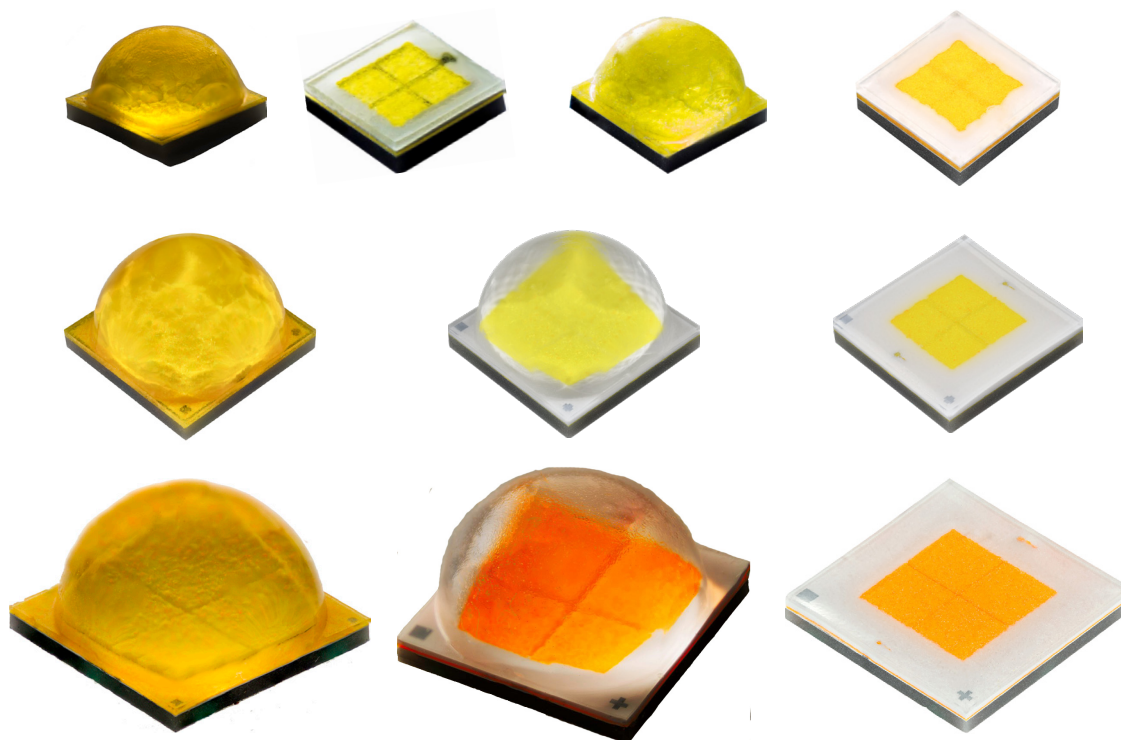# XLamp® XHP Family LEDs



## 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.
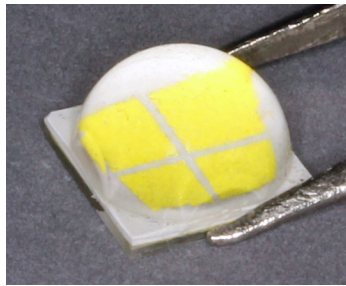
## TABLE OF CONTENTS

**Cree LED / 4001 E. Hwy. 54, Suite 2000 / Durham, NC 27709 USA / +1.919.313.5330 / www.cree-led.com**
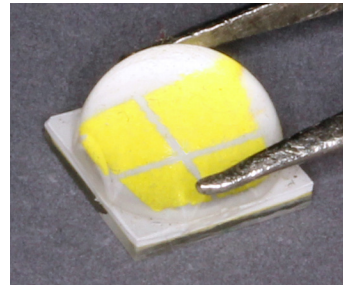
## HANDLING XLAMP® XHP FAMILY LEDS

### 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.
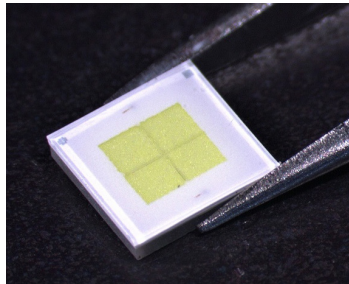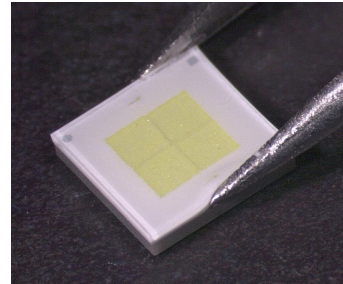
✓ **CORRECT**



🚫 **WRONG**

✓ **CORRECT**



🚫 **WRONG**

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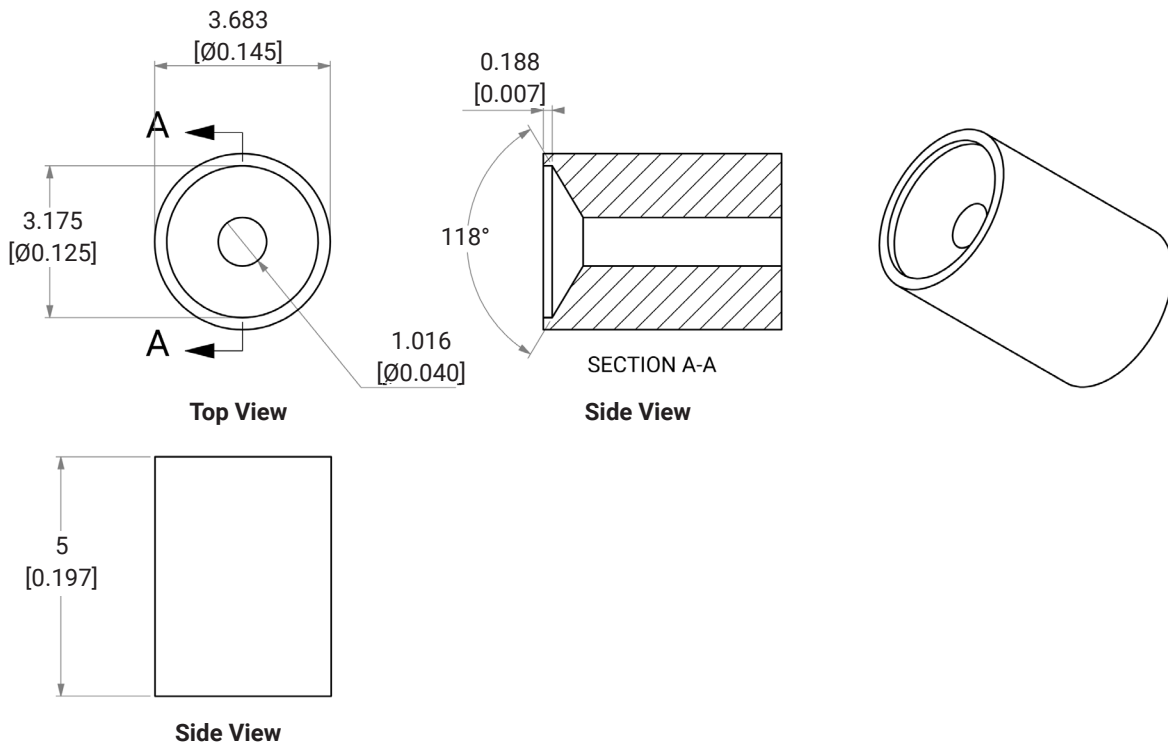
- Avoid putting mechanical stress on the LED lens.
- Never touch the optical surface with fingers or sharp objects. The LED lens surface could be soiled or damaged, which would affect the optical performance of the LED.
- Cree LED recommends always handling XHP Family LEDs with appropriate ESD grounding.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

## 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, XHP35.2 High-Density Pro9**

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

3.683
[Ø0.145]

A

3.175
[Ø0.125]

A

1.016
[Ø0.040]

**Top View**

0.188
[0.007]

118°

SECTION A-A

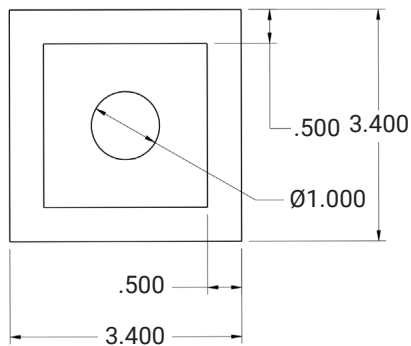**Side View**

5
[0.197]

**Side View**

## HANDLING XLAMP® XHP FAMILY LEDS - CONTINUED

### XHP35.2 High Intensity, XHP35.2 High-Intensity Pro9
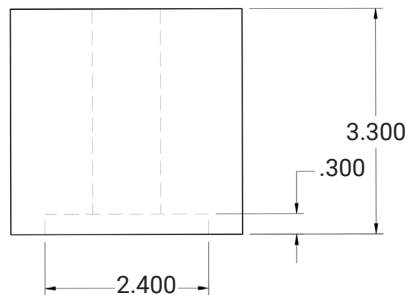
Cree LED recommends using a spring-relieved pick and place nozzle with a spring constant of 0.05 lb-ft (0.07 N-m).

