

ProLight Crab

Assembly Information

This application note brief covers the assembly information for Crab LEDs. Please read the entire document to understand how to properly handle Crab LEDs.



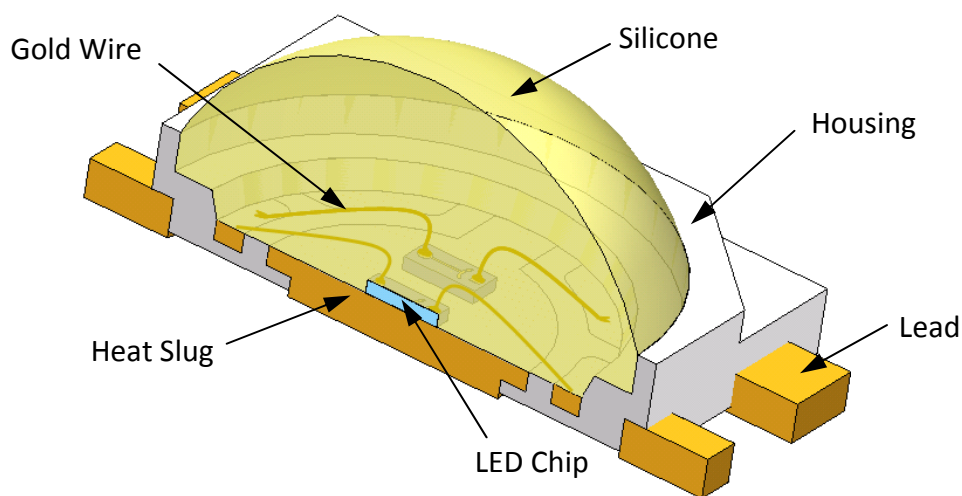
Contents

PACKAGE STRUCTURE	2
HANDLING CRAB LEDS	3
METAL CORE PRINTED CIRCUIT BOARD (MCPCB) LAYOUTS	4
SLUG TEMPERATURE (T_s) MEASUREMENT POINT	5
NOTES ON SOLDERING CRAB LEDS	5
REFLOW PROFILE	7
HEAT PLATE SOLDERING	8
MOISTURE SENSITIVITY	8
ASSEMBLY STORAGE AND HANDLING	9

October 2009 V1.0

Package Structure

The below figure illustrates the internal construction of the ProLight Crab package. The LED chip is bonded to the copper leadframe, which is the best thermal solution in industry of the world. The semiconductor chip inside the ProLight Crab package is optimized for light extraction efficiency, thermal management and current density. And the LED chip is connected to the leadframe using a gold wire. This gold wire is mechanically supported by the optical-grade encapsulate and helps provide the mechanical ruggedness and resistance to mechanical shock and vibration inherent in semiconductor technology. A clear silicone lens is molded over the LED chip and gold wire.



Handling Crab LEDs

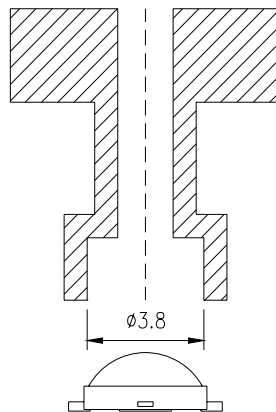
ProLight recommends the following at all times when handling Crab LEDs or assemblies containing these LEDs:

- 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.

Whenever possible, ProLight recommends the use of a pick & place tool to remove Crab LEDs from the tape and reel packaging.

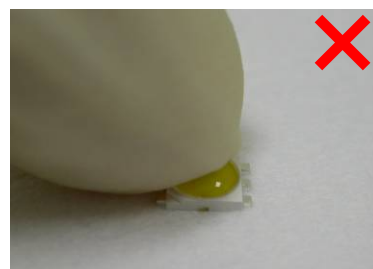
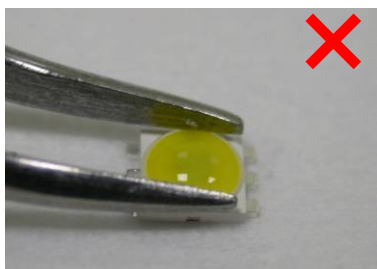
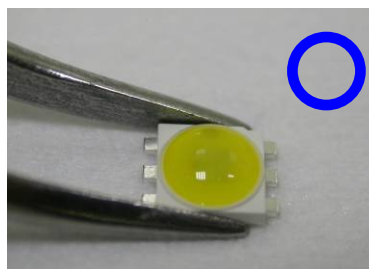
Pick and Place Nozzle

ProLight recommends the pick and place nozzle tip shown below for Crab LEDs. The inner diameter is 3.8mm.



Manual Handling

Use tweezers to grab Crab LEDs at the housing. Do not touch the lens with the tweezers. Do not touch the lens with fingers. Do not push on the lens.

