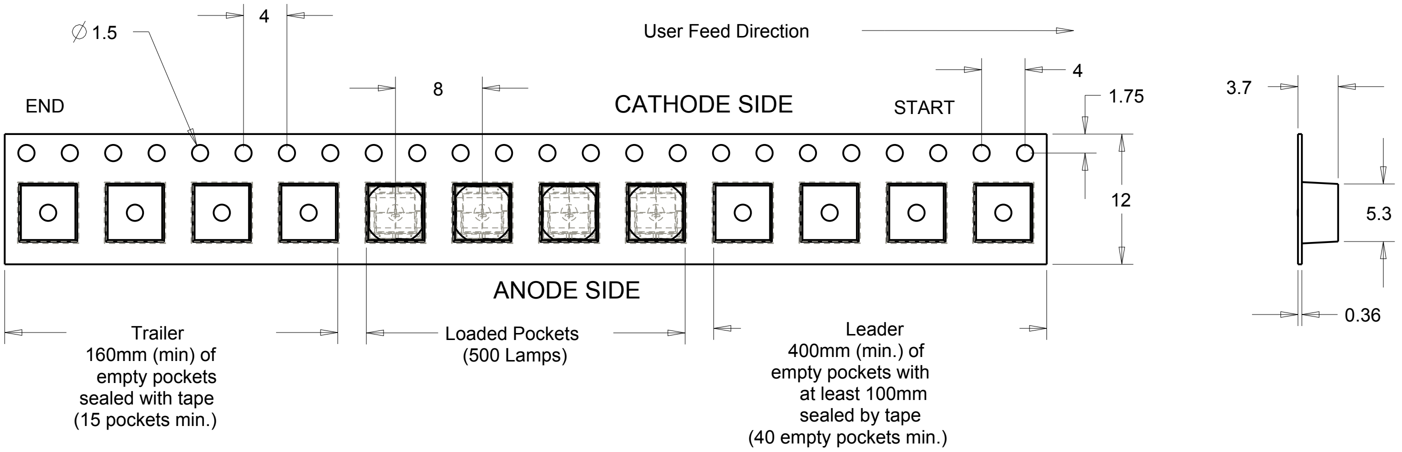
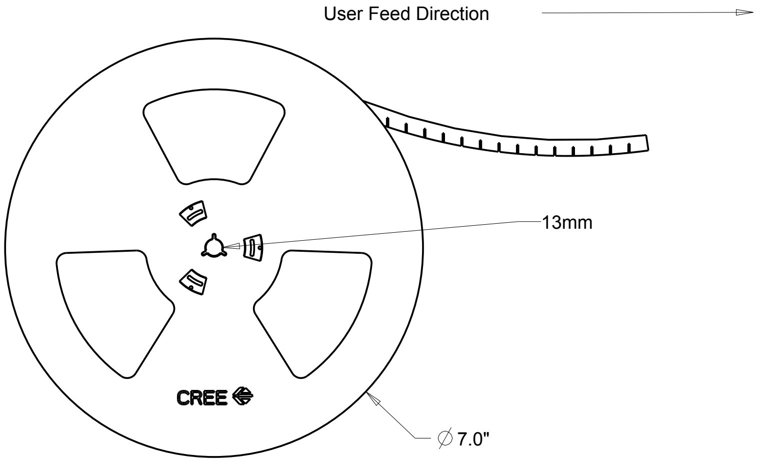
TAPE AND REEL - CONTINUED