All dimensions in mm [in]

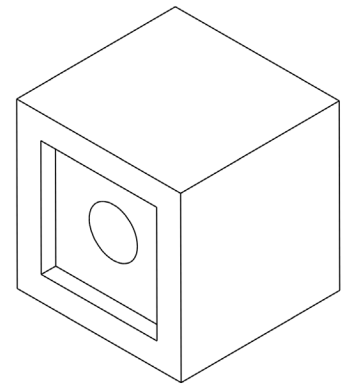Tolerance: ±0.001



.500   3.400

Ø1.000

.500

3.400

**Top View**

3.300

.300

2.400

**Side View**

### XHP50.2, XHP50.3 High Density

All dimensions in mm [in]
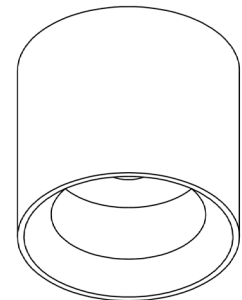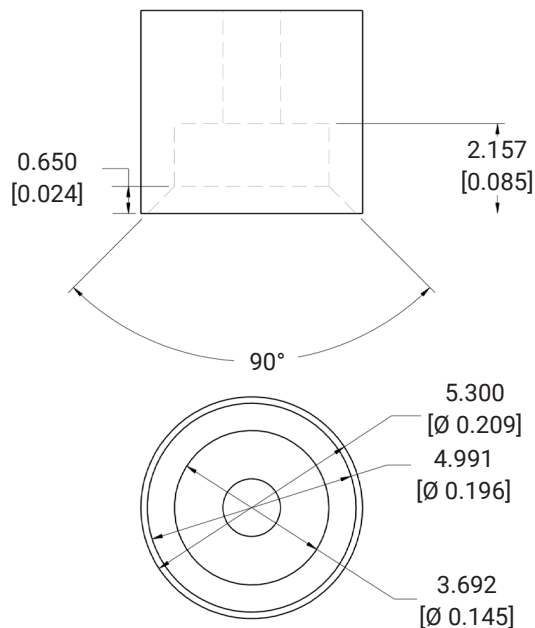
0.650
[0.024]

2.157
[0.085]

90°

5.300
[Ø 0.209]

4.991
[Ø 0.196]

3.692
[Ø 0.145]

## HANDLING XLAMP® XHP FAMILY LEDS - CONTINUED

**XHP50.3 High Intensity**

All dimensions in mm [in]

[5.500]
Ø 0.217

[0.500]
0.020

[1]
Ø 0.039

[4.300]
Ø 0.169

**XHP70.2, XHP70.3 High Density**

All dimensions in mm [in]

[7.300]
Ø 0.287

[2.695]
Ø 0.106

90°

[1.142]
Ø 0.045

[6.684]
Ø 0.263

[4.400]
Ø 0.173
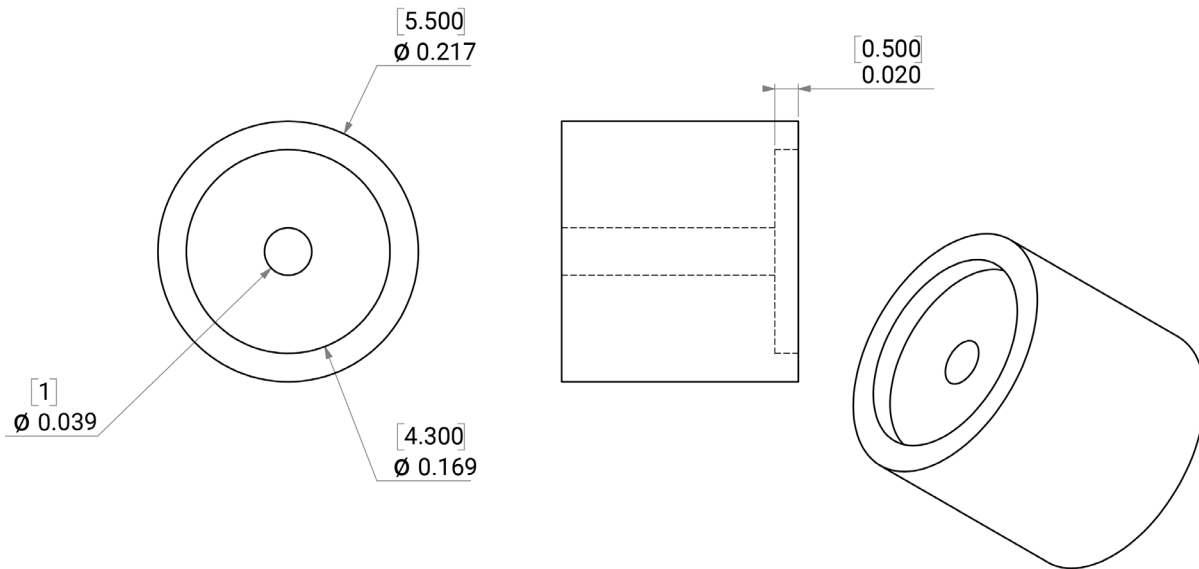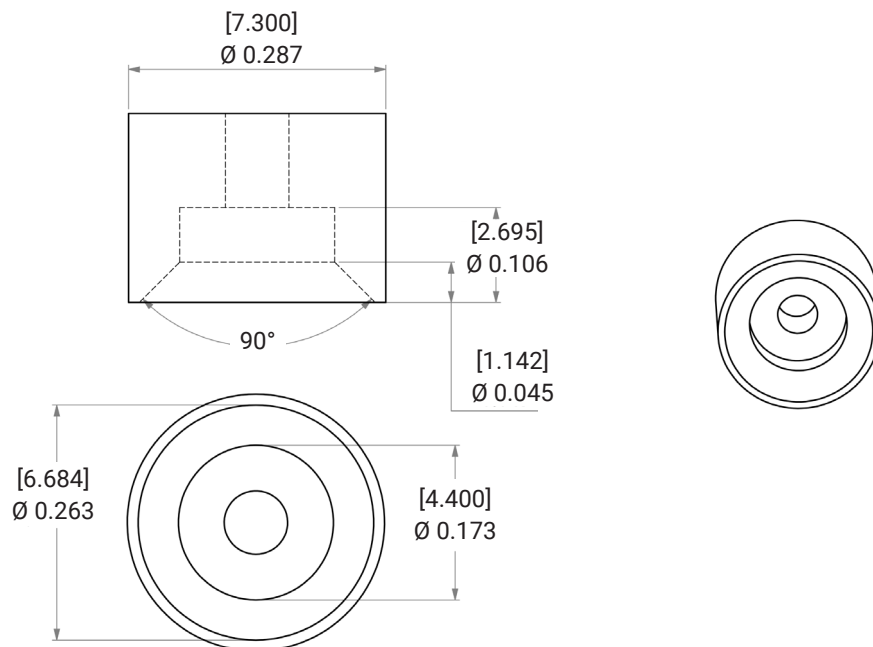
## HANDLING XLAMP® XHP FAMILY LEDS - CONTINUED

### XHP70.3 High Intensity

All dimensions in mm

## 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 High Density, XHP35.2 High Intensity



**Recommended 3-V PCB Footprint (Center Pad is Electrically Isolated)**
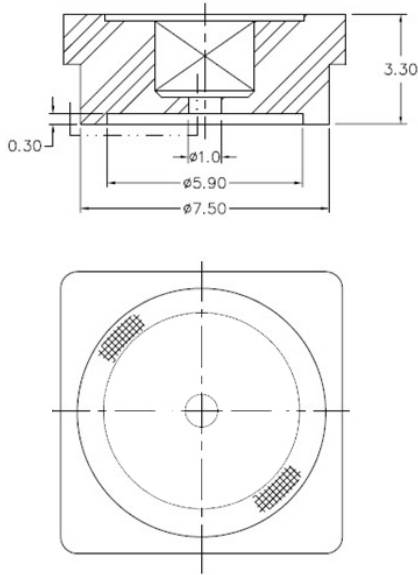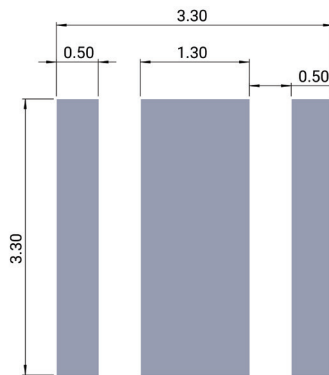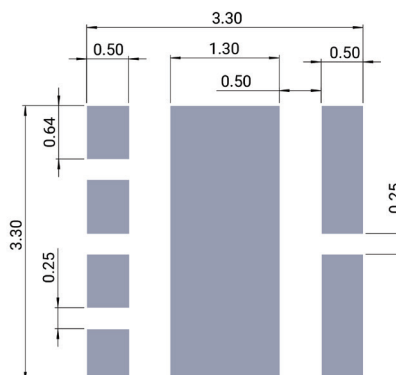
**Recommended 3-V Solder Mask Opening**
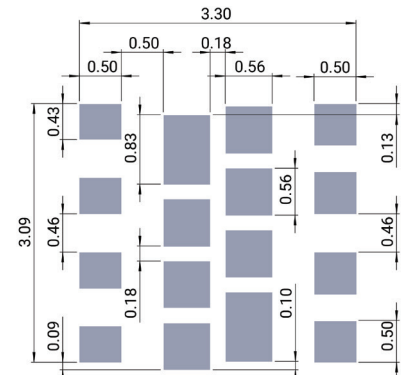
**Recommended 3-V Stencil Openings***

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.

## CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

### XHP35.2 High Density and XHP35.2 High Intensity
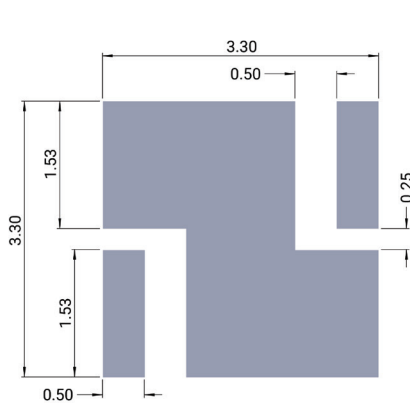
**Recommended 6-V
PCB Footprint
(Center Pad is Connected to
Anode and Cathode and is
not Electrically Isolated)**
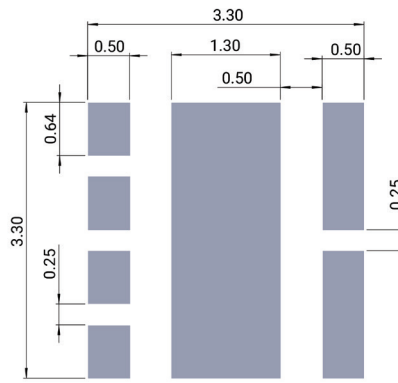
**Recommended 6-V
Solder Mask Opening**
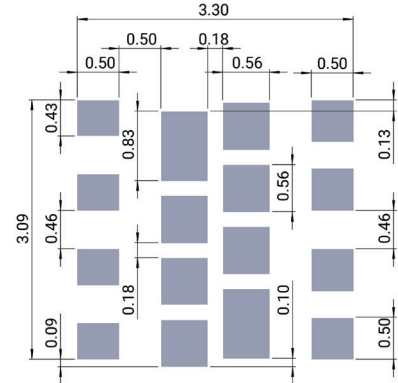
**Recommended 6-V
Stencil Openings\***

