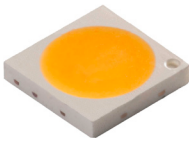
J Series® LEDs

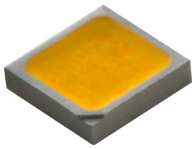
2016

2835 White
2835 Pro9™

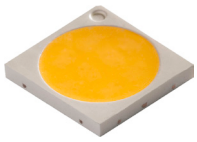
2835 Color



3030 Round



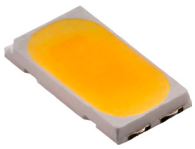
3030 HE
JB3030C



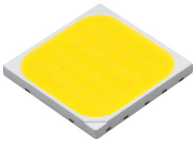
5050A Round

5050B Square

5050C Square



5630



7070

INTRODUCTION

This application note applies to J Series® LEDs.

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

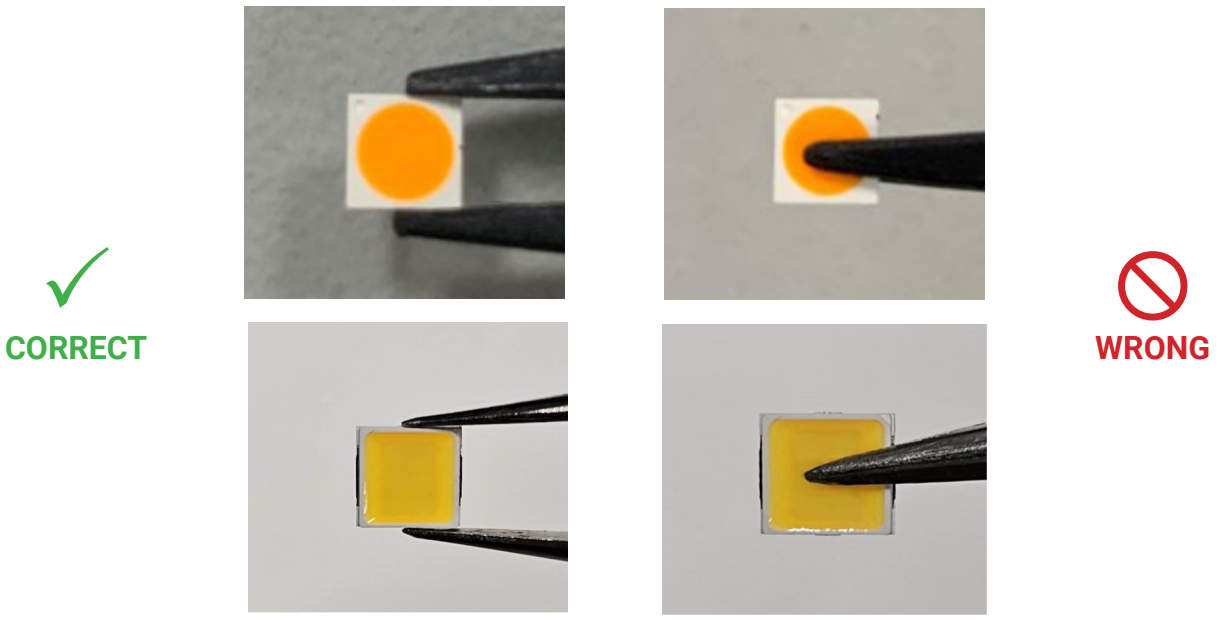
TABLE OF CONTENTS

Cree LED / 4001 E. Hwy. 54, Suite 2000 / Durham, NC 27713 USA / +1.919.313.5330 / www.cree-led.com

HANDLING J SERIES® LEDS

Manual Handling

- Use tweezers to grab J Series LEDs at the base.
- Do not touch the Light Emitting Surface (LES) with the tweezers.
- Do not touch the LES with fingers.
- Do not push on the LES.
- Excessive force on the LES could damage the LED.



Cree LED recommends the following at all times when handling J Series LEDs or assemblies containing these LEDs:

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

Pick & Place

Cree LED suggests that the customer consider the following general pick & place guidelines:

- The nozzle tip should be clean and free of any particles since it may interact with the top surface of the silicone encapsulation of the J Series LED package.
- During setup and the first initial production runs, it is a good practice to inspect the top surface of the J Series LED emitters under a microscope after reflow to ensure that the emitters are not accidentally damaged by the pick & place nozzle.

If the LED sticks to the nozzle during the pick & place process, the recommendations below might be able to overcome the issue:

- Construct the nozzle head of conductive Delrin® material
- Construct the nozzle head of PU (polyurethane) material

Nozzle

- Cree LED suggests the nozzle outer diameter be larger than the LED silicone encapsulation and smaller than the opening of the reel pocket tape. See the table below for detailed dimensions.
- Cree LED also suggests the nozzle pick the LED edge (lead-frame) to avoid LED damage.
- A plastic or ceramic nozzle is acceptable. A metal nozzle needs to be tested to avoid a large force on the LED.

LED Package	Encapsulation Size (mm)	Opening of Pocket Size (mm)
2016	1.75 x 1.35	2.30 x 1.75
2835	2.95 x 2.50	3.00 x 3.70
2835 Pro9	2.95 x 2.50	3.00 x 3.70
3030 (Round LES)	Φ 2.60	3.20 x 3.20
3030 (Square LES)	2.60 x 2.60	3.15 x 3.15
JB3030C (Square LES)	2.64 x 2.64	3.30 x 3.50
5050A (Round LES)	Φ 4.56	5.20 x 5.40
5050B (Square LES)	4.55 x 4.55	5.20 x 5.40
5050C (Square LES)	4.52 x 4.45	5.20 x 5.40
5630	4.68 x 2.58	6.05 x 3.25
7070	6.50 x 6.50	7.30 x 7.30

CIRCUIT BOARD PREPARATION & LAYOUTS

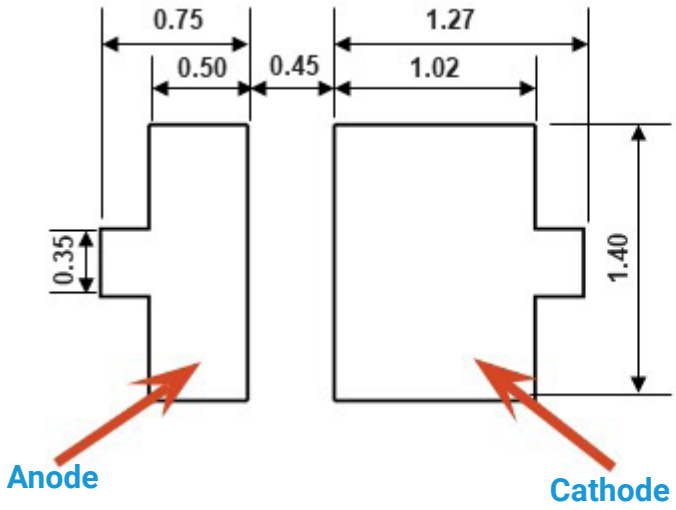
Printed circuit boards (PCBs) should be prepared and/or cleaned according to the manufacturer's specifications before placing or soldering J Series LEDs onto the PCB.

The diagrams below shows the recommended PCB solder pad layout for J Series LEDs.

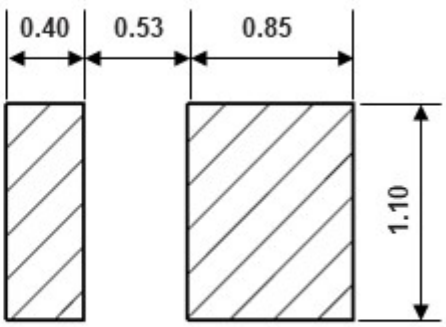
All dimensions in mm.

2016 Series

Applicable Part Numbers: JB2016xWT-x-xxxxxxxxx-xxxxxxxx



Recommended Solder Pad



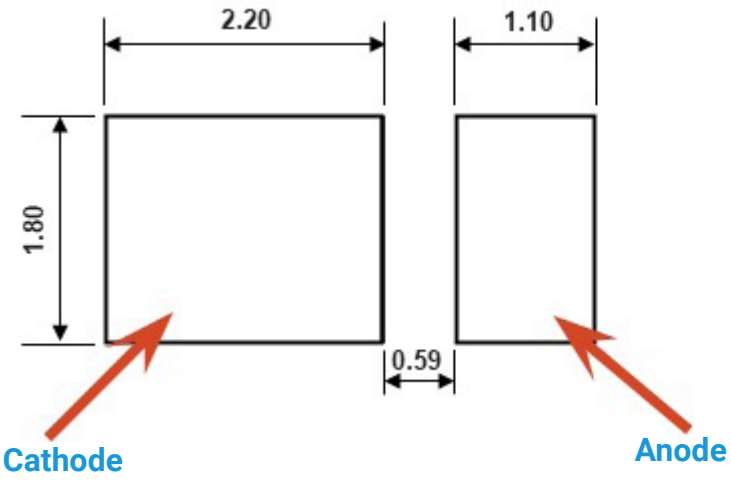
Recommended Stencil Openings

Notes:

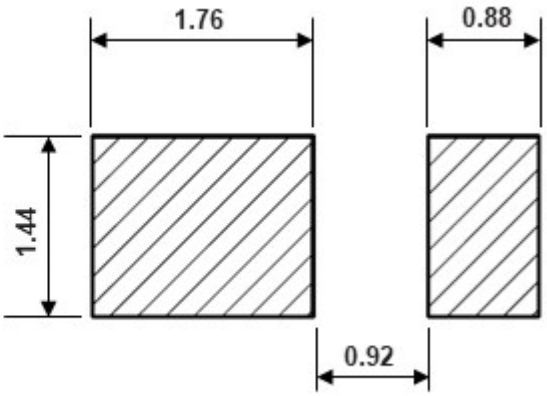
- Cree LED recommends using thermal pad kickouts to maximize component thermal performance.
- Cree LED recommends using white solder mask material to minimize system optical loss.
- This stencil has been tested and optimized for the avoidance of voiding when using ALPHA® LUMET® P30 Maxrel solder paste. 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.

2835 White, 2835 Pro9

Applicable Part Numbers: 2835 White: Jx2835xWT-x-xxxxxxxxx-xxxxxxxx
2835 Pro9: Jx2835xWT-x-xxxxxxxxx-xxxxPxxx



Recommended PCB Solder Pad

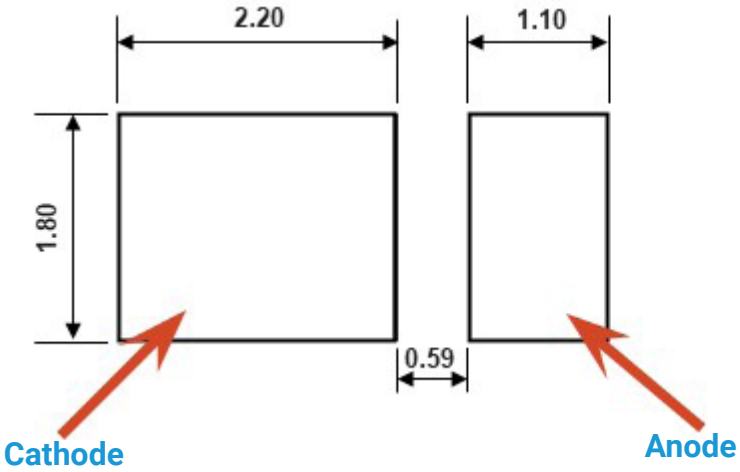


Recommended Stencil Openings

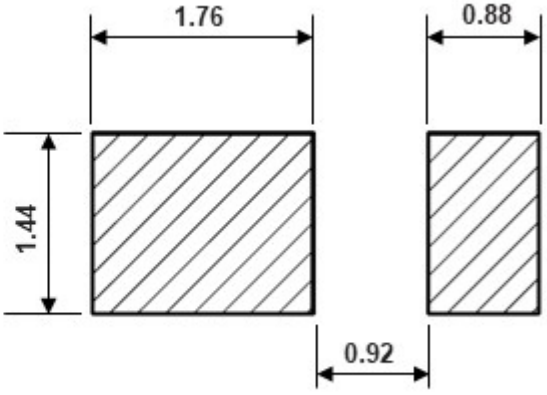
2835 Colors

Violet, Royal Blue, Blue, Cyan, Green, PC Lime, PC Mint, PC Amber, PC Red Orange, PC Purple