XHP50.2





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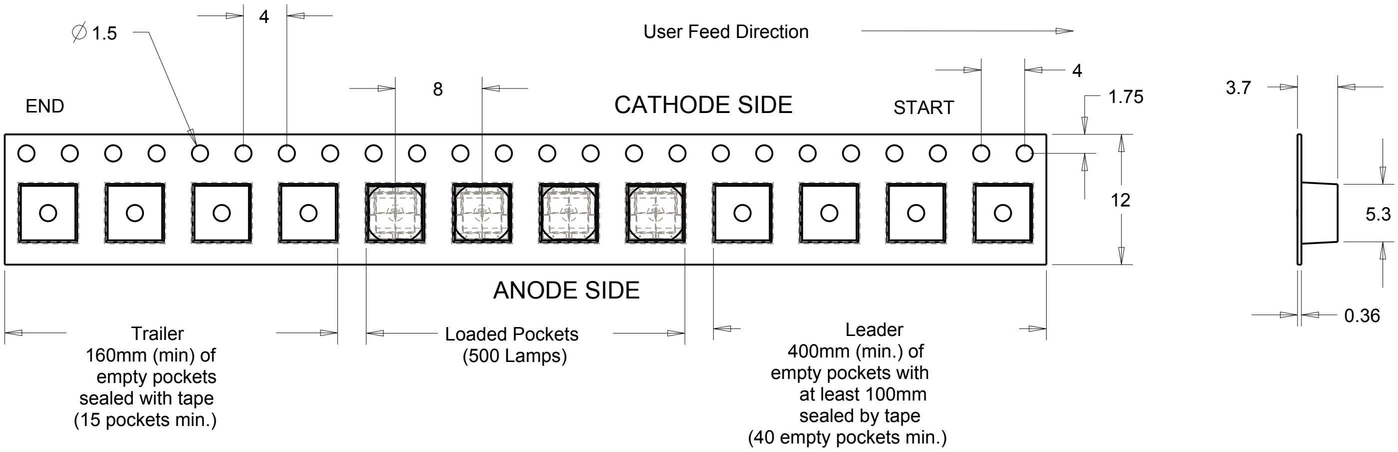
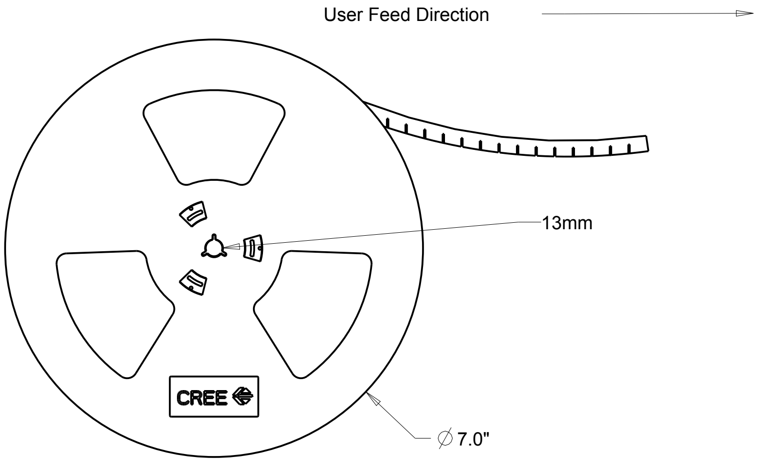
TAPE AND REEL - CONTINUED

XHP50.3 High Density





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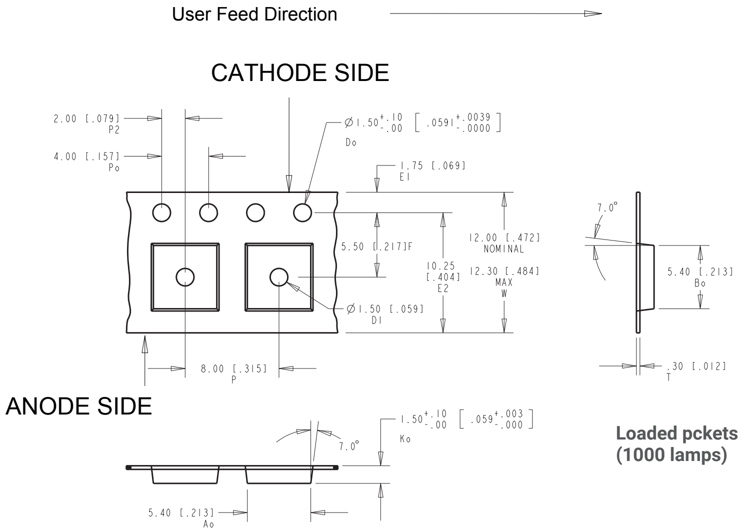
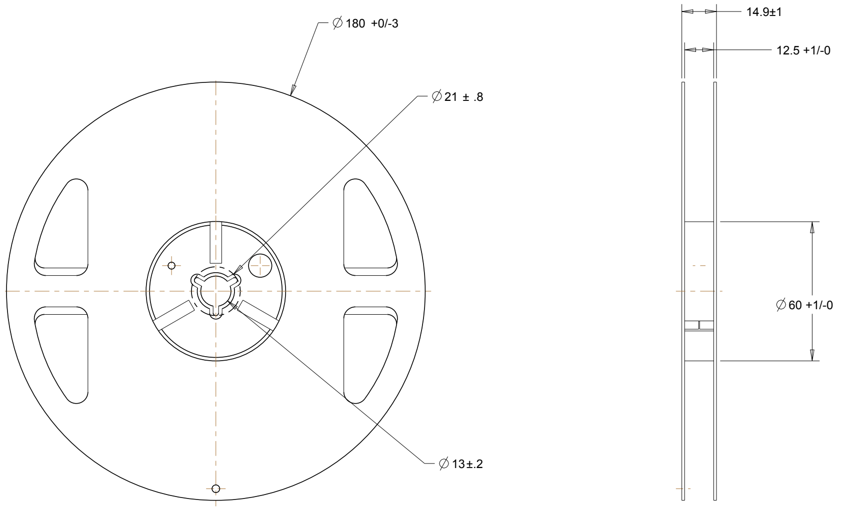
TAPE AND REEL - CONTINUED