**Recommended 12-V
PCB Footprint
(Center Pad is
Electrically Isolated)**

**Recommended 12-V
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.

## CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

**XHP35.2 High-Density Pro9, XHP35.2 High-Intensity Pro9**



**Recommended 12-V
PCB Footprint
(Center Pad is
Electrically Isolated)**

**Recommended 12-V
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.

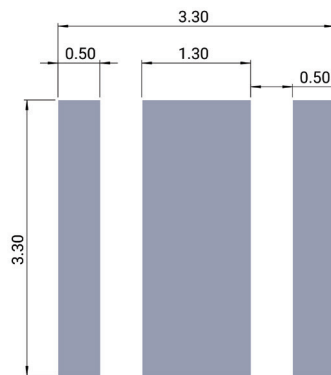## CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

### XHP50.2



**3-V and 6-V PCB Footprint**
**(Thermal pad is electrically isolated)**



**12-V PCB Footprint**
**(Thermal pad is connected to anode and cathode**
**and is not electrically isolated)**



**3-V PCB Soldermask Opening**



**6-V and 12-V PCB Soldermask Opening**



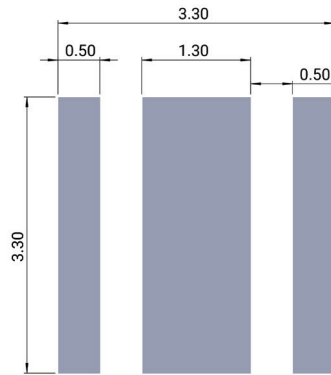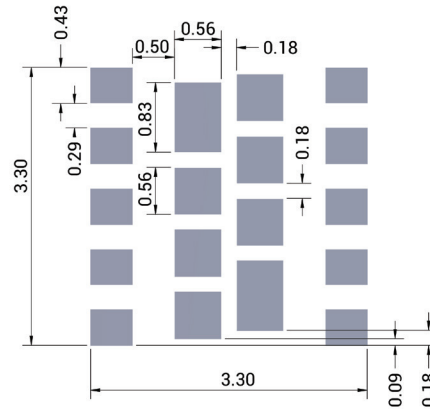**3-V, 6-V and 12-V Stencil Opening***

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.

## CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

### XHP50.3 High Density, XHP50.3 High Intensity



**3 V and 6 V PCB Footprint
(Thermal pad is electrically isolated)**



**12 V PCB Footprint
(Thermal pad is connected to anode and cathode
and is not electrically isolated)**



**3 V PCB Solder Mask Opening**



**6 V and 12 V PCB Solder Mask Opening**



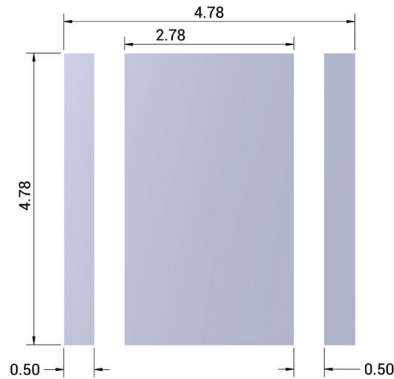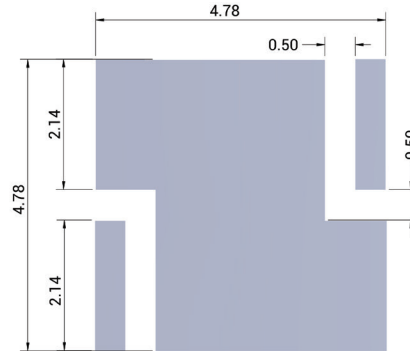**3 V, 6 V and 12 V Stencil Opening***

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.

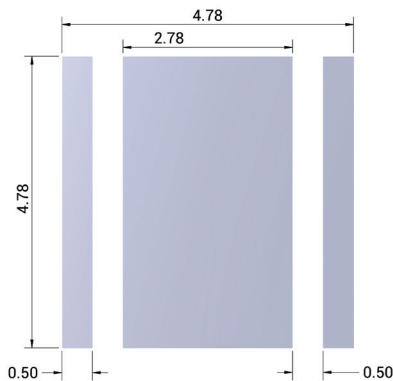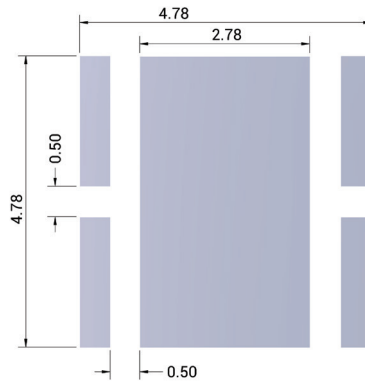## CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

### XHP70.2



**Recommended 3-V PCB Footprint**



**Recommended 6-V PCB Footprint**
**Configuration Depending on Vf Class**
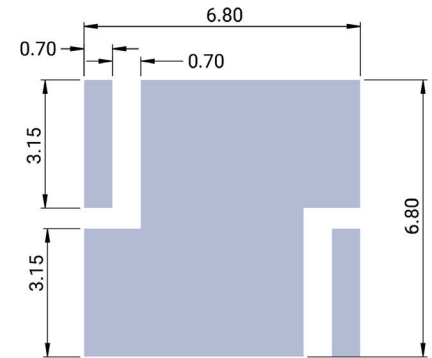


**Recommended 12-V PCB Footprint**
**(Thermal pad is connected to anode and**
**cathode and is not electrically isolated)**
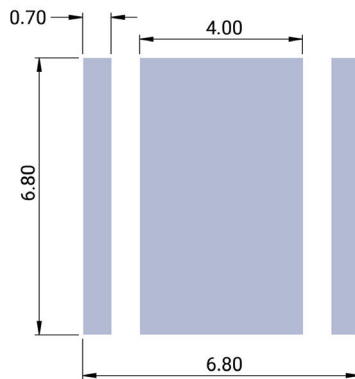


**Recommended 3-V PCB Solder**
**Mask Opening**
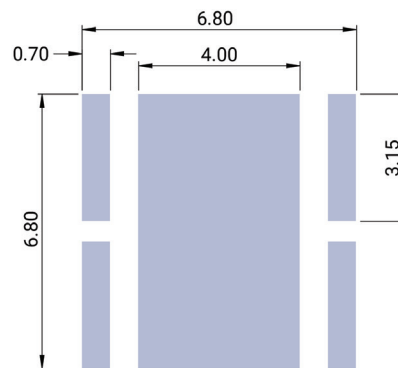


**Recommended 6-V & 12-V**
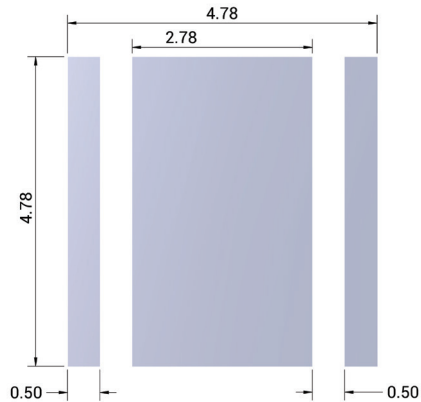**PCB Solder Mask Opening**
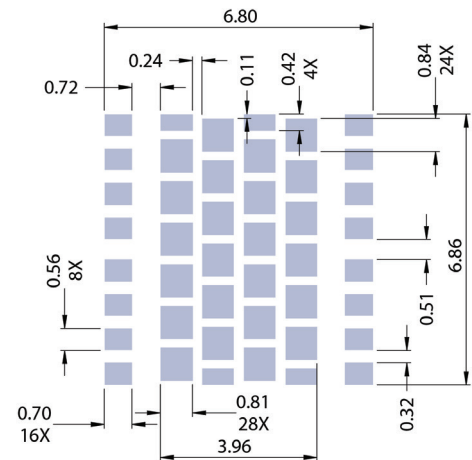


**Recommended 3-V, 6-V & 12-V**
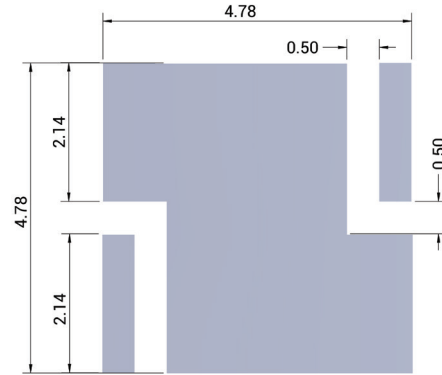**Stencil Openings***

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.
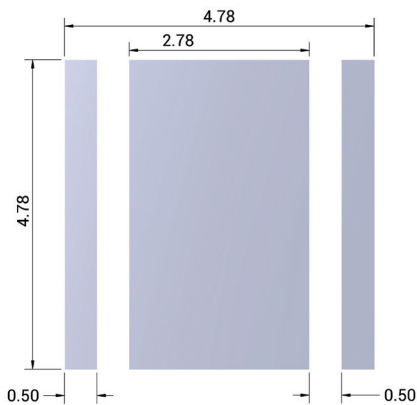
**CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED**
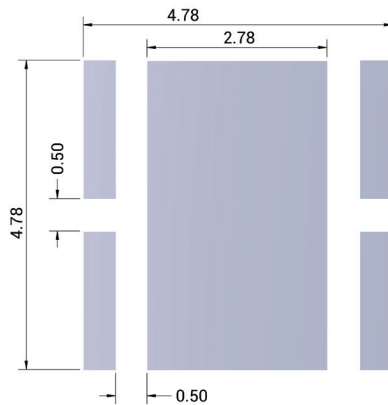
### XHP70.3 High Density, XHP50.3 High Intensity

0.70

4.00

6.80

6.80
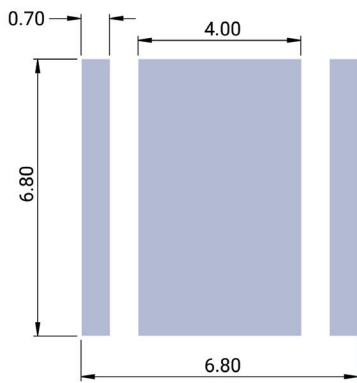
**Recommended 3-V & 6-V PCB Footprint**