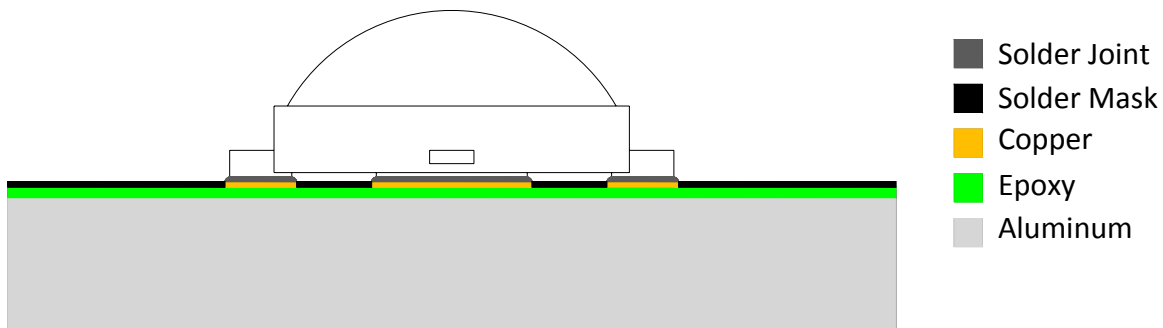


Metal Core Printed Circuit Board (MCPCB) Layouts

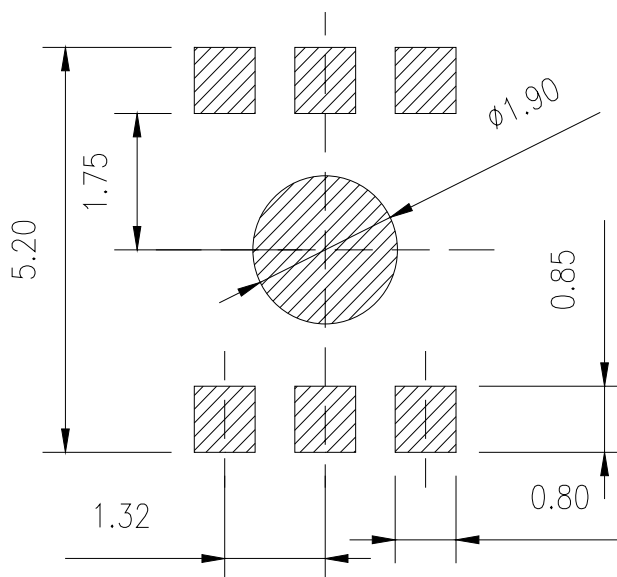
For the low thermal resistance, ProLight recommends using the MCPCB for the substrate material. The typical MCPCB consists of the following three layers that provide both electrical connections and a low thermal resistance path to external heatsink.

- Aluminum base
- Epoxy insulation layer
- Copper layer

The typical thickness of the MCPCB is 1.6mm. The base material is typically aluminum, which provides the first level of heat-sinking capacity of the array. On top of the aluminum layer is an epoxy layer that provides electrical insulation between the aluminum and the copper layer. The copper layer on top of the epoxy is used for the electrical connections and to help the lateral spreading of the heat dissipated by the Crab LEDs over a larger area. The figure below shows across section of a typical MCPCB.



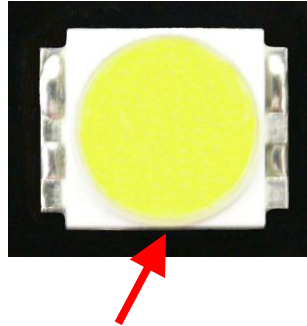
The recommended MCPCB solder pad layout for Crab LEDs shows below. The slug of LED is not electrically neutral. Do not electrically connect either the anode or cathode to the slug.



All dimensions in mm

Slug Temperature (T_s) Measurement Point

Crab family LED slug temperature should be measured on the MCPCB surface, as close to the LED's slug as possible. This measurement point is shown in the picture below.



Notes on Soldering Crab LEDs

Crab LEDs are designed to be reflow soldered to a MCPCB. Reflow soldering may be done by a reflow oven or by placing the MCPCB on a heat plate and following the reflow soldering profile listed on the next page. Do not hand solder Crab LEDs.



Reflow Oven



Heat Plate



Soldering Iron

Notes on Soldering Crab LEDs (continued)

Solder Paste

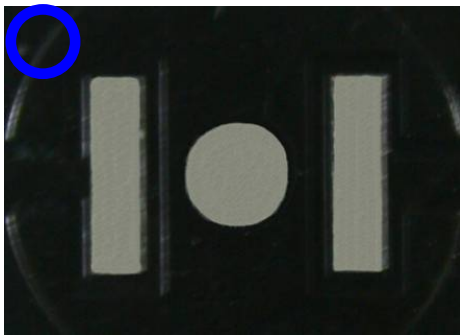
ProLight recommends using the 58Bi-42Sn eutectic solder paste for low-temperature lead-free soldering (melting point = 138 °C). The following companies provide this solder paste.

Company	Product code	Website
Indium	NC-SMQ81	http://www.indium.com/
Nihon Superior	BI57	http://www.nihonsuperior.co.jp/
SHENMAO	PF602P	http://www.shenmao.com/

Note: 58Bi-42Sn can't be soldering with Sn-Pb plating components. The lead and 58Bi-42Sn is easily formed 8Sn-52Pb-40Bi eutectic mixture (melting point 95 °C). It will cause the early failure at high temperature operation.