XHP50.3 High Intensity





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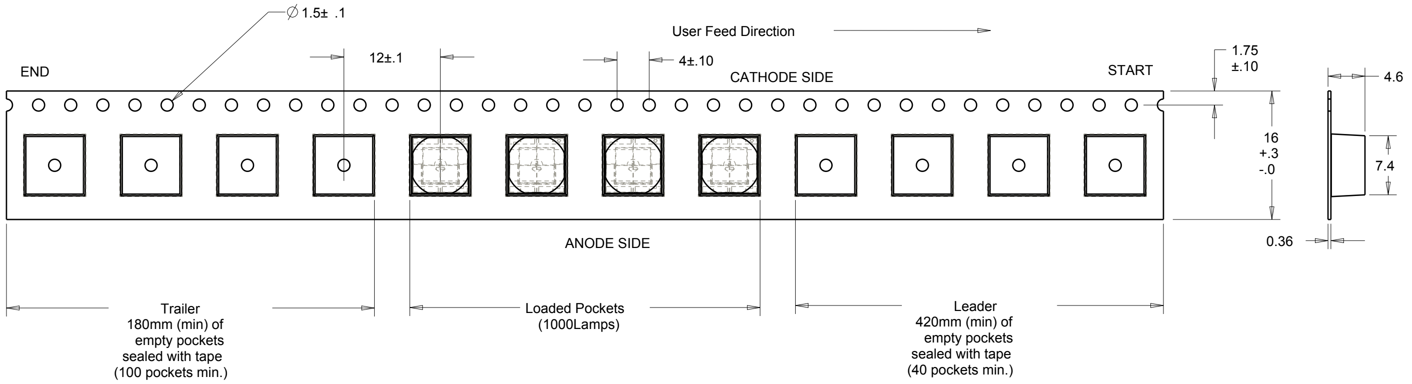
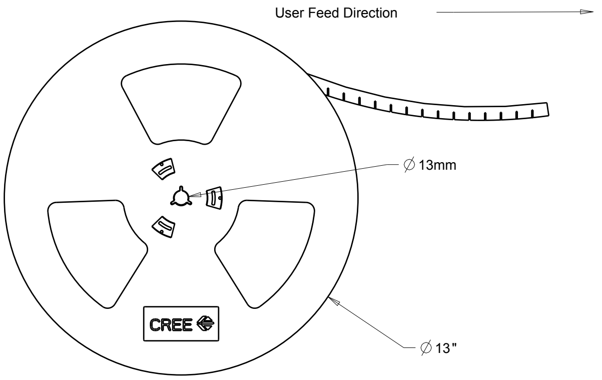
TAPE AND REEL - CONTINUED

XHP70.2, XHP70.3





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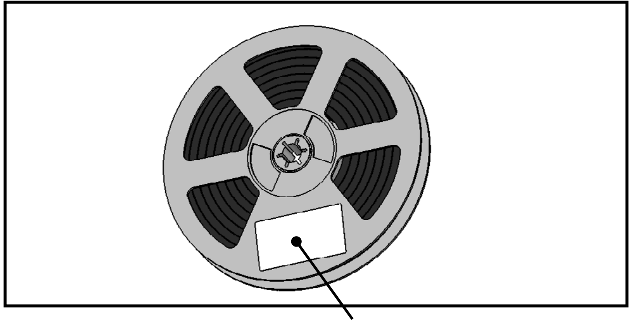
PACKAGING & LABELS

The diagrams below show the packaging and labels Cree LED uses to ship XLamp XHP Family LEDs. XLamp XHP Family LEDs are shipped in tape loaded on a reel. Each box contains only one reel in a moisture barrier bag.