**(center pad is electrically isolated)**
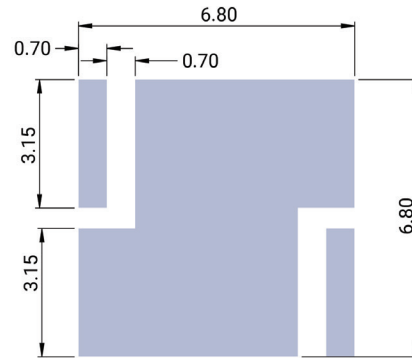
6.80

0.70

0.70

3.15

3.15

6.80

**Recommended 12-V PCB Footprint**

**(center pad is connected to anode and**

**cathode and is not electrically isolated)**

0.70

4.00

6.80

6.80
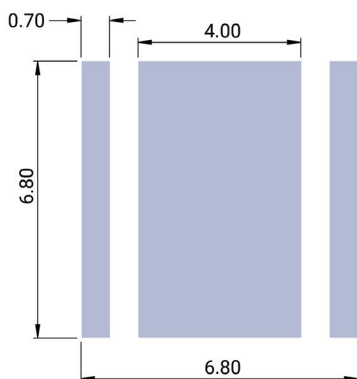
**Recommended 3-V & 6-V**

**PCB Solder Mask Opening**

**(solid area is open)**

6.80

0.70

4.00

6.80

3.15
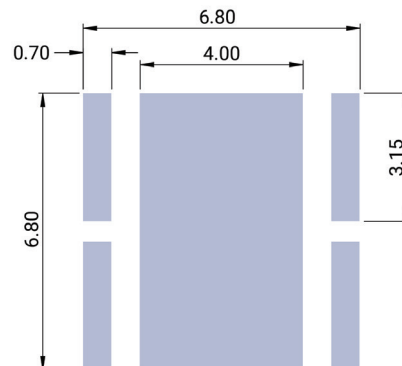
**Recommended 12-V**

**PCB Solder Mask Opening**

**(solid area is open)**

## CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

**XHP70.3 High Density, XHP70.3 High Intensity**
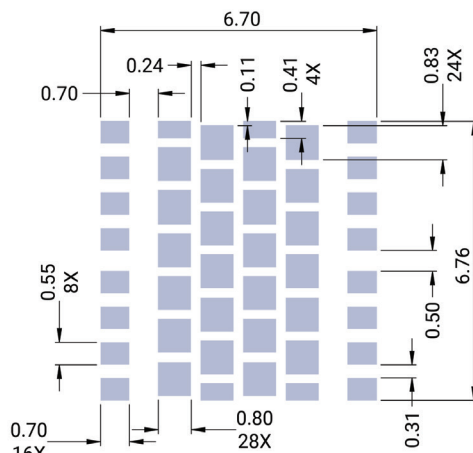


**Recommended Stencil Openings***

**3 V & 6-V Configuration**

**(solid area is open)**
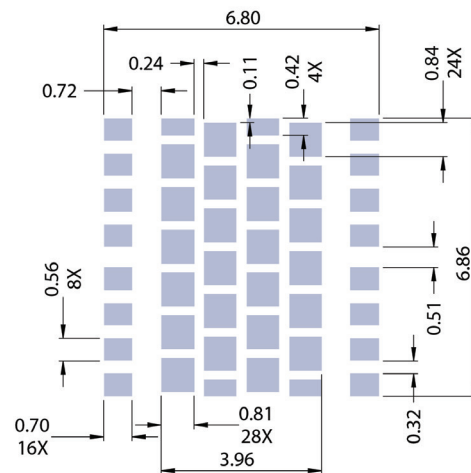


**Recommended Stencil Openings***

**12 V Configurations**

**(solid area is open)**
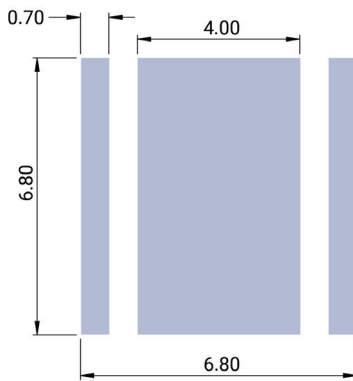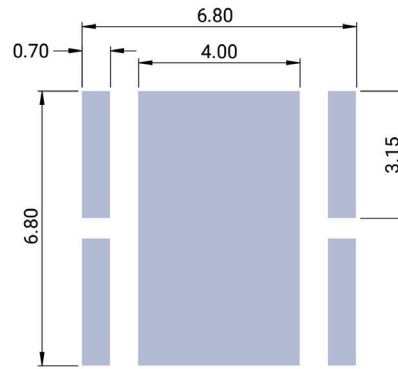
Notes:

• 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.

## 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**  **XHP35.2 High-Density Pro9**  **XHP35.2 High-Intensity Pro9**

**XHP50.2**  **XHP50.3 High Density**  **XHP50.3 High Intensity**

**XHP70.2**  **XHP70.3 High Density**  **XHP70.3 High Intensity**
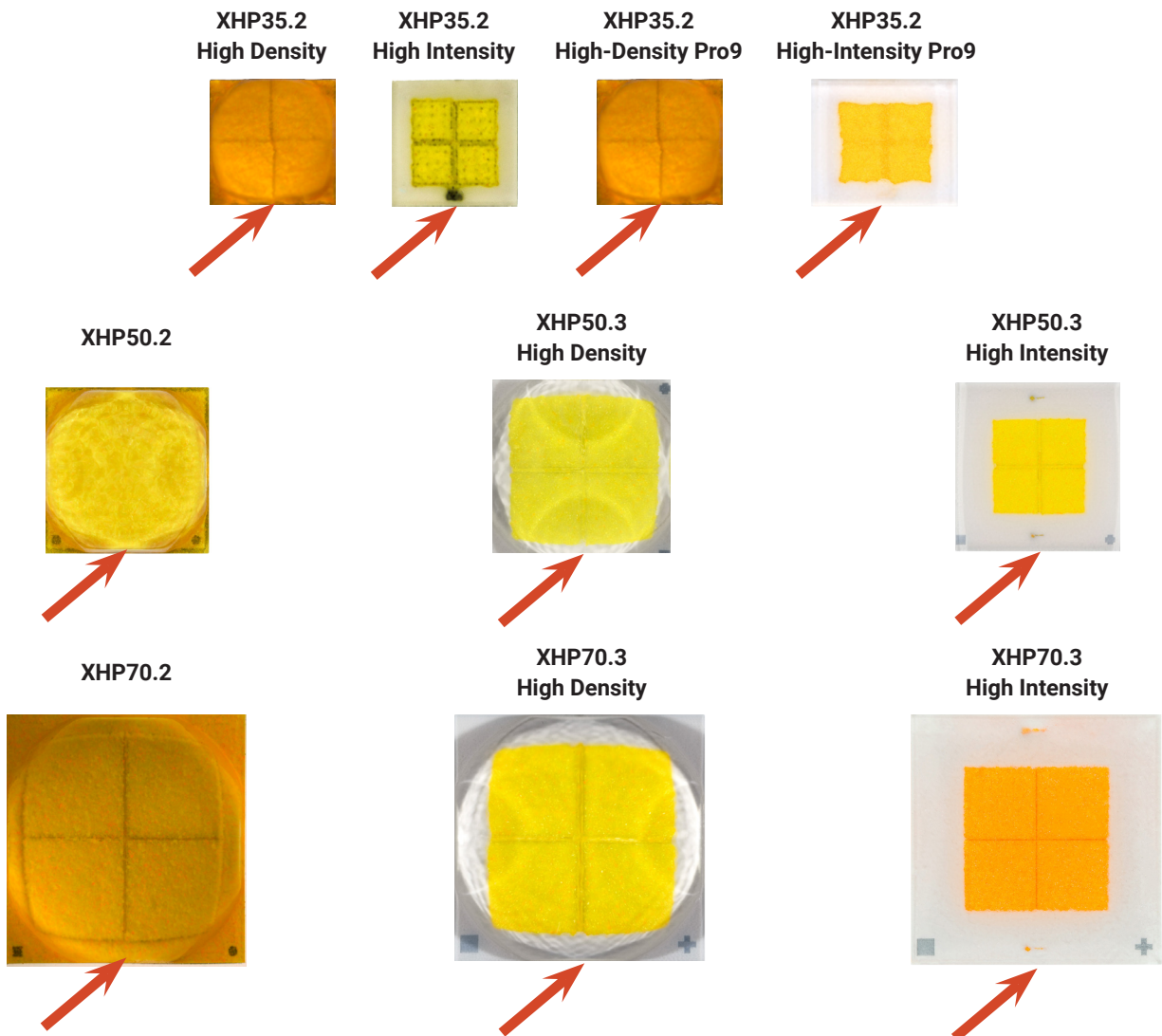
It is not required to use a solder footprint for the thermal pad that is larger than the XLamp XHP Family LED itself. In testing, Cree LED has found such a solder pad to have insignificant impact on the resulting $T_s$ measurement.

## 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 18.



**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**
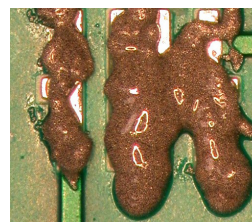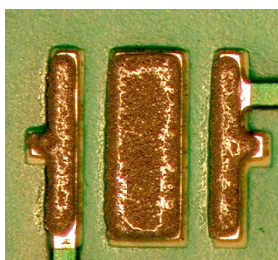
**WRONG**

## 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.

## 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.
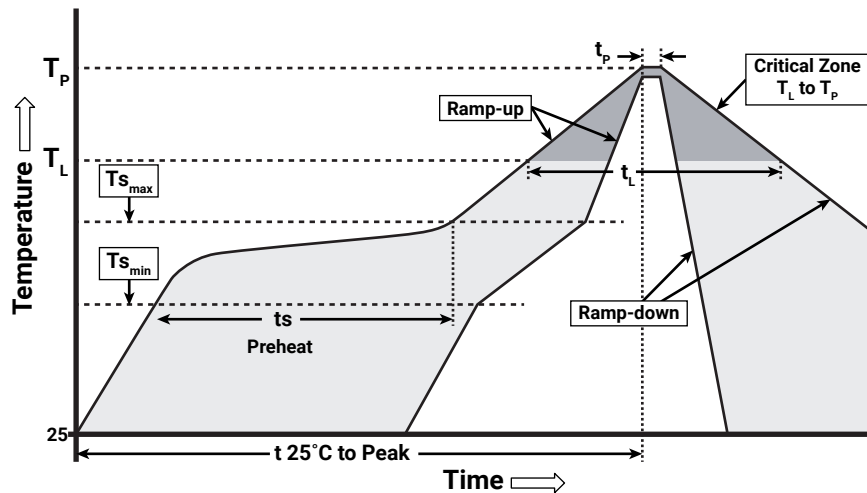


IPC/JEDEC J-STD-020C

| 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.