Applicable Part Numbers: Violet: JE2835AVT-N-xxxxxxxxx-xxxxxxxx
Royal Blue: JE2835ARY-N-xxxxxxxxx-xxxxxxxx
Blue: JE2835ABL-N-xxxxxxxxx-xxxxxxxx
Cyan: JE2835ACY-N-xxxxxxxxx-xxxxxxxx
Green: JE2835AGR-N-xxxxxxxxx-xxxxxxxx
PC Lime: JE2835APL-N-xxxxxxxxx-xxxxxxxx
PC Mint: JE2835APM-N-xxxxxxxxx-xxxxxxxx
PC Amber: JE2835APA-N-xxxxxxxxx-xxxxxxxx
PC Red-Orange: JE2835APO-N-xxxxxxxxx-xxxxxxxx
PC Purple: JE2835APP-N-xxxxxxxxx-xxxxxxxx



Recommended PCB Solder Pad

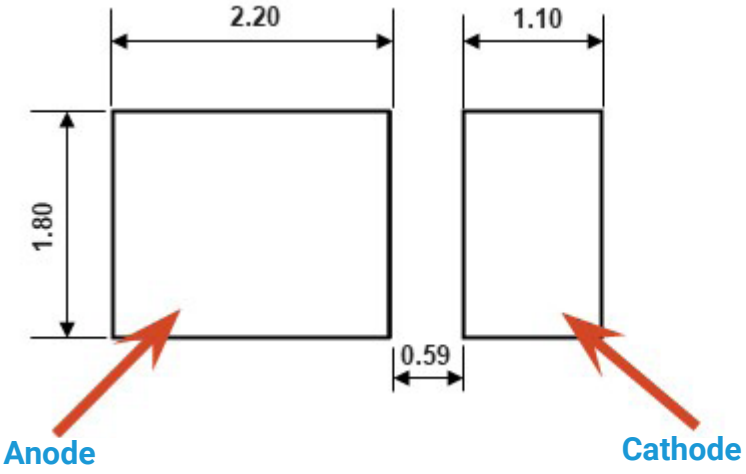


Recommended Stencil Openings

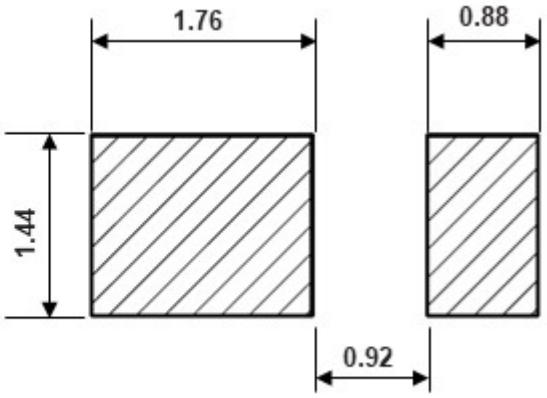
2835 Colors

Amber, Red Orange, Red, Photo Red, Far Red

Applicable Part Numbers: Amber: JE2835AAM-N-xxxxxxxxx-xxxxxxxx
Red-Orange: JE2835ARO-N-xxxxxxxxx-xxxxxxxx
Red: JE2835ARD-N-xxxxxxxxx-xxxxxxxx
Photo Red: JE2835AHR-N-xxxxxxxxx-xxxxxxxx
Far Red: JE2835AFR-N-xxxxxxxxx-xxxxxxxx



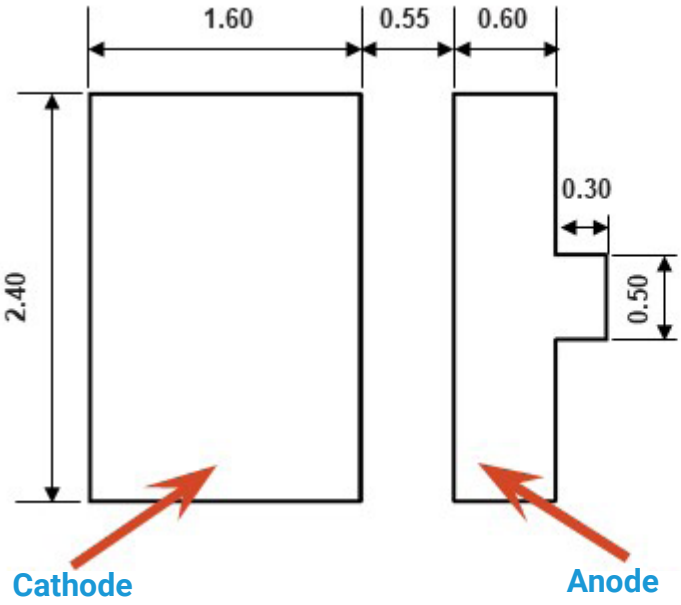
Recommended PCB Solder Pad



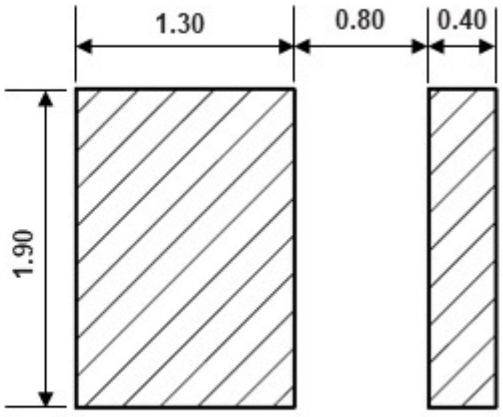
Recommended Stencil Openings

3030 & 3030 HE

Applicable Part Numbers: Jx3030AWT-x-xxxxxxxxx-xxxxxxxx
Jx3030UWT-x-xxxxxxxxx-xxxxxxxx



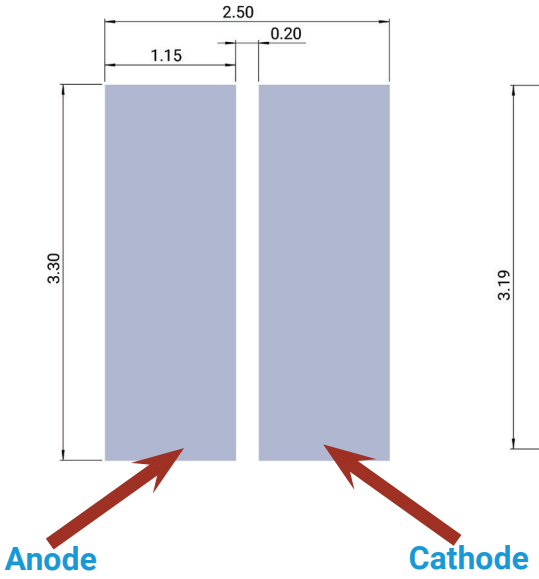
Recommended PCB Solder Pad



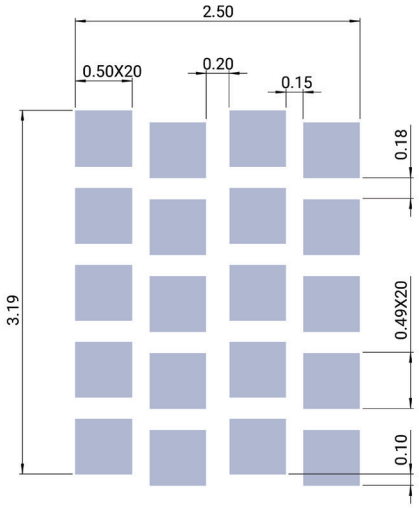
Recommended Stencil Openings

JB3030C

Applicable Part Numbers: JB3030CWT-E-xxxxxxxxx-xxxxxxxx
JB3030CWT-F-xxxxxxxxx-xxxxxxxx



Recommended PCB Solder Pad

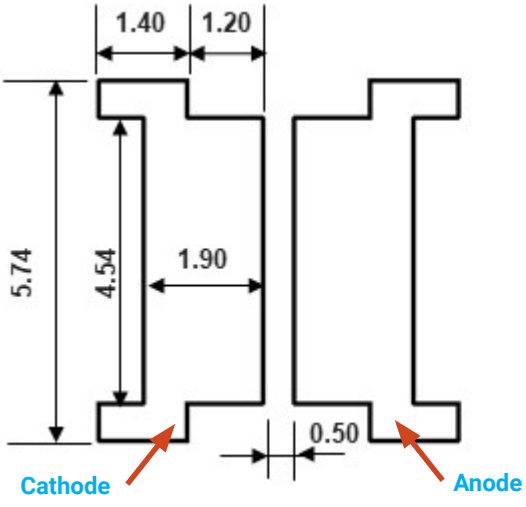


Recommended Stencil Openings

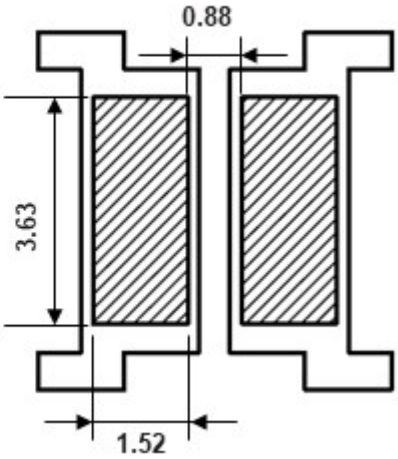
5050A

Round LES

Applicable Part Numbers: Jx5050AWT-x-xxxxxxxxx-xxxxxxxx



Recommended PCB Solder Pad

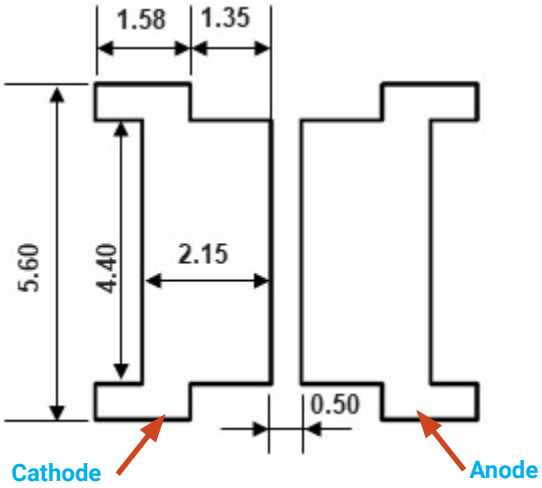


Recommended Stencil Openings

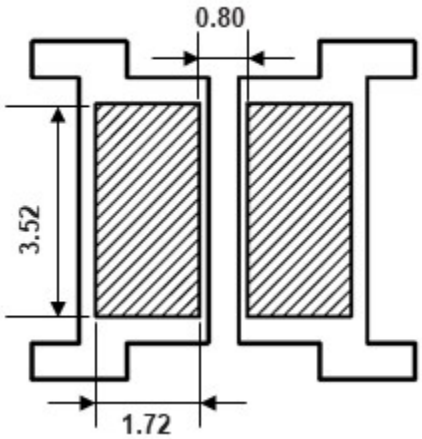
5050B

Square LES

Applicable Part Numbers: Jx5050BWT-x-xxxxxxxxx-xxxxxxxx



Recommended PCB Solder Pad

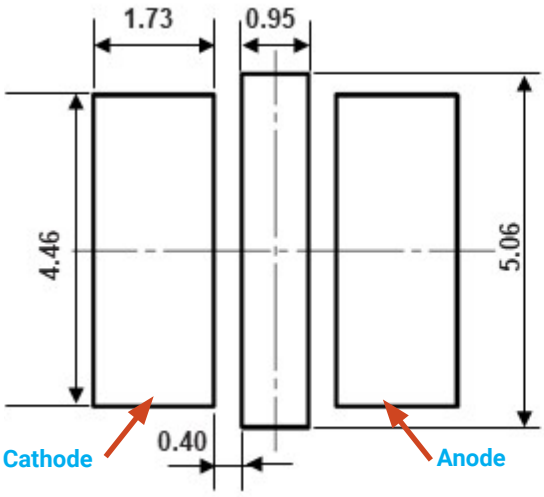


Recommended Stencil Openings

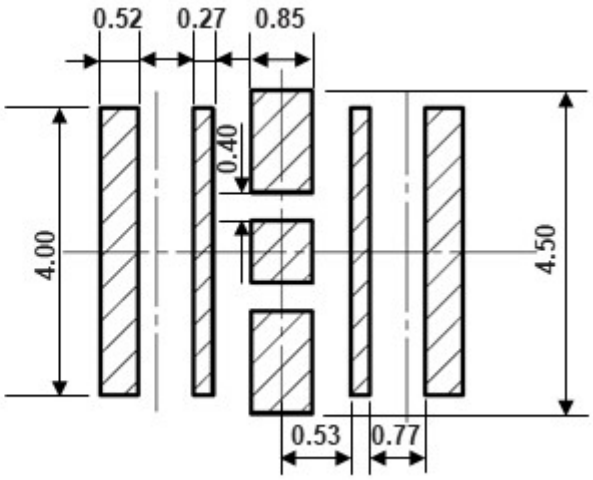
5050C

Square LES

Applicable Part Numbers: Jx5050CWT-x-xxxxxxxxx-xxxxxxxx
The middle pad is electrically active.