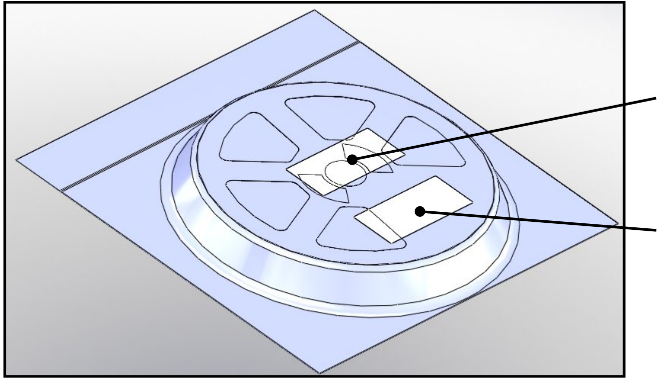
XHP35.2, XHP50.2, XHP50.3

Unpackaged Reel



Label with Cree Bin Code, Quantity, Reel ID

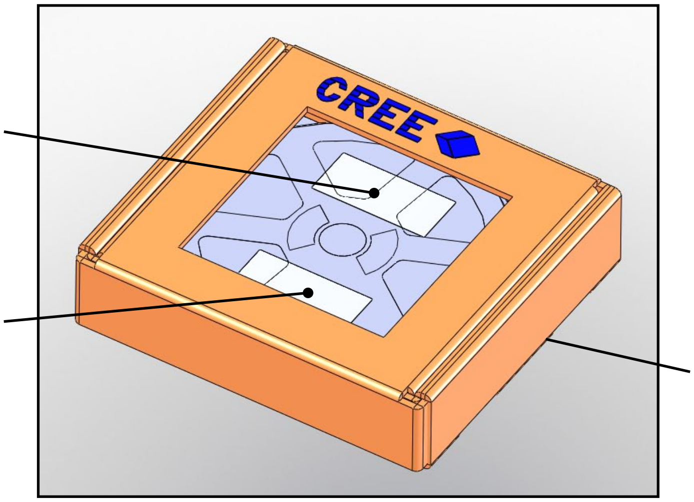
Packaged Reel



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)

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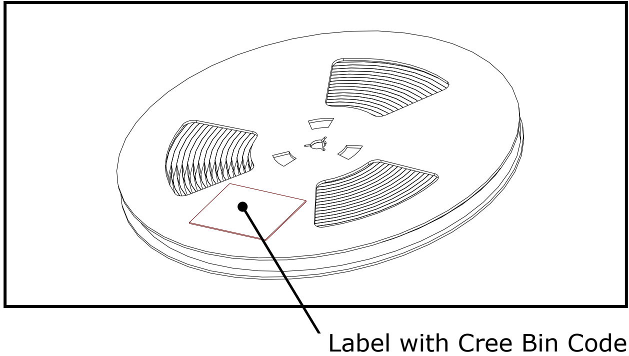
PACKAGING & LABELS - CONTINUED

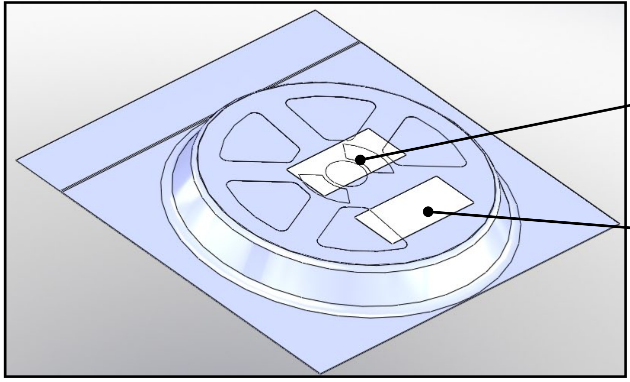
XHP70.2, XHP70.3

Unpackaged Reel



Label with Cree Bin Code, Quantity, Reel ID

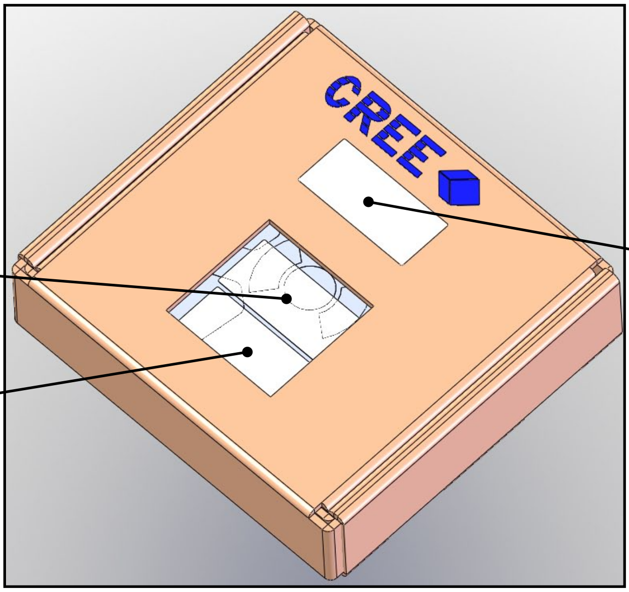
Packaged Reel



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

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