## 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.

**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.

## 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
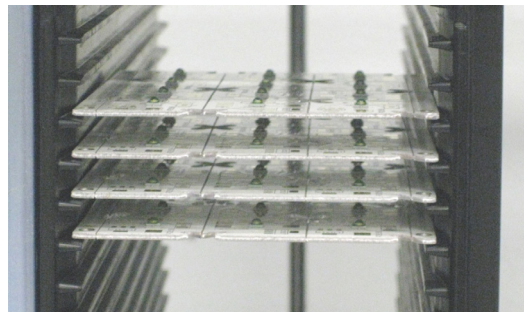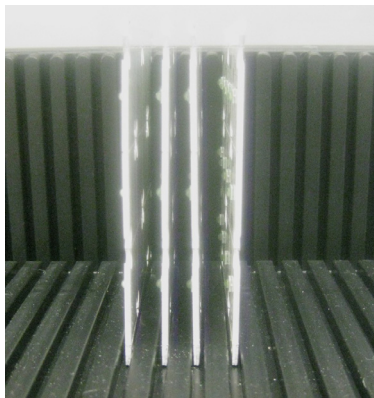
✓ CORRECT

🚫 WRONG
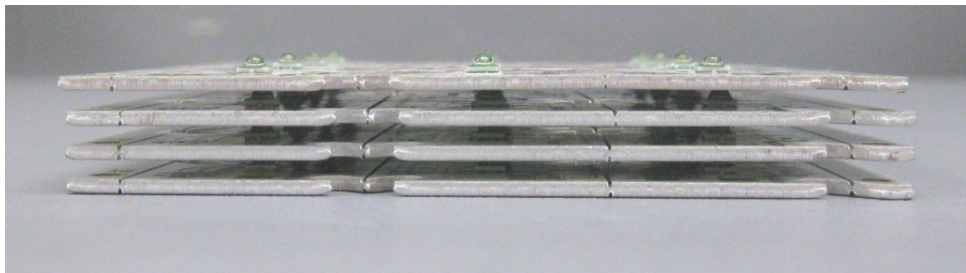
## TAPE AND REEL

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

Except as noted, all dimensions in mm [inches]

All dimensions are ±.13 mm unless otherwise indicated.

### XHP35.2, XHP35.2 Pro9



A-A SECTION

DETAIL"I"

DETAIL"H"

B-B SECTION
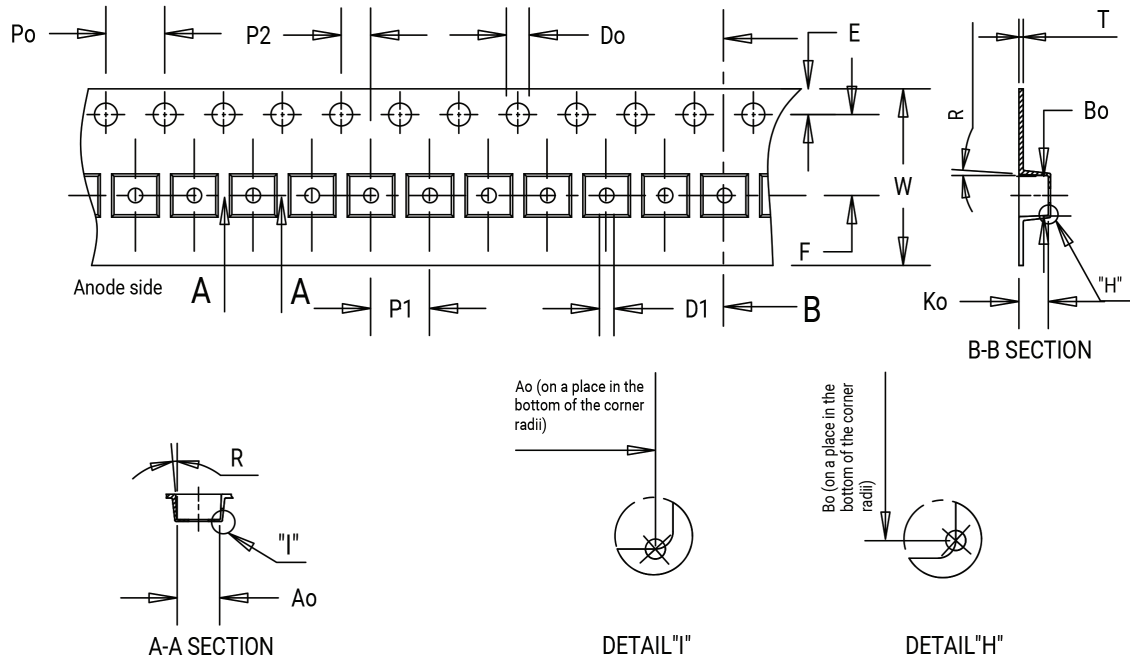
### XHP35.2 High Density

XHP35B-**0**x-xxxx-xxxxxxxxx

└─── XHP35.2 High Density

### XHP35.2 High-Density Pro9

XHP35B-**0**x-xxxx-xx**P**xxxxxx

└─── XHP35.2 High-Density Pro9

| Item | Ao | Bo | Ko | Po | P1 | P2 | T | E | F | Do | D1 | W | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dimension | 3.60 | 3.60 | 3.00 | 4.00 | 8.00 | 2.00 | 0.30 | 1.75 | 5.50 | 1.50 | 1.50 | 12.00 | 3° |

### XHP35.2 High Intensity

XHP35B-**H**x-xxxx-xxxxxxxxx

└─── XHP35.2 High Intensity

### XHP35.2 High-Intensity Pro9

XHP35B-**H**x-xxxx-xx**P**xxxxxx

└─── XHP35.2 High-Intensity Pro9

| Item | Ao | Bo | Ko | Po | P1 | P2 | T | E | F | Do | D1 | W | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dimension | 3.70 | 3.70 | 1.20 | 4.00 | 8.00 | 2.00 | 0.30 | 1.75 | 5.50 | 1.50 | 1.50 | 12.00 | 3° |

## TAPE AND REEL - CONTINUED
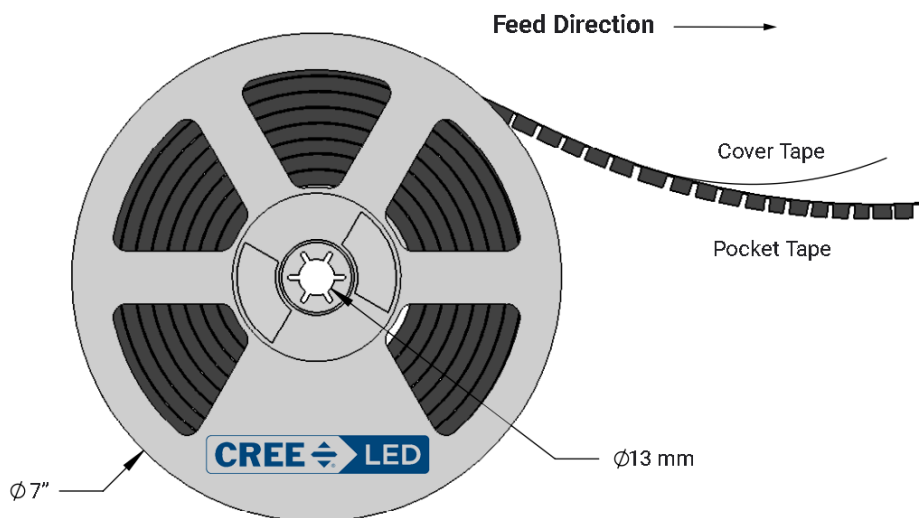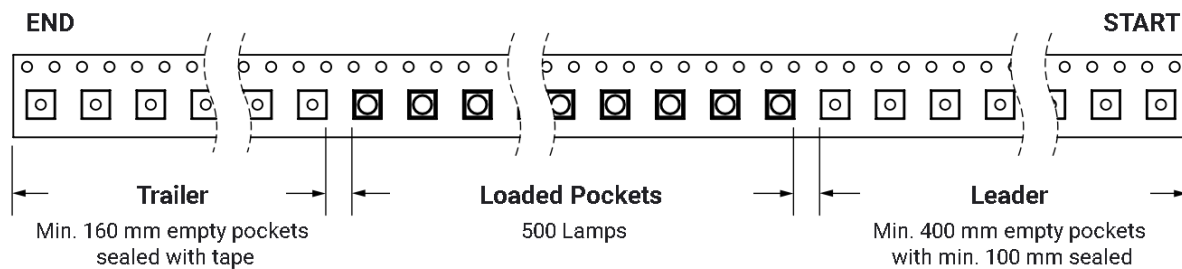
**XHP35.2 High Density, XHP35.2 High-Density Pro9**



END                                                                      START

Trailer                          Loaded Pockets                     Leader
Min. 160 mm empty pockets           500 Lamps              Min. 400 mm empty pockets
sealed with tape                                            with min. 100 mm sealed

Feed Direction →



Cover Tape

Pocket Tape

Ø13 mm

Ø 7"

## TAPE AND REEL - CONTINUED

### XHP35.2 High Intensity, XHP35.2 High-Intensity Pro9



END                                                              START

Trailer                    Loaded Pockets                    Leader

Min. 160 mm empty pockets      1000 Lamps        Min. 400 mm empty pockets
sealed with tape                                  with min. 100 mm sealed