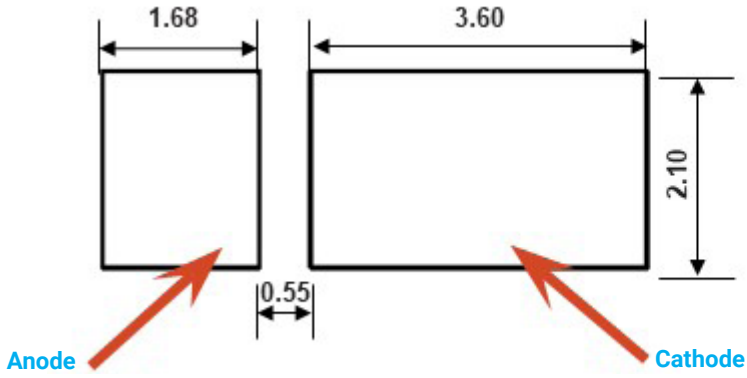
Recommended PCB Solder Pad



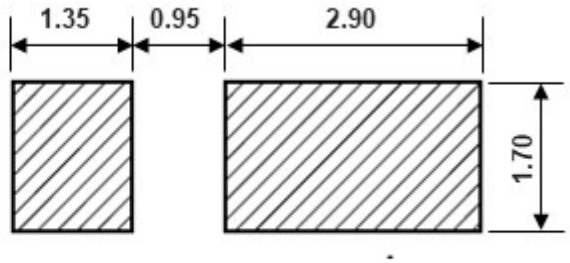
Recommended Stencil Openings

5630 Series (not applicable to 5630-C)

Applicable Part Numbers: JB5630AWT-x-xxxxxxxxx-xxxxxxxx



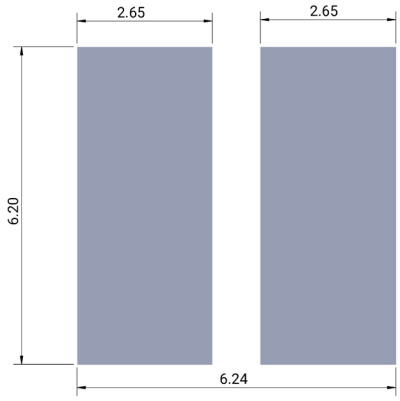
Recommended PCB Solder Pad



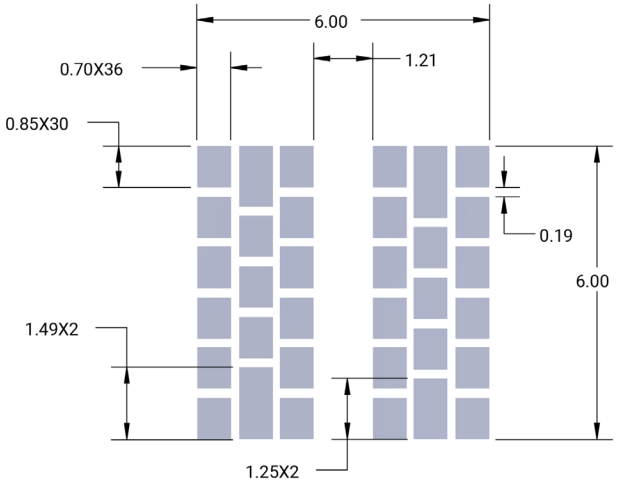
Recommended Stencil Openings

7070B

Applicable Part Numbers: JU7070BWT-x-xxxxxxxxx-xxxxxxxx



Recommended PCB Footprint



Recommended Stencil Pattern

THERMAL MEASUREMENT GUIDELINES

J Series 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 pictures below.

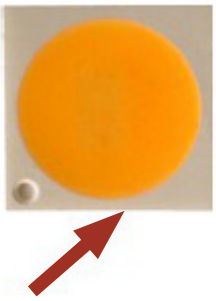
2016

5630

2835 White
2835 Pro9

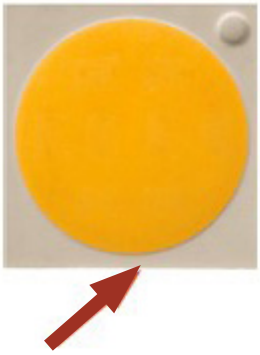
2835 Color

3030 (Round LES)

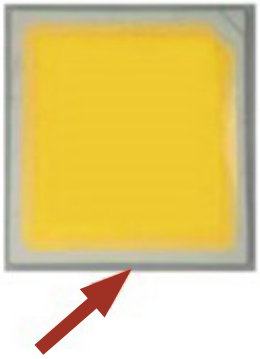


3030 HE (Square LES)
JB3030C

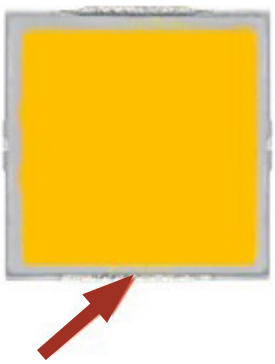
5050A (Round LES)



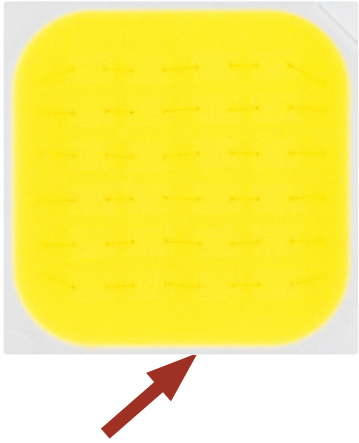
5050B (Square LES)



5050C (Square LES)



7070



J Series LEDs case temperature (T_s) should be measured by a thermocouple. Therefore, a thermally conductive epoxy or solder is recommended to ensure good heat transfer from the board to the thermocouple. The thermocouple must be in direct contact with the copper thermal pad. Any solder mask must be removed first before mounting the thermocouple onto the PCB copper pad.

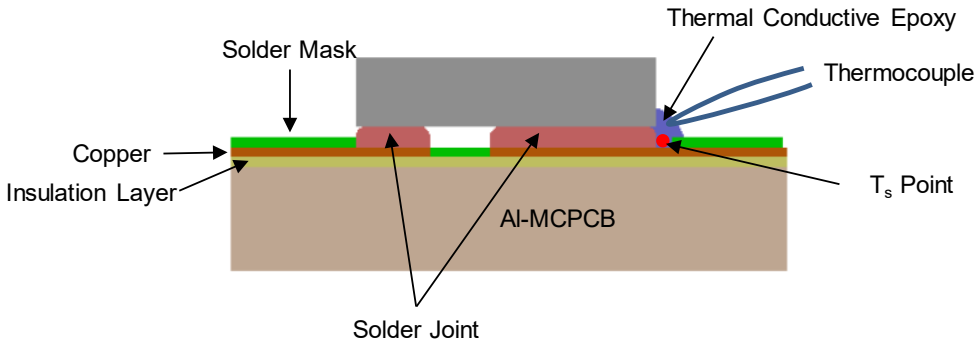
The typical thermal resistance (R_{th}) between junction and the solder pads of all of J Series LEDs are provided in the datasheet. With this information, the junction temperature (T_j) can be determined according to the following equation:

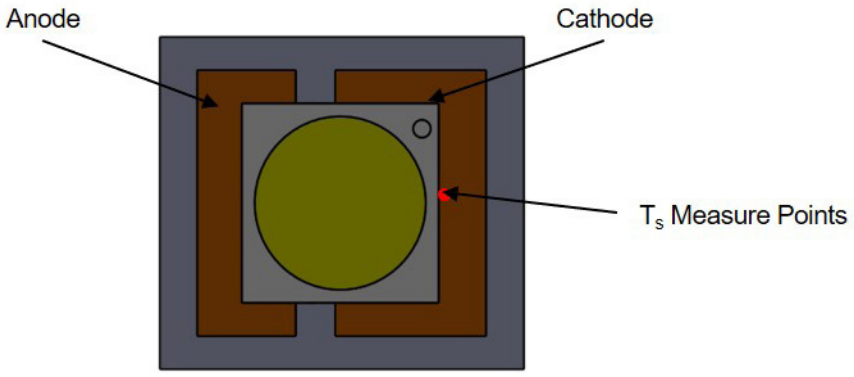
$$T_j = T_{case} + R_{th} \times P_{electrical}$$

In this equation, T_{case} is the temperature at the bottom of the LED solder pads and $P_{electrical}$ is the electrical power going into the LED. In typical applications it may be difficult, though, to measure the temperature (T_{case}) directly. Therefore, a practical way to determine the junction temperature of the J Series LEDs is to measure the temperature (T_s) of a predetermined sensor pad on the PCB with a thermocouple. The recommended location of the sensor pad is next to the cathode of LED on the PCB, as shown below. To ensure an accurate reading, the thermocouple tip must make direct contact to the copper of the PCB onto which the LED cathode pad is soldered, i.e., any solder mask or other masking layer must first be removed before mounting the thermocouple onto the PCB. The tip of the thermocouple wire should be placed as close as possible to the LED package on the exposed cathode copper layer.

The T_s test method shown below is applicable to all the J Series LEDs unless otherwise specified.

2016, 5630, 2835, 2835 Pro9, 3030, JB3030C, 5050 (not applicable to 5050 E Class), 7070