Feed Direction →

Cover Tape

Pocket Tape

Ø13 mm

Ø7"
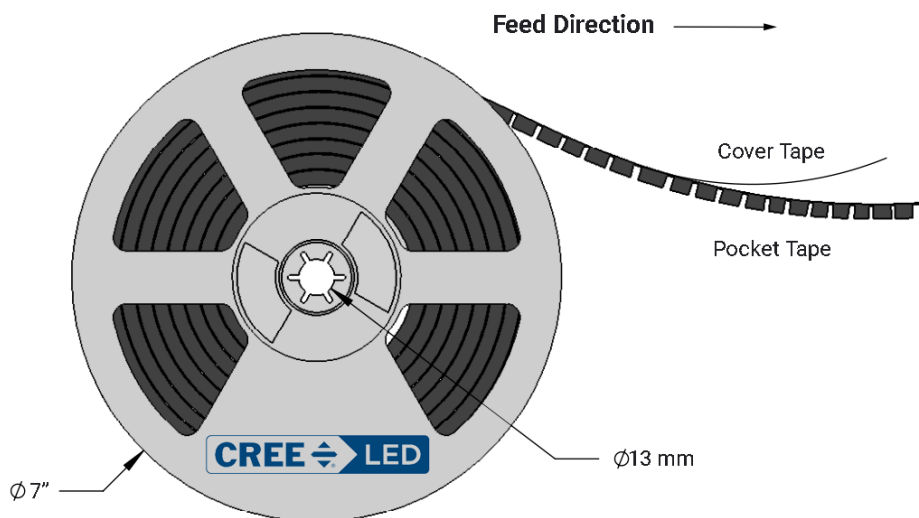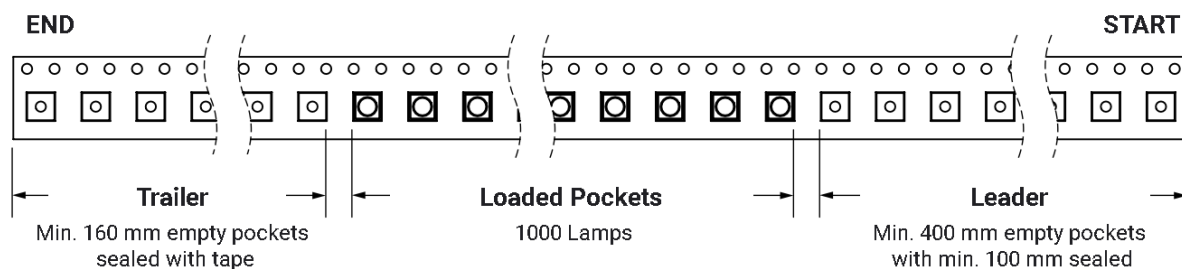
## TAPE AND REEL - CONTINUED
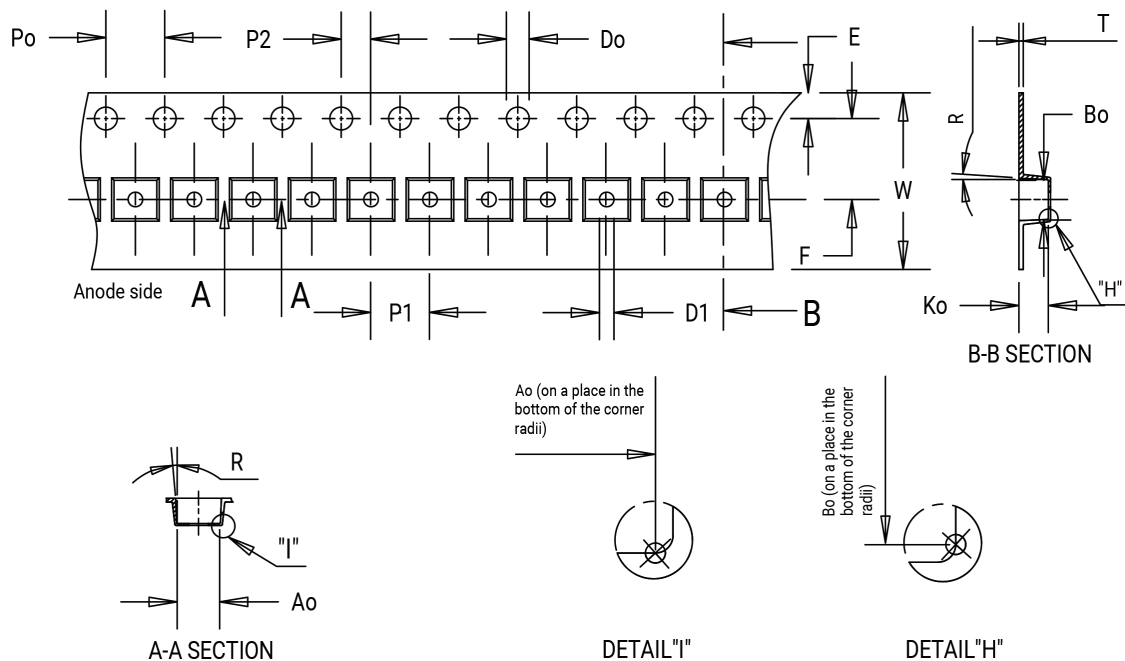
### XHP50.2



| Item | Ao | Bo | Ko | Po | P1 | P2 | T | E | F | Do | D1 | W | R |
|------|------|------|------|------|------|------|------|------|------|------|------|-------|-----|
| Dim. | 5.30 | 5.30 | 3.70 | 4.00 | 8.00 | 2.00 | 0.36 | 1.75 | 5.50 | 1.50 | 1.50 | 12.00 | 5° |

## TAPE AND REEL - CONTINUED

**XHP50.2**



END ..... START

Trailer — Min. 160 mm empty pockets sealed with tape

Loaded Pockets — 500 Lamps

Leader — Min. 400 mm empty pockets with min. 100 mm sealed

Feed Direction →

Cover Tape

Pocket Tape

Ø13 mm

Ø7"
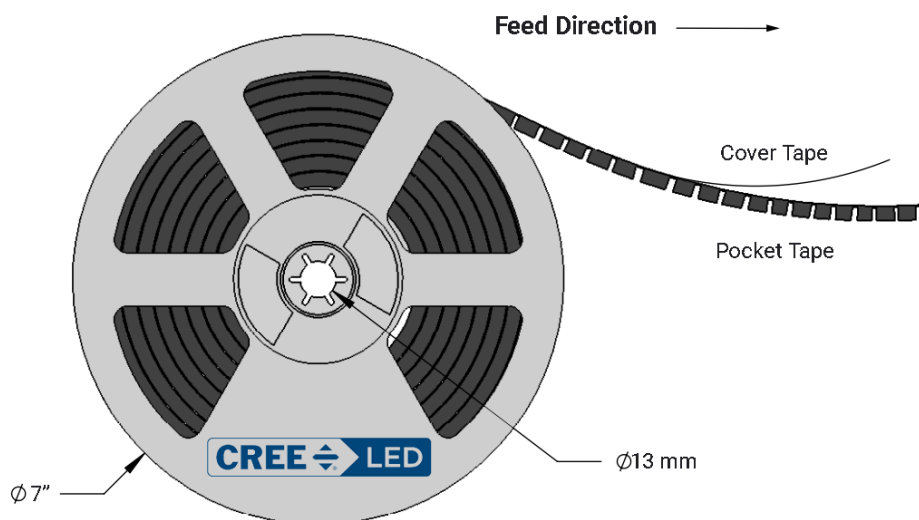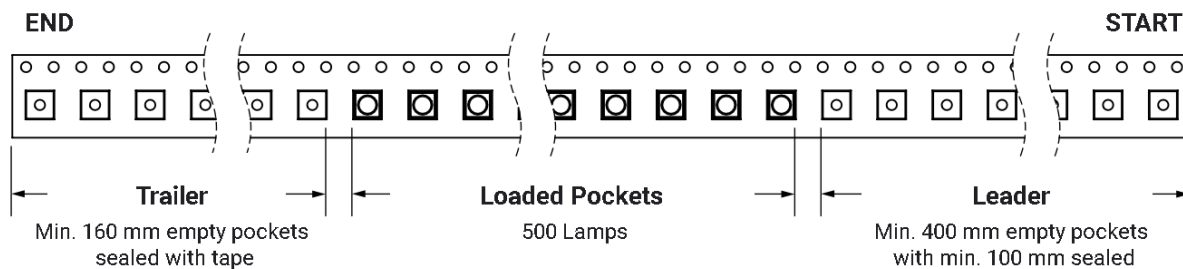
## TAPE AND REEL - CONTINUED
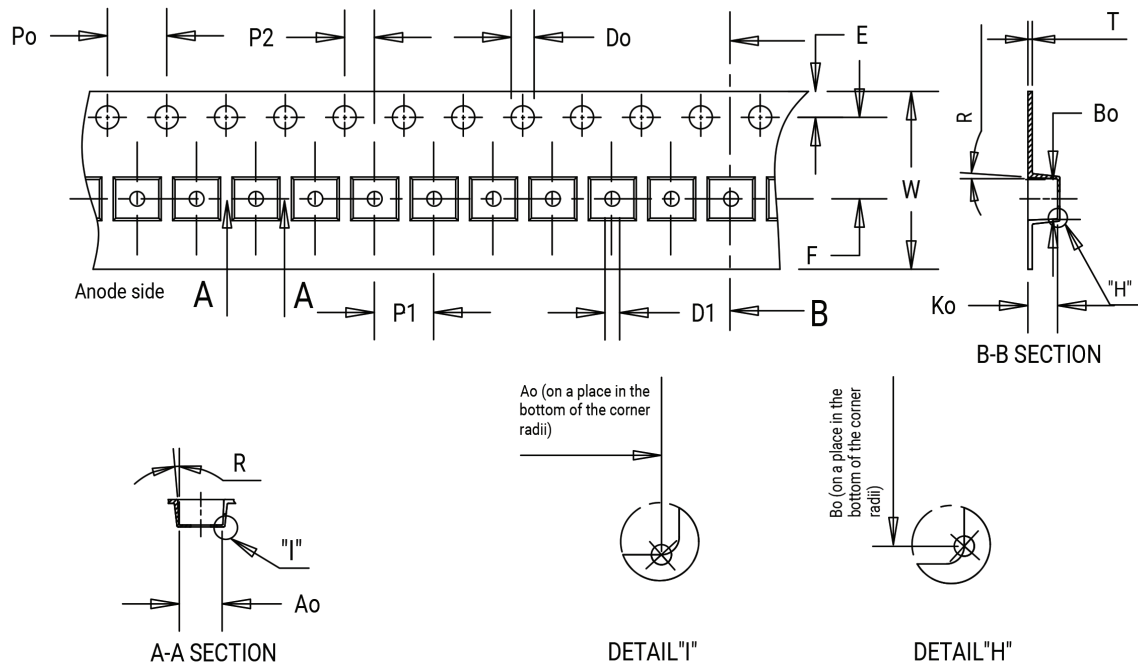
### XHP50.3