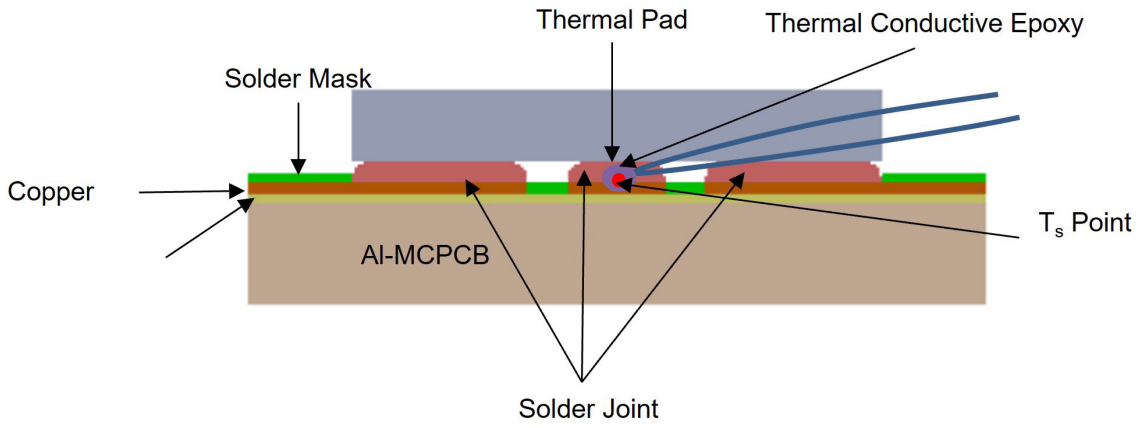


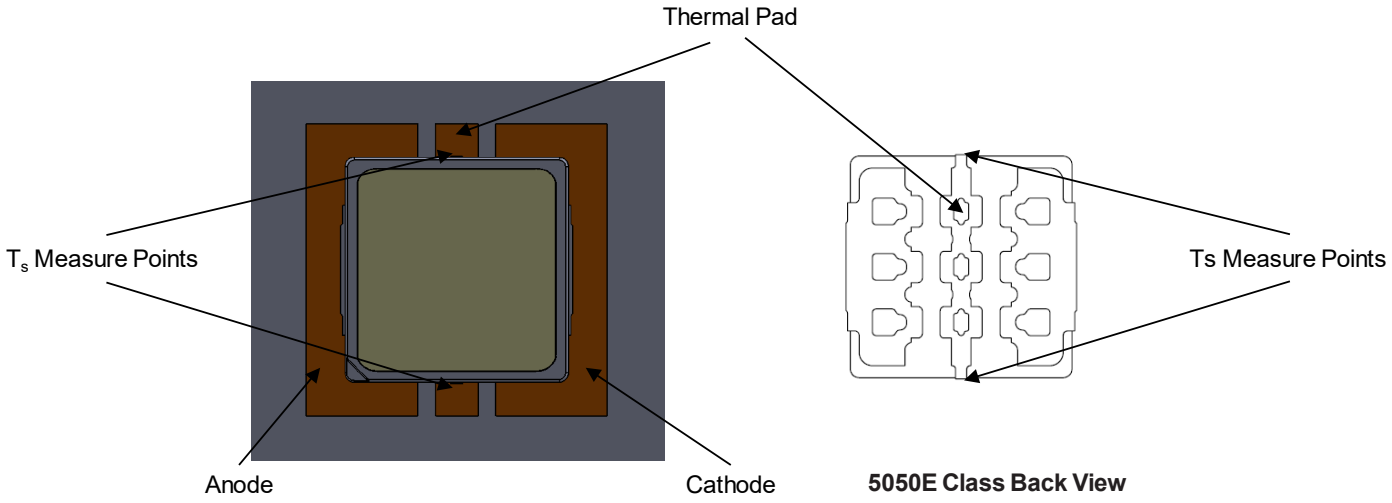


It is not required to use a solder footprint for the thermal pad that is larger than the J Series LED itself. In testing, Cree LED has found such a solder pad to have insignificant impact on the resulting T_s measurement.

The T_s test method shown below is applicable to J Series 5050 E Class LEDs, which each have an individual thermal pad.

5050 E Class





5050E Class Back View

It is not required to use a solder footprint for the thermal pad that is larger than the J Series 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 J SERIES® LEDS

J Series LEDs are designed to be reflow soldered to a PCB. Reflow soldering may be done by a reflow oven and following the reflow soldering profile listed on page 15 and page 21.

CORRECT

WRONG

Cree LED recommends the maximum number of reflow solderings not exeed 2 times under MSL3.

- Do not wave solder J Series LEDs.
- Do not hand solder J Series LEDs.

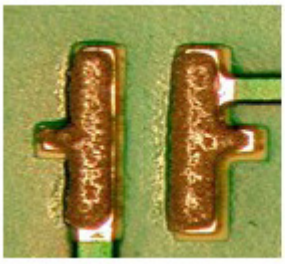
Solder Paste Type

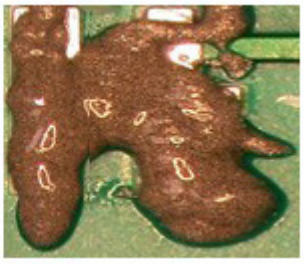
- Cree LED strongly recommends using “no clean” solder paste with J Series LEDs so that cleaning the PCB after soldering is not required.
- Cree LED recommends the following solder paste compositions: SnAgCu (tin/silver/copper) and SnAg (tin/silver).

Solder Paste Thickness

The choice of solder and the application method will dictate the specific amount of solder needed. 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

After Soldering

After soldering, allow J Series LEDs to return to room temperature before subsequent handling. Premature handling of the device, especially around the LES, 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 J Series LEDs in the provided, resealable moisture-barrier packaging (MBP) until immediately prior to soldering. Unopened MBPs that contain J Series LEDs do not need special storage for moisture sensitivity.

Once the MBP is opened, J Series LEDs may be stored as MSL 3 per JEDEC J-STD-033, meaning they have limited exposure time before damage to the LED may occur during the soldering operation. The table below specifies the maximum exposure time in days depending on temperature and humidity conditions. LED with exposure times longer than the specified maximums must be baked according to the baking conditions listed below.

Baking Conditions

It is not necessary to bake all J Series LEDs. Only the LEDs that meet all of the following criteria must be baked:

- LEDs that have been removed from the original MBP.
- LEDs that have been exposed to a humid environment longer than listed in the below.
- LEDs that have not been soldered.

Moisture Sensitivity Level	Temp	Maximum Percent Relative Humidity				
		50%	60%	70%	80%	90%
Level 3	35 °C	8	5	1	0.5	0.5
Level 3	30 °C	11	7	1	1	1
Level 3	25 °C	14	10	2	1	1
Level 3	20 °C	20	13	2	1	1

LEDs should be baked at 60 °C for 24 hours. LEDs may be baked in the original reels. Remove LEDs from the MBP before baking. Do not bake parts at temperatures higher than 60 °C. This baking operation resets the exposure time as defined in the table above.

SOLDERING GUIDELINES - E & F CLASS LEDS

This section contains important soldering and rework guidelines for the following LEDs.

JB3030C E Class: JB3030CWT-E-xxxxxxxxx-xxxxxxxx
JB3030C F Class: JB3030CWT-F-xxxxxxxxx-xxxxxxxx
JR5050C E Class: JR5050CWT-E-xxxxBxxxx-xxxxxxxx

These listed LEDs will be referred to as “E Class LEDs” in the rest of this section. For all other J Series LEDs, please refer to the Soldering Guidelines section on page 21.

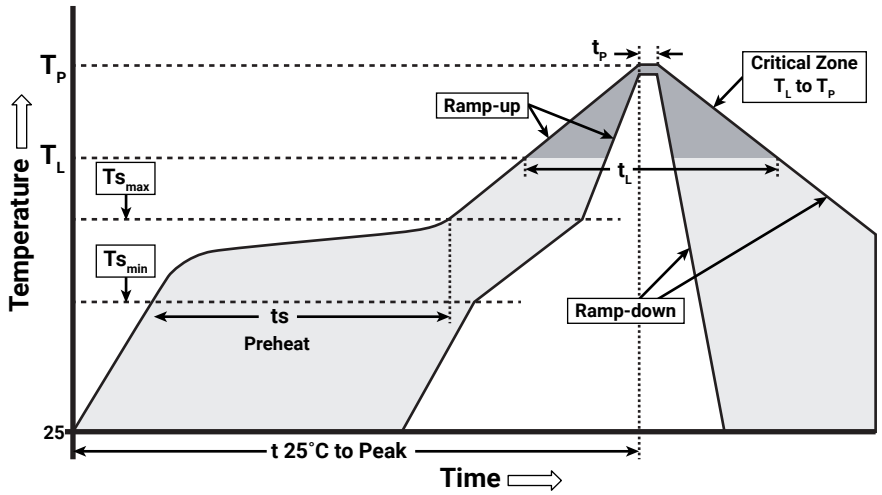
Recommended Reflow Profile

In testing, Cree LED has found J Series LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below below unless otherwise specified. Note that these conditions are different than other J Series LEDs. E Class LEDs generally have lower recommended temperatures. 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.

However, E Class LEDs are more sensitive to reflow conditions than other Cree LED packages, so the following guidelines must be followed regardless of the chosen solder paste:

- Maximum peak temperature (Tp): 235-245 °C.
- Time within 5 °C of actual peak temperature (tp): 20-40 seconds.
- Do not reflow the LEDs more than one time under MSL3.
- Do not use a hot plate or heat gun to repair failed LEDs for commercial use. This can create high stress on the LED diodes and lead frame. See the rework guidelines section below for recommended approaches for both prototype and commercial use.
- All temperatures refer to the topside of the package, measured on the package body surface. When measuring the reflow profile temperature, use the exact production PCB fully populated. Testing on PCBs of a different size, thickness, material, reflectivity, or without other components can affect the heating and cooling rates, giving erroneous measurements.
- Do not cover thermocouple measurement points with tape or glue. Doing so will affect the accuracy of the measurement.

Note that this general guideline might not apply to all PCB designs and configurations of reflow soldering equipment.



IPC/JEDEC J-STD-020C

Reflow Profile Parameters for E Class LEDs Only	
Profile Feature	**Lead-Free Solder**
Average Ramp-Up Rate (Ts_{max} to T_p)	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.

Troubleshooting LEDs on a PCBA

The most common failure mode of E Class LEDs after improper reflow conditions is an electrical short between the diodes within the LED package. This is usually caused by the reflow temperature running above the specified conditions or an excessive heating/cooling rate.

In the following scenarios, the LED is permanently damaged and should not be reworked:

- Any one or more diodes inside the package do not light up.
- One or more, or all of the diodes inside the package flicker or only faintly light up.

If the whole LED does not light up, or a whole string of LEDs do not light up, there might be a problem with the connection between the package and the PCB. The LEDs can be reflowed one more time using the suggested reflow oven profiles to repair the solder joint connection.

The cause of the failures can be diagnosed with an X-ray tool.

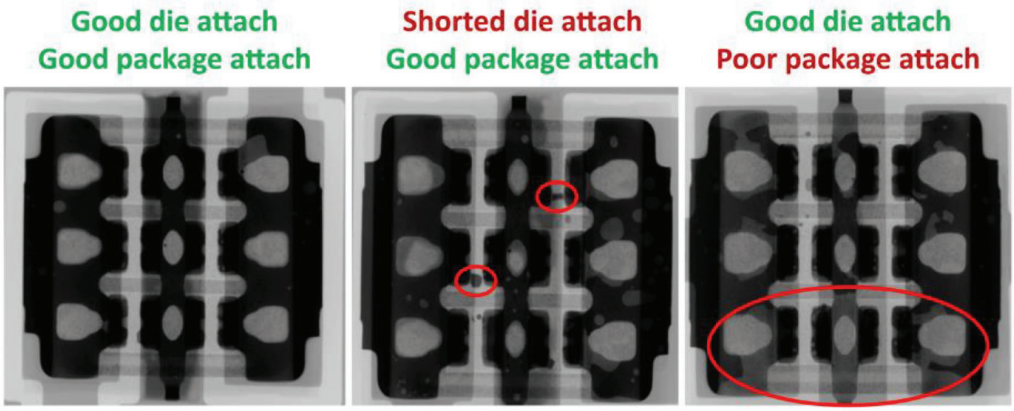


Figure 1: X-rays of 5050 E Class LEDs showing three scenarios for troubleshooting. The middle scenario of finding shorted die within the package is typically caused by improper reflow conditions and cannot be repaired. Note the metal found between the bond pads of the diodes inside the package, circled in red. The right scenario can be caused by many factors and may be repaired by adjusting reflow oven parameters, solder paste deposition parameters, and handling processes.

For prototyping and characterization builds, failing LEDs may be individually reworked using the procedures below. These procedures are not recommended for commercial production builds.

Guidelines for Rework of Individual LEDs on a PCBA

Reworking of E Class LEDs after first reflow may damage the reworked component or neighboring components, and this damage may not always be visible or measurable. Cree LED does not recommend rework of PCBAs with E Class LEDs, and Cree LED cannot guarantee reliability or lifetimes will meet expectations if rework is performed.

Cree LED understands the need for rework and have developed the following recommendations to be used only when necessary, understanding the risks involved and the need for additional testing to confirm operation after rework.

The most common cause of damage to LEDs during reflow is a heating rate that is too high. Both hot plate and hot air rework typical conditions can exceed the safe rate of temperature rise.

Setup and Materials for Hot Plate Rework

To rework failed LEDs on a PCBA, we can still use a hot plate while reducing the heating rate by adding thermal mass to the PCB. This could be any metal, or an identical blank PCB. It is important to monitor the temperature rise for each thermal mass.

The exact temperatures and sizing of thermal masses depend on many factors, including:

- Solder paste type
- PCB material
- Size of PCB
- Size and thermal mass of hot plate
- Airflow at the rework station

Because of the increased area and additional thermal interfaces, the hot plate temperature must be set higher than normal for the solder joint to reach the recommended 235 °C peak temperature.

In Cree LED's testing, the following setup worked consistently:

- 140 mm x 60 mm aluminum-core MCPCB with a 28-LED array and 38 g total mass
- Alpha Lumet P30 lead-free solder paste
- Sikama 8" x 8" hotplate set to 255 °C
- Copper plate, 190 g mass

This setup achieved an approximate heating rate of 130 °C/min through the melting point of 220 °C.

Procedure for Hot Plate Rework

Cree LED's Applications Team has been able to repeat the process below several times on a single board without inducing further failures.

Removing Failed LEDs:

1. Identify failed LEDs by testing the PCB at low current. Mark their positions.
2. Place the PCB on the copper plate or stack 1-2 matching bare PCB as added thermal mass, starting both at room temperature.
3. Place the stacked pieces on the hot plate.
4. Start a timer and monitor the PCB surface temperature via an IR thermometer.
5. Heat the PCB to a peak temperature of 230-235 °C (for lead-free solder), reaching that temperature in no less than 60 seconds.
6. If the PCB bows upwards away from the plate, it may be necessary to push down on an edge to help redistribute heat.
7. As soon as the failed LED(s) can be moved, remove the failed parts using tweezers.
8. Keeping them stacked, remove the PCB and plate from the hot plate and hold them in air while monitoring with the IR thermometer. Keep them cooling via natural convection until they fall to 200 °C. At this point all solder is solidified.
9. Optionally, and only after falling below 200 °C, place the PCB on a heat sink or large piece of metal to cool to room temperature more quickly.

Attaching New LEDs to Depopulated Failure Locations:

1. At room temperature, add new solder paste to the PCB where the components were removed.
2. Place the new components on the PCB pads. Align them carefully as they will not self-center as well as they normally would during oven reflow.
3. Repeat the same heating process above, starting with both PCB and thermal mass at room temperature, and heat to 230 °C over no less than 60 seconds. For more detailed instructions, see the heating rate plots below in Figure 2 and Figure 3.
4. Observe solder melting and the LEDs settling into position. It is sometimes necessary to gently nudge the LEDs with tweezers at this stage.
5. Repeat the cooldown process, removing both PCB and thermal mass together and hold them in air until they cool to below 200 °C.
6. Test the board to see if the process was successful.

Guidelines for Hand-Building LEDs on PCBAs

Cree LED does not recommend hand-building PCBAs for commercial sale but understands that this can be a fast and effective method for prototyping and early characterization. E Class LEDs are more sensitive to the above recommended reflow profile, so using a hot plate to reflow lead-free solder can often result in electrical shorts and string outs.

- Use a lead-based solder and a hot plate at temperatures not exceeding 200 °C. Please check all local regulations regarding lead-based solder relevant to the intended use of this prototype board.
- If hand-building using lead-free solder, slow the heating rate using additional thermal mass as detailed below.

Typically, placing a single PCB on a hot plate at 240 °C or higher will thermally shock E Class LEDs and cause failures due to a high heating rate. For prototyping builds only, this heating rate can be slowed to prevent failures by inserting 1, 2, or 3 bare PCBs of the same material in between the populated PCB and the hot plate.

In some cases, this can be too slow, so one or more of these thermal mass layers should be removed during heating to match the intended heating rate of the solder paste manufacturer. In our examples in Figure 2 below, we show the heating rate of an aluminum 2 W/m-K board on a 240 °C hot plate with and without these extra layers of thermal mass. They are compared to the grey and black dashed lines which are the recommended heating rates of the solder paste.

Heating rates and peak temperatures should always be measured for the specific product. For example, FR4 boards shown in Figure 3 naturally have a lower heating rate and need less thermal mass in between.

These curves should serve as examples to save customers time in starting this process, but the board temperature should be measured in each case with a thermal couple on the Tc point on the top of the board. As previously stated, E Class LEDs should not be heated to 230 °C in less than 60 seconds, and cooling should also occur over several minutes.

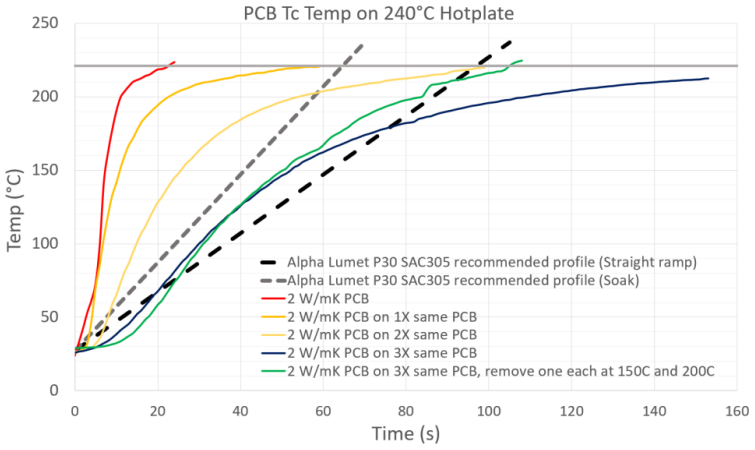


Figure 2: Temperature rise of a 2 W/m-K PCB on a 240 °C hot plate (solid lines) plotted against the recommended heating rates of Alpha Lumet P30 SAC305 (dashed lines). The horizontal grey line indicates the minimum liquidus temperature needed for solder melting at 220 °C. The green line shows an ideal heating rate created by using 3 bare PCBs below the populated PCB and removing one each as the temperature reaches 150 °C and 200 °C.

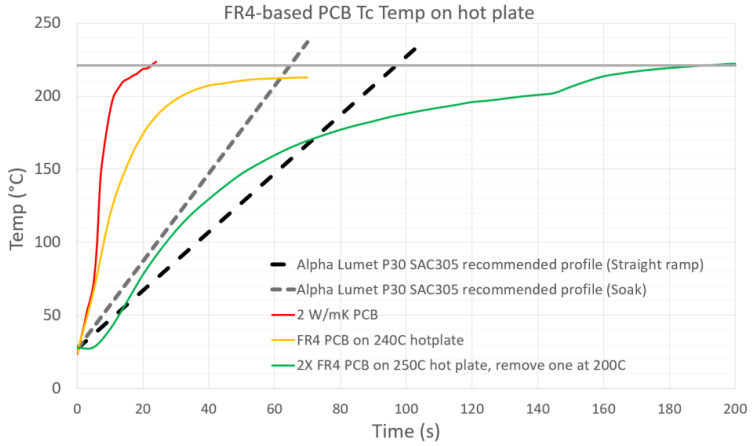


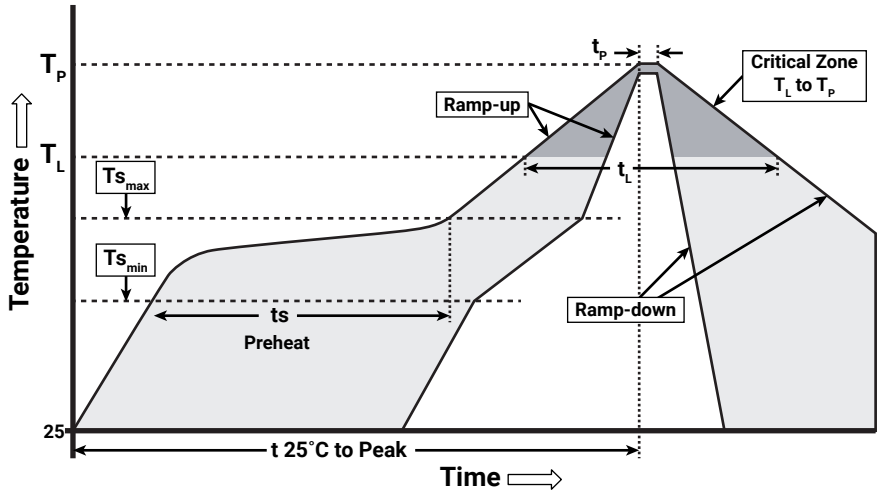
Figure 3: Temperature rise of a 2 W/m-K PCB on a 240 °C hot plate and FR4 PCB on 240 °C and 250 °C hot plates (solid lines) plotted against the recommended heating rates of Alpha Lumet P30 SAC305 (dashed lines). The horizontal grey line indicates the minimum liquidus temperature needed for solder melting at 220 °C. The green line shows a preferred heating rate created by using 2 bare FR4 PCBs below the populated FR4 PCB and removing one as the temperature reaches 200 °C. Note the slower natural heating rate of FR4 compared to the aluminum 2 W/m-K PCB.

SOLDERING GUIDELINES - ALL OTHER J SERIES® LEDS

In testing, Cree LED has found J Series LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below below unless otherwise specified. 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.

2016, 2835, 2835 Pro9, 3030, 5050 (not applicable to JB3030C E & F Class, 5050 E Class), 5630, 7070



IPC/JEDEC J-STD-020C

Reflow Profile Parameters for All Other J Series LEDs	
Profile Feature	**Lead-Free Solder**
Preheat: Temperature Min. (Ts_{min})	150 °C
Preheat: Temperature Max. (Ts_{max})	200 °C
Preheat: Time (Ts_{min} to Ts_{max})	60-120 seconds
Ramp-Up Rate (T_L to T_p)	3 °C/second
Time Maintained Above: Temperature (T_L)	217 °C
Time Maintained Above : Time (T_L)	60-150 seconds
Peak/Classification Temperature (Tp)	260 °C max.
Time Within 5 °C of Actual Peak Temperature (tp)	30 seconds max.
Ramp-Down Rate (T_p to T_L)	6 °C/second max.
Time 25 °C to Peak Temperature	8 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. 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 Chemicals

In testing, Cree LED has found the following chemicals to be safe to use with J Series 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 J Series LEDs. Cree LED recommends not using these chemicals anywhere in an LED system containing J Series 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)

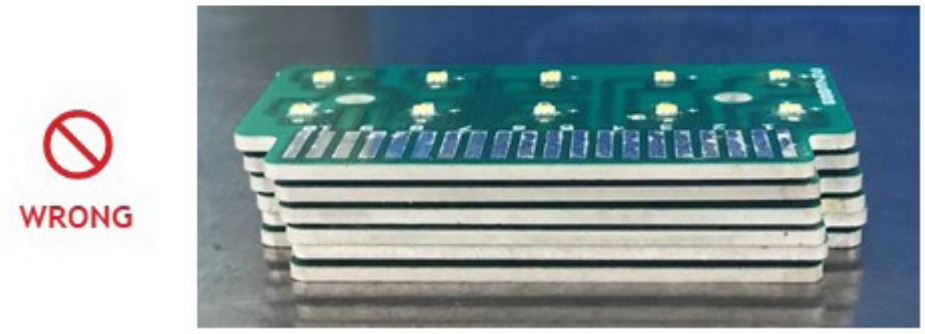
Hermetically Sealing Luminaires

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 J Series LEDs so that anything rests on the LED LES. Force applied to the LED LES may result in the LES being knocked off. PCBs or assemblies containing J Series LEDs should be stacked in a way to allow at least 1-cm clearance above the LED LES.

Do not use bubble wrap directly on top of J Series LEDs. Force from the bubble wrap can potentially damage the LED.