### XHP50.3 High Density

| Item | Ao | Bo | Ko | Po | P1 | P2 | T | E | F | Do | D1 | W | R |
|------|------|------|------|------|------|------|------|------|------|------|------|-------|-----|
| Dim. | 5.30 | 5.30 | 3.70 | 4.00 | 8.00 | 2.00 | 0.36 | 1.75 | 5.50 | 1.50 | 1.50 | 12.00 | 5° |

### XHP50.3 High Intensity

| Item | Ao | Bo | Ko | Po | P1 | P2 | T | E | F | Do | D1 | W | R |
|------|------|------|------|------|------|------|------|------|------|------|------|-------|-----|
| Dim. | 5.40 | 5.40 | 1.5 | 4.00 | 8.00 | 2.00 | 0.30 | 1.75 | 5.50 | 1.50 | 1.50 | 12.00 | 7° |

## TAPE AND REEL - CONTINUED
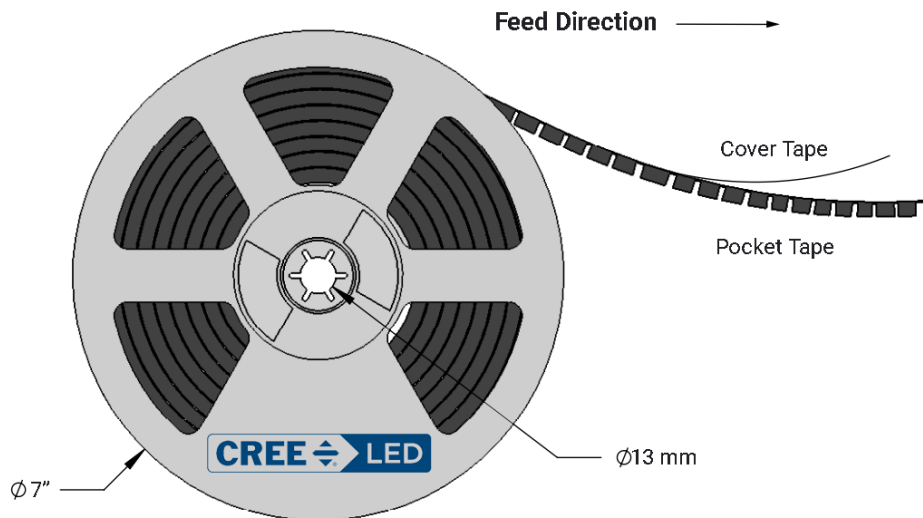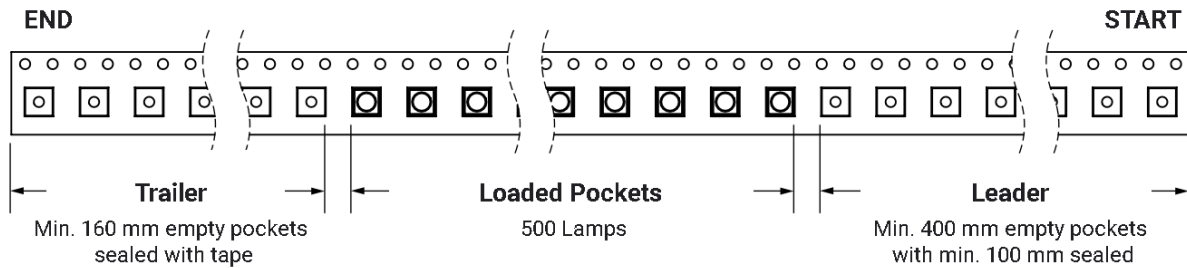
### XHP50.3 High Density



END                                                                    START

Trailer                          Loaded Pockets                        Leader
Min. 160 mm empty pockets            500 Lamps                  Min. 400 mm empty pockets
    sealed with tape                                            with min. 100 mm sealed



Feed Direction →

Cover Tape

Pocket Tape

∅13 mm

∅7"

## TAPE AND REEL - CONTINUED

### XHP50.3 High Intensity



END                                                                 START

Trailer                    Loaded Pockets                    Leader
Min. 160 mm empty pockets      1000 Lamps       Min. 400 mm empty pockets
sealed with tape                                with min. 100 mm sealed

Feed Direction ———→

Cover Tape

Pocket Tape

Ø7"        Ø13 mm

## TAPE AND REEL - CONTINUED

**XHP70.2**



A-A SECTION

DETAIL"I"

DETAIL"H"

B-B SECTION
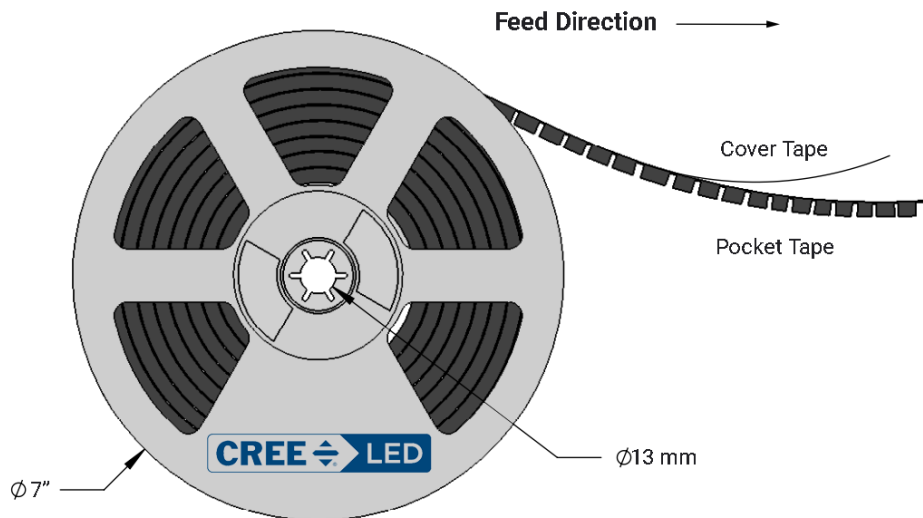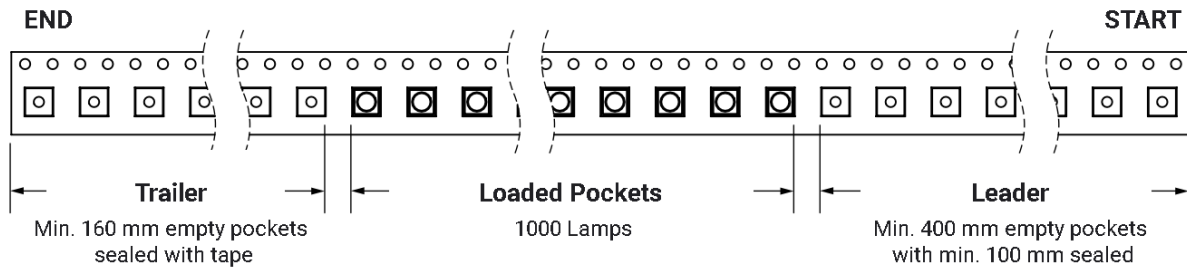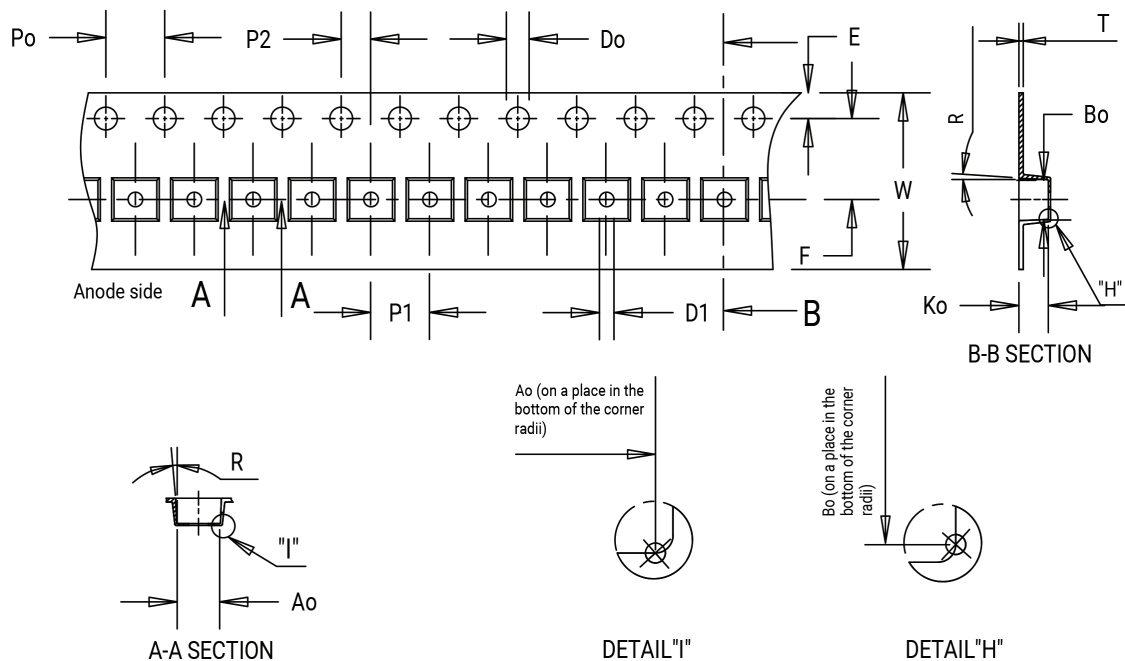
| Item | Ao | Bo | Ko | Po | P1 | P2 | T | E | F | Do | D1 | W | R |
|------|------|------|------|------|-------|------|------|------|------|------|------|-------|-----|
| Dim. | 7.40 | 7.40 | 4.60 | 4.00 | 12.00 | 2.00 | 0.36 | 1.75 | 7.50 | 1.50 | 1.50 | 16.00 | 5° |