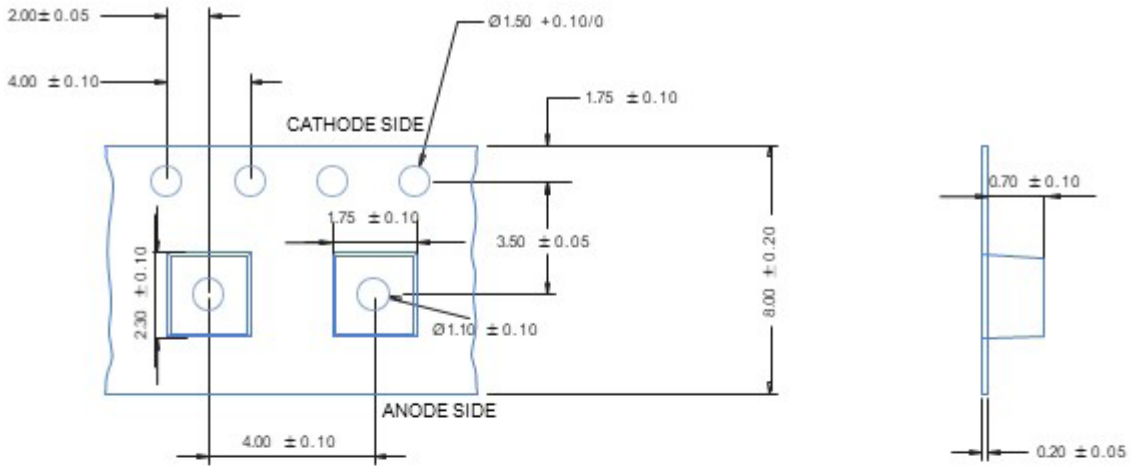


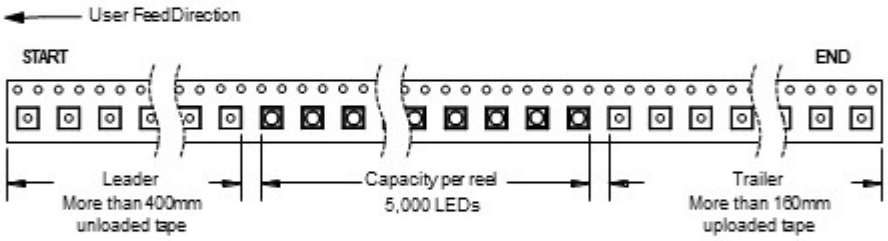
TAPE & REEL

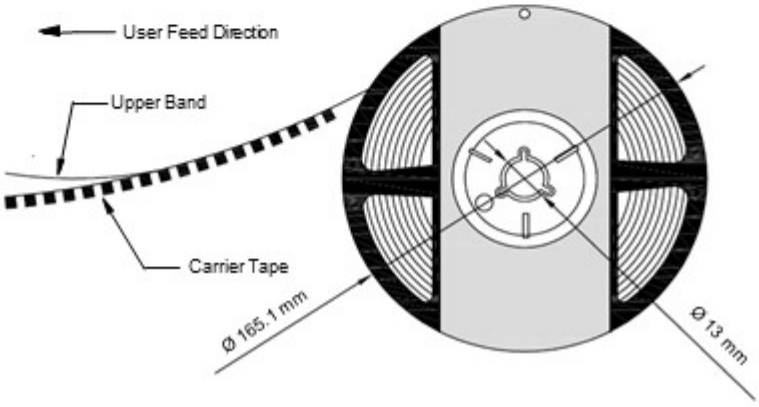
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.
All dimensions in mm.

2016 Series

Applicable Part Numbers: JB2016xWT-x-xxxxxxxxx-xxxxxxxx



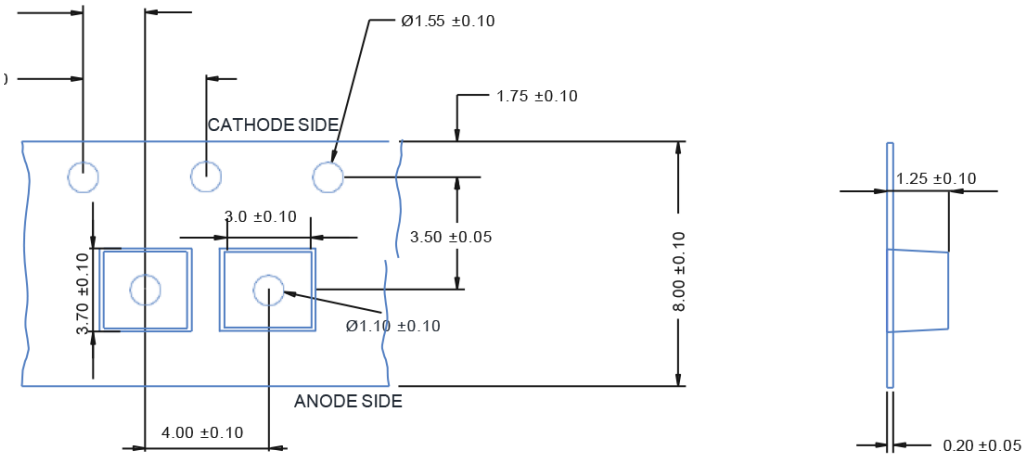


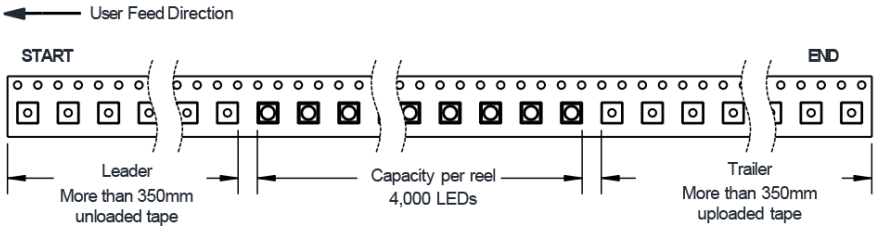


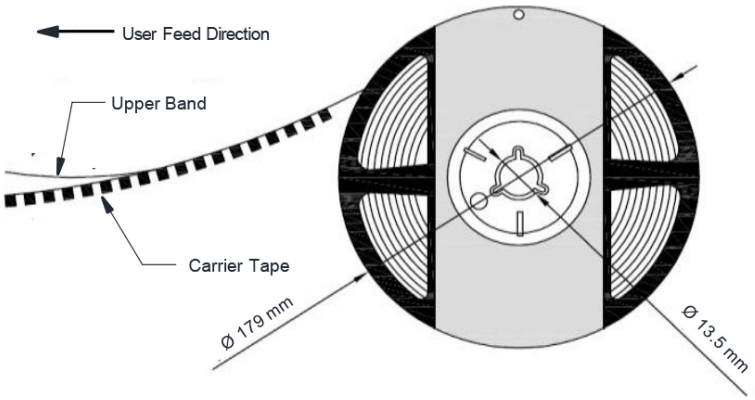
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.
All dimensions in mm.

2835 Series (applicable to white and colors)

Applicable Part Numbers: Jx2835xxx-x-xxxxxxxxx-xxxxxxxx
Jx2835xxx-x-xxxxxxxxx-xxxxPxxx



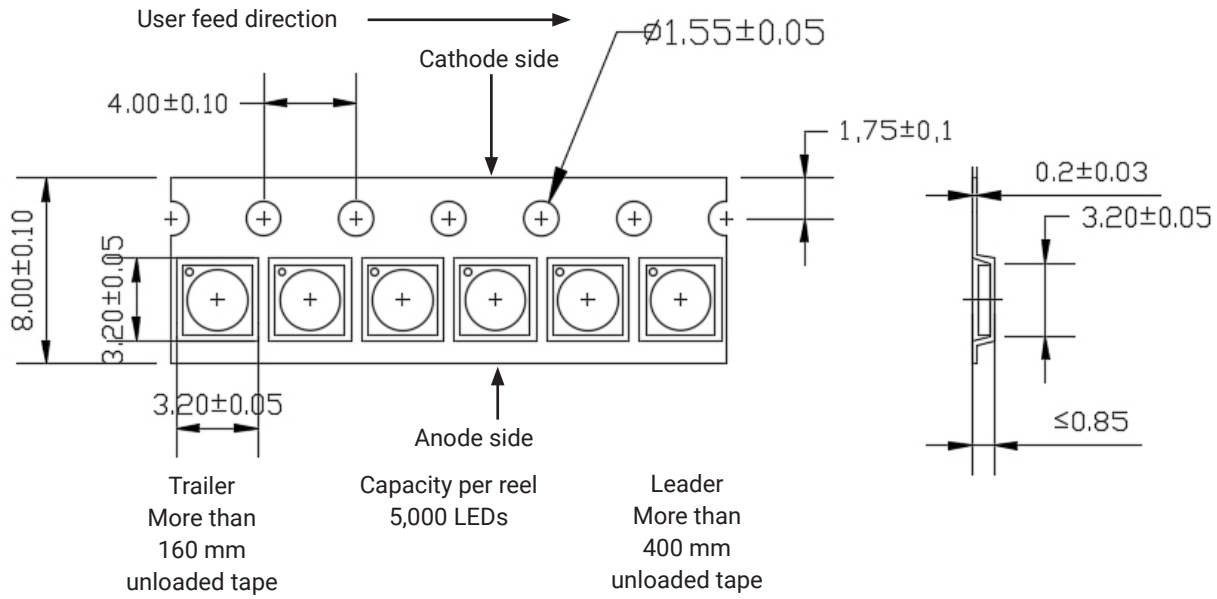


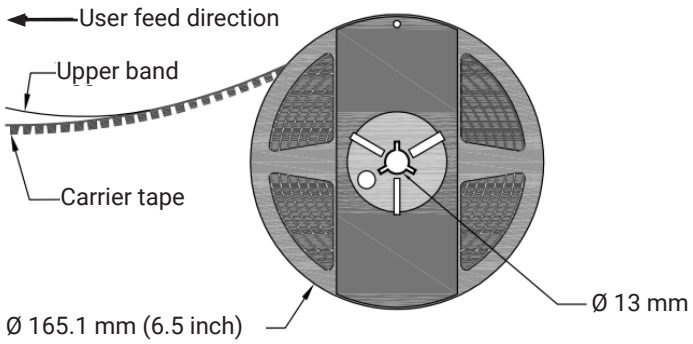


All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.
All dimensions in mm.

3030 (Round LES)

Applicable Part Numbers: Jx3030AWT-x-xxxxxxxxx-xxxxxxxx

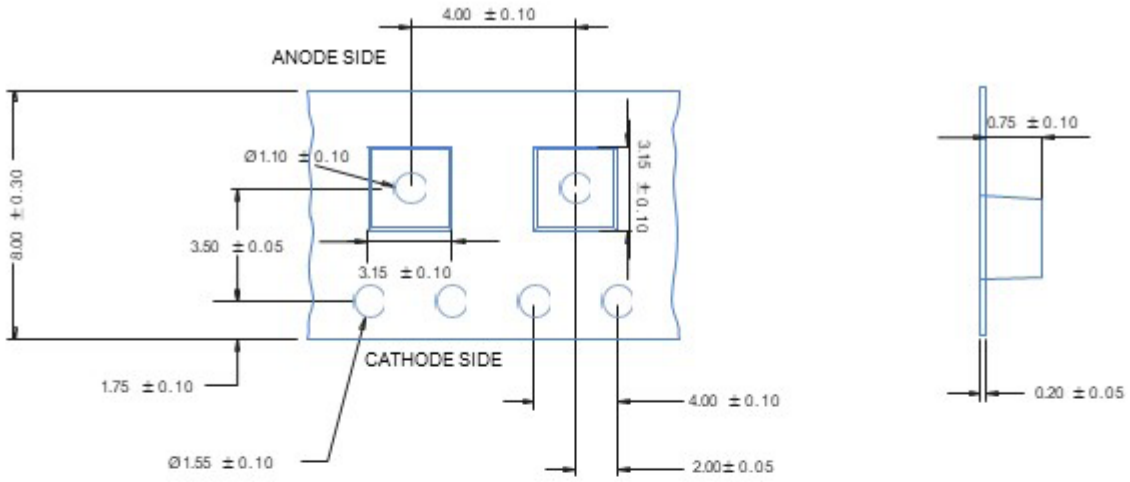


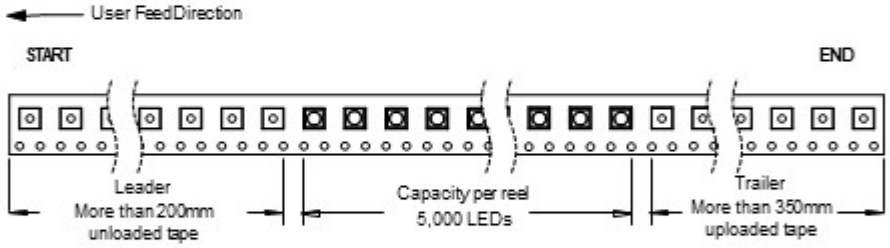


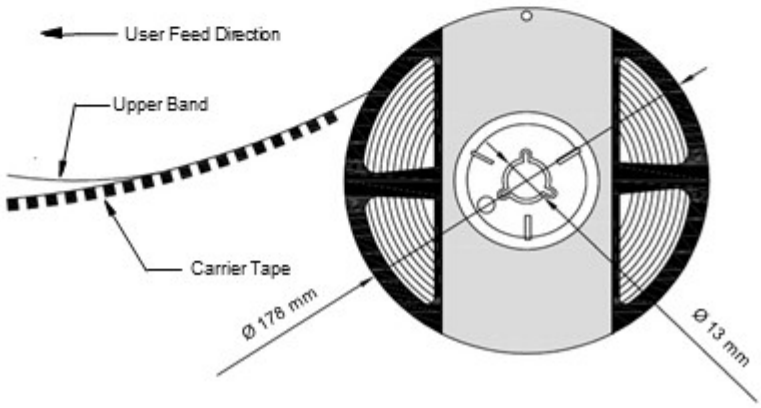
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.
All dimensions in mm.