## TAPE AND REEL - CONTINUED

**XHP70.2**

Feed Direction ⟶

END                                                                                    START

| Trailer | Loaded Pockets | Leader |
|---------|----------------|--------|
| Min. 160 mm empty pockets sealed with tape | 1000 Lamps | Min. 400 mm empty pockets with min. 100 mm sealed |

**Feed Direction** ⟶

Cover Tape

Pocket Tape

∅13 mm

∅13"
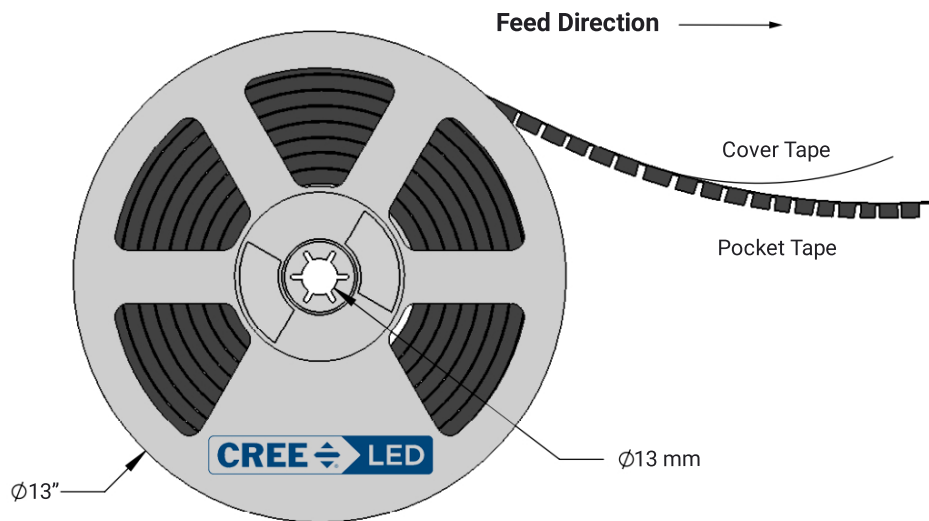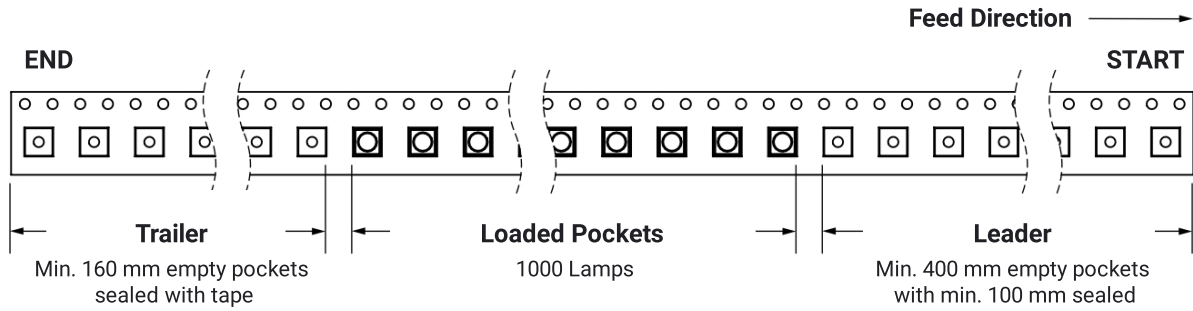
## TAPE AND REEL - CONTINUED
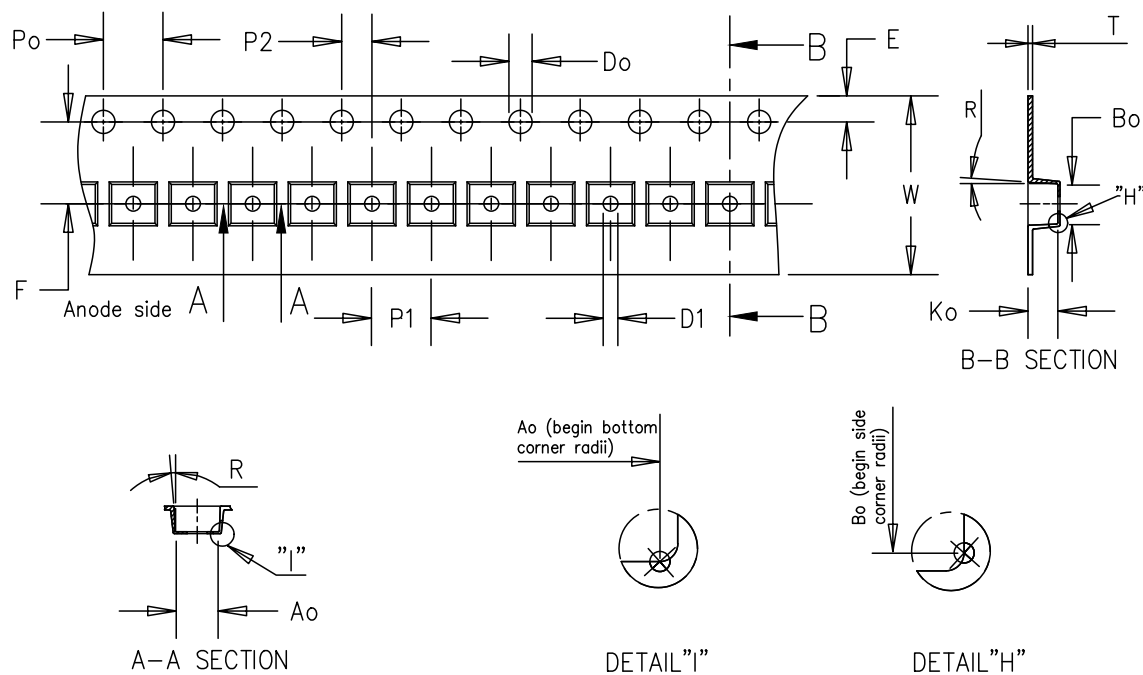
**XHP70.3**



### XHP70.3 High Density

| Item | Ao | Bo | Ko | Po | P1 | P2 | T | E | F | Do | D1 | W | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dim. | 7.40 | 7.40 | 4.60 | 4.00 | 12.00 | 2.00 | 0.36 | 1.75 | 7.50 | 1.50 | 1.50 | 16.00 | 5° |

### XHP70.3 High Intensity

| Item | Ao | Bo | Ko | Po | P1 | P2 | T | E | F | Do | D1 | W | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dim. | 7.60 | 7.60 | 1.70 | 4.00 | 12.00 | 2.00 | 0.30 | 1.75 | 7.50 | 1.50 | 1.50 | 16.00 | 3° |

## TAPE AND REEL - CONTINUED

**XHP70.3**

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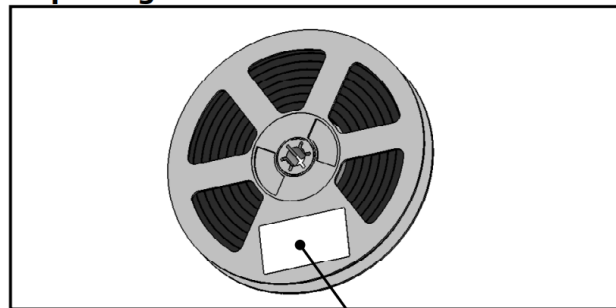
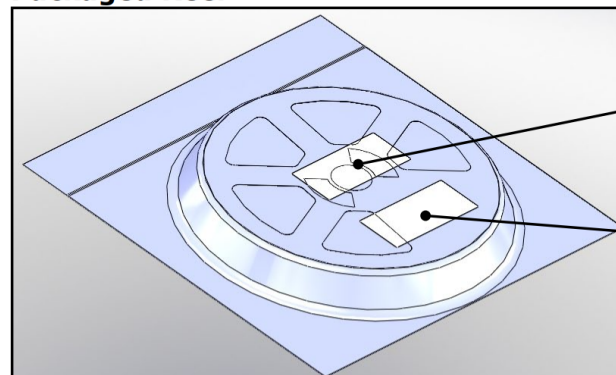CLD-AP202
REV 14A

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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.

### Unpackaged Reel



Label with Cree LED Bin Code, Quantity, Reel ID
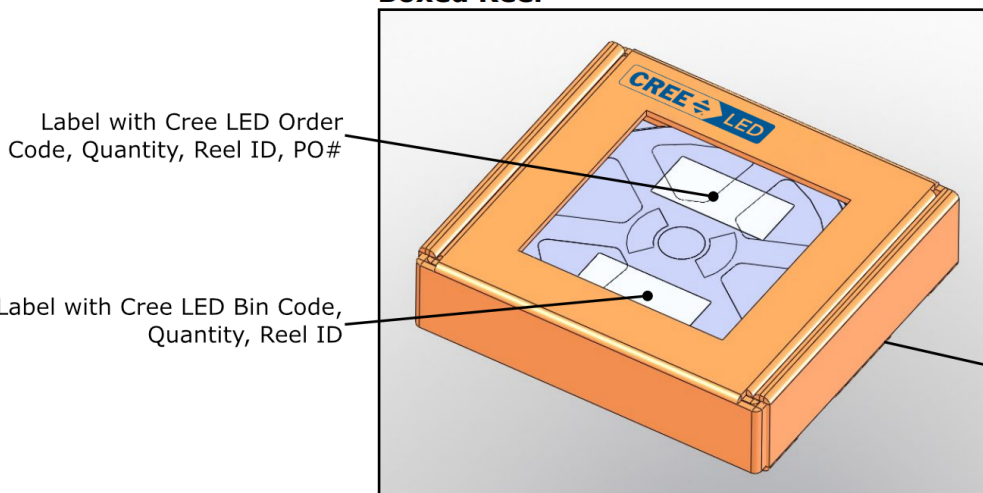
### Packaged Reel



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)