3030 HE (Square LES)

Applicable Part Numbers: Jx3030UWT-x-xxxxxxxxx-xxxxxxxx



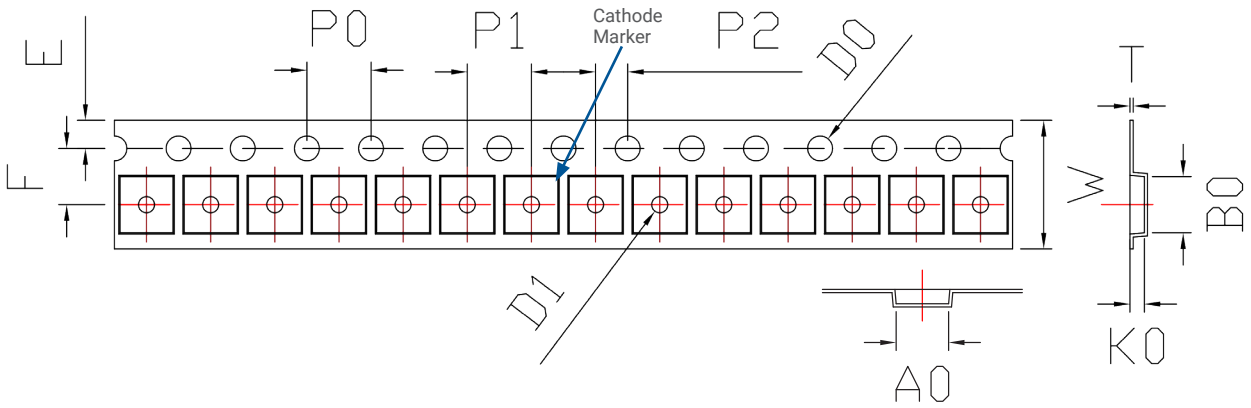




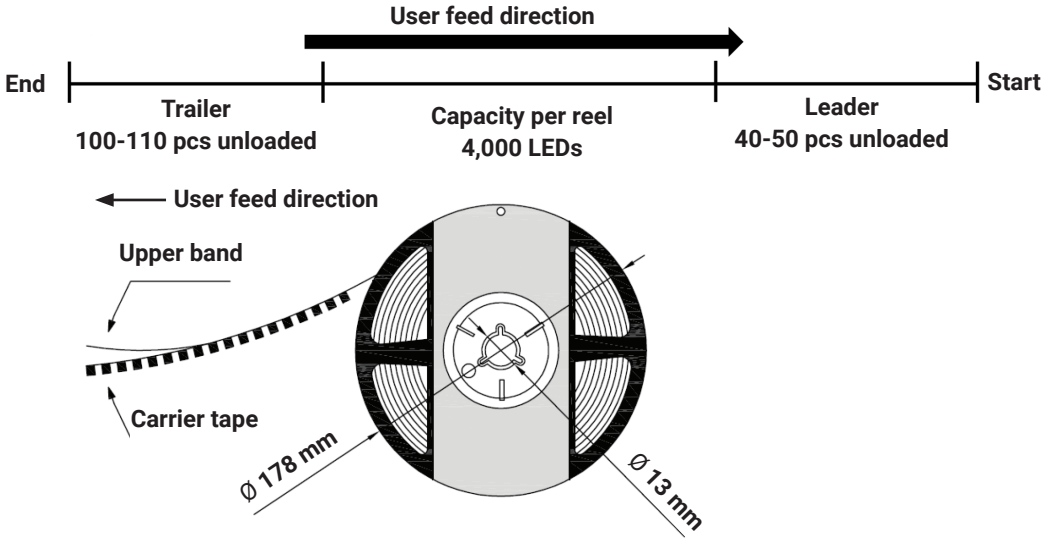
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.
All dimensions in mm.

JB3030C E & F Class

Applicable Part Numbers: JB3030CWT-E-xxxxxxxxx-xxxxxxxx
JB3030CWT-F-xxxxxxxxx-xxxxxxxx



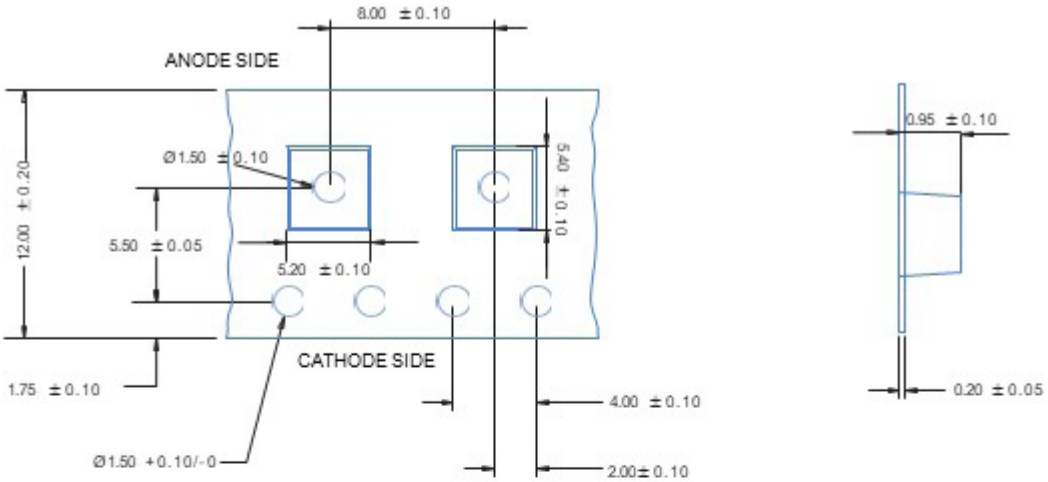
Symbol	Specification	Symbol	Specification	Symbol	Specification	Symbol	Specification
W	8.00 ± 0.2	E	1.75 ± 0.10	P0	4.00 ± 0.10	A0	3.30 ± 0.10
T	0.20 ± 0.05	F	3.50 ± 0.1	P1	4.0 ± 0.10	B0	3.50 ± 0.10
D1	1.00 ± 0.1	D0	1.5 + 0.1 -0	P2	2.00 ± 0.10	K0	0.90 ± 0.10

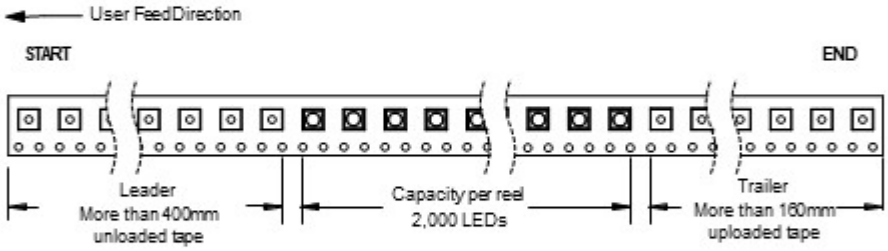


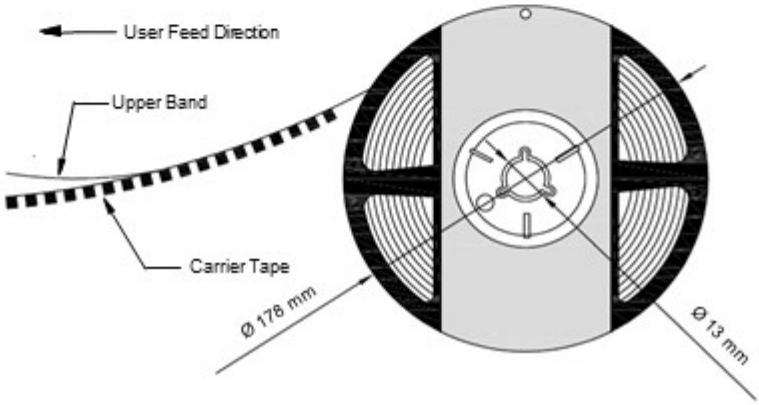
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.
All dimensions in mm.

5050 Series

Applicable Part Numbers: Jx5050xWT-x-xxxxxxxxx-xxxxxxxx



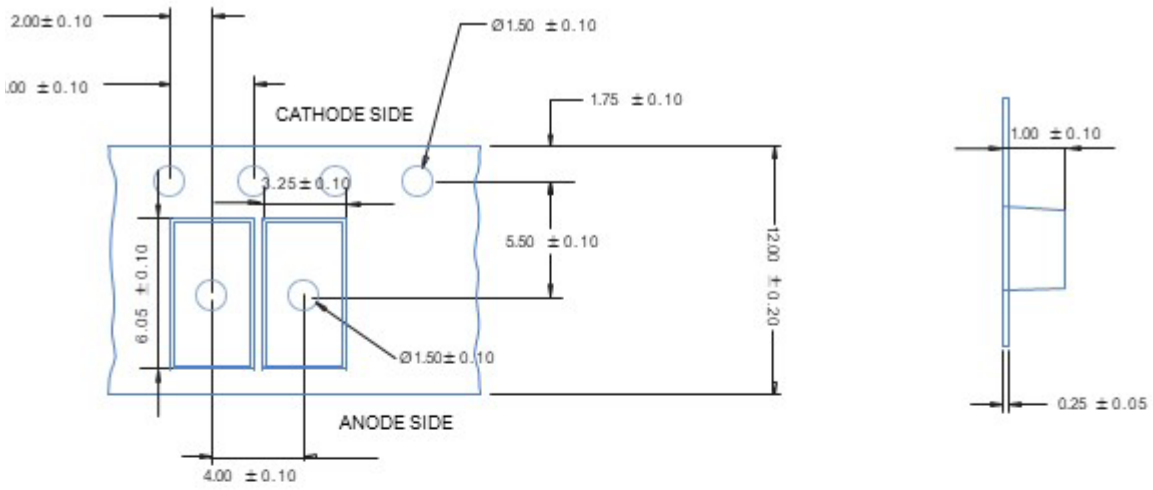


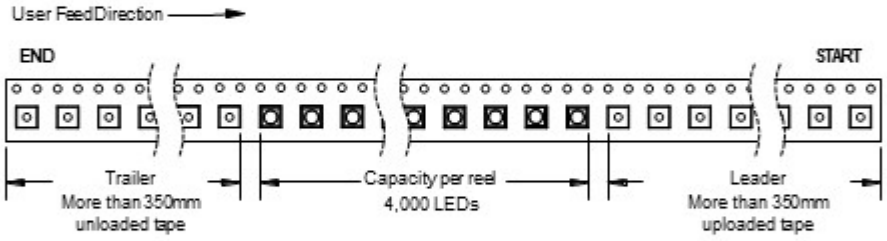


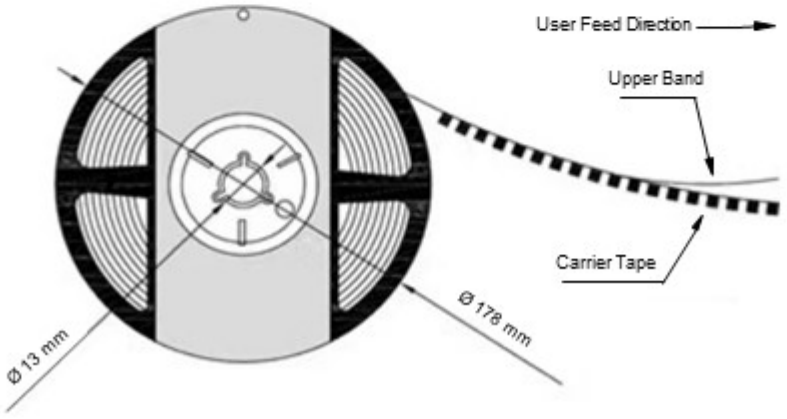
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.
All dimensions in mm.

5630 Series (not applicable to 5630-C)

Applicable Part Numbers: JB5630AWT-x-xxxxxxxxx-xxxxxxxx



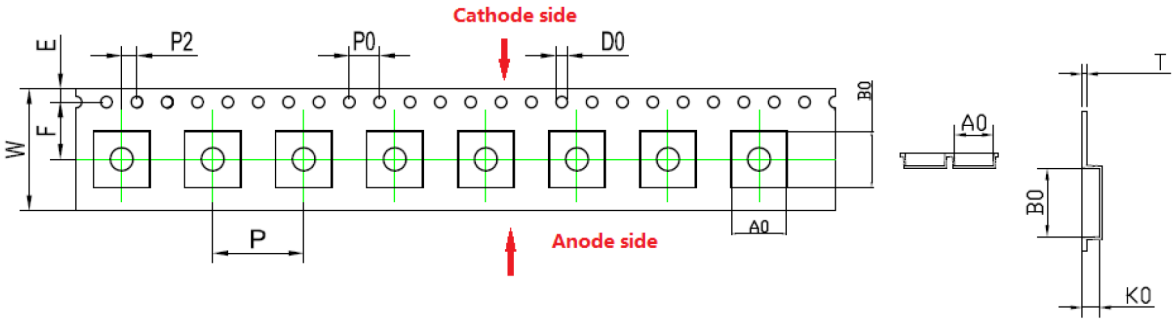




All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.
All dimensions in mm.

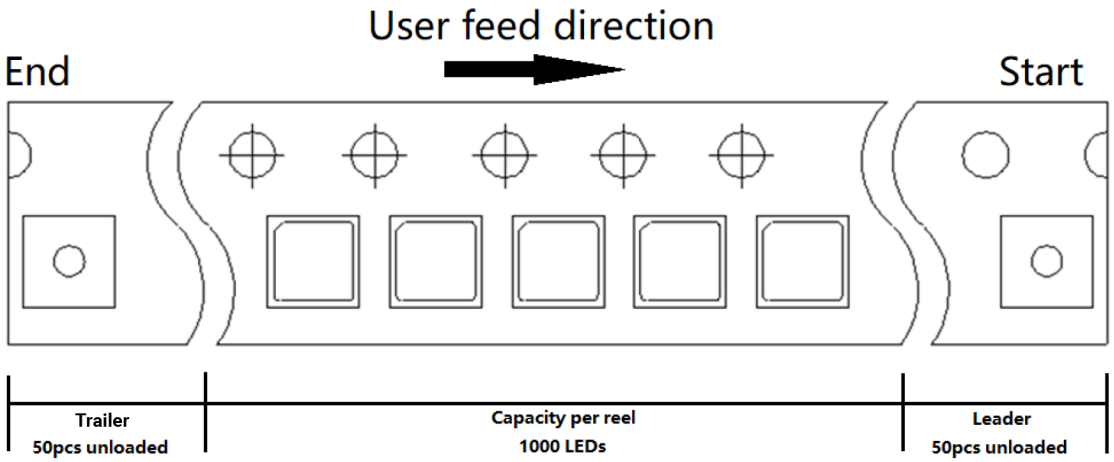
7070B

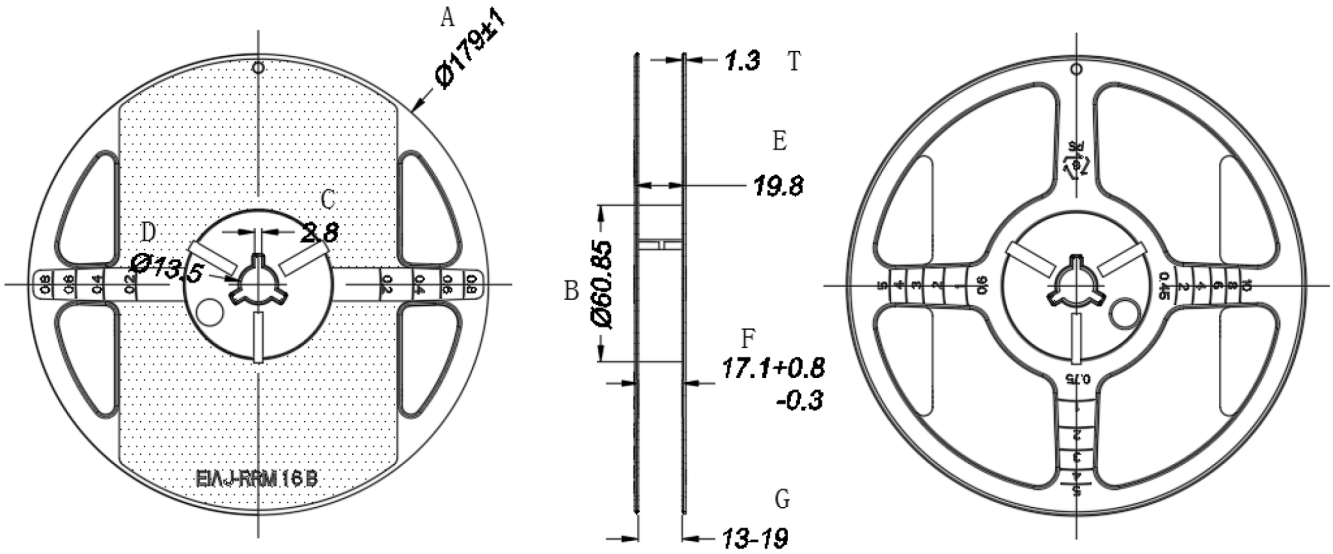
Applicable Part Numbers: JU7070BWT-x-xxxxxxxxx-xxxxxxxx



Item	A0	B0	K0	P0	P	P2	W	T	E	F	D0	D1
Dim.	7.30±0.1	7.30±0.1	1.00±0.1	4.00±0.10	12.0±0.1	2.00±0.10	16.0±0.3	0.30±0.05	1.75±0.10	7.5±0.1	$1.50^{+0.1}_{-0}$	1.50±0.10

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

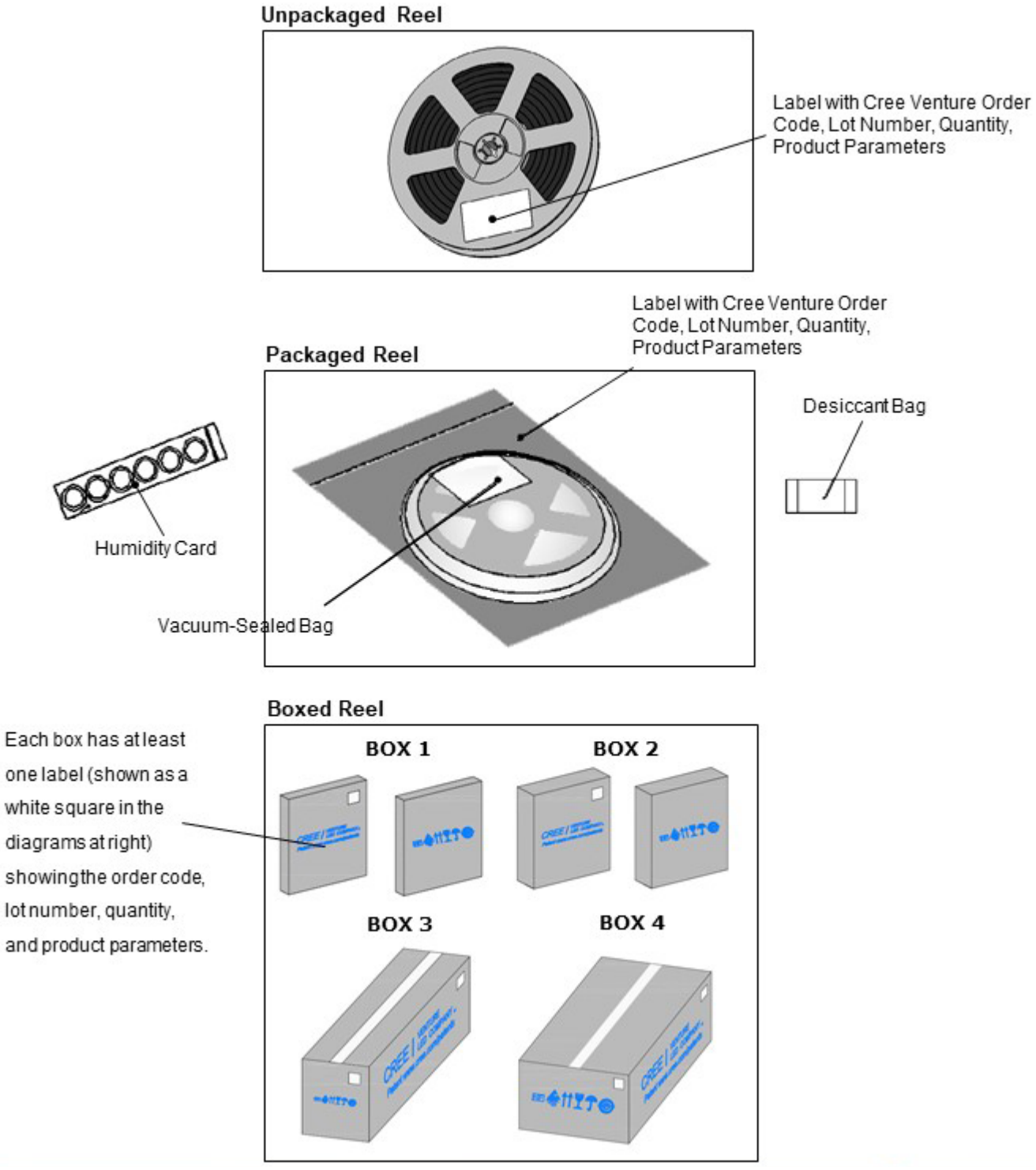




Item	A±1	B±0.5	C±0.3	D±0.3	E±0.5	$F^{+0.8}_{-0.3}$	G	T±0.2
Dim.	Ø179	Ø60.85	2.8	Ø13.5	19.8	17.1	13-19	1.3

PACKAGING & LABELS

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



J Series LEDs are packaged in boxes for shipment. Box sizes and the number of reels per box are as follows.

2016

Box	Box Dimensions	Maximum Number of Reels per Box
1	250 x 210 x 30 mm	2
2	250 x 210 x 50 mm	4
3	530 x 230 x 275 mm	44
4	530 x 443 x 275 mm	88

5630

Box	Box Dimensions	Maximum Number of Reels per Box
1	250 x 210 x 30 mm	2
2	250 x 210 x 50 mm	4
3	530 x 230 x 275 mm	32
4	530 x 443 x 275 mm	64

2835 (applicable to white and colors), 2835 Pro9

Box	Box Dimensions	Maximum Number of Reels per Box
1	250 x 210 x 30 mm	2
2	250 x 210 x 50 mm	4
3	530 x 230 x 275 mm	42
4	530 x 443 x 275 mm	84

3030, 3030 HE, JB3030C

Box	Box Dimensions	Maximum Number of Reels per Box
1	250 x 210 x 30 mm	2
2	250 x 210 x 50 mm	4
3	530 x 230 x 275 mm	44
4	530 x 443 x 275 mm	88

5050A, 5050B, 5050C

Box	Box Dimensions	Maximum Number of Reels per Box
1	250 x 210 x 30 mm	2
2	250 x 210 x 50 mm	3
3	530 x 230 x 275 mm	32
4	530 x 443 x 275 mm	64

7070

Box	Box Dimensions	Maximum Number of Reels per Box
1	250 x 210 x 30 mm	1
2	250 x 210 x 50 mm	2
3	530 x 230 x 275 mm	28
4	530 x 443 x 275 mm	48