Solder Paste Thickness

For the most consistent results, an automated dispensing system or a solder stencil printer is recommended. ProLight recommends the solder paste thickness is 0.1 mm.



After Soldering

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

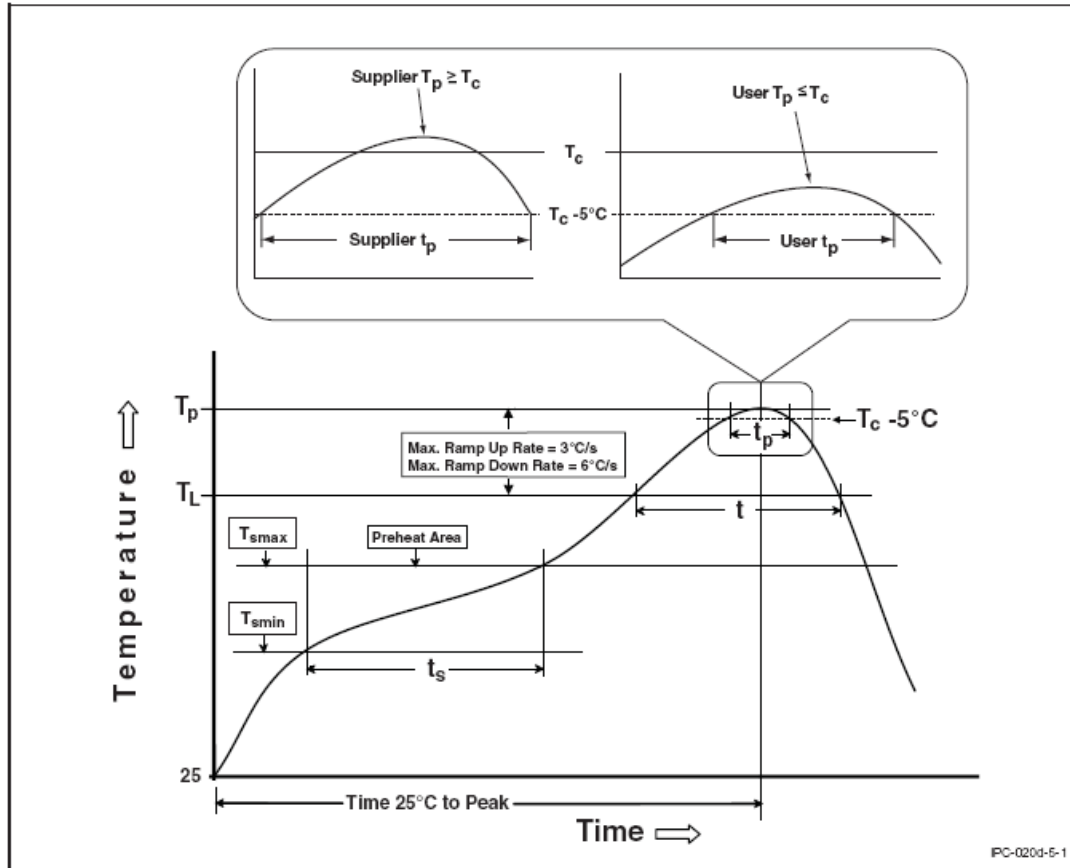
ProLight recommends verifying the solder process by checking the consistency of the solder bond of several trial MCPCBs after reflow. After shearing selected devices from the MCPCB the solder should appear completely re-flown (no solder grains evident). The solder areas should show minimum evidence of voids on the backside of the package and the MCPCB.

Cleaning MCPCBs After Soldering

If MCPCB cleaning is necessary, ProLight recommends using isopropyl alcohol (IPA). Do not use ultrasonic cleaning.

Reflow Profile

ProLight Crab LEDs are compatible with surface mount technology and low-temperature lead-free reflow, using the parameters listed below. As a general guideline, ProLight recommends that users follow the recommended soldering profile provided by the manufacturer of solder paste used.



Profile Feature	Sn-Pb Eutectic Assembly	Low-Temp. & Pb-Free Assembly (58Bi-42Sn Eutectic Alloy)
Average Ramp-Up Rate (T_{smax} to T_p)	3 °C / second max.	2 °C / second max.
Preheat: Temperature Min. (T_{smin})	100 °C	90 °C
Preheat: Temperature Max. (T_{smax})	150 °C	120 °C
Preheat: Time (T_{smin} to T_{smax})	60-120 seconds	60-120 seconds
Liquidous Temperature (T_L)	183 °C	138 °C
Time at Liquidous (t_L)	60-150 seconds	20-50 seconds
Peak/Classification Temperature (T_p)	235 °C	185 °C
Time Within 5 °C of the Actual Peak Temperature (t_p)	20 seconds	20 seconds
Average Ramp-down Rate (T_p to T_{smax})	6 °C/second max.	3 °C/second max.
Time 25°C to Peak Temperature	6 minutes max.	4 minutes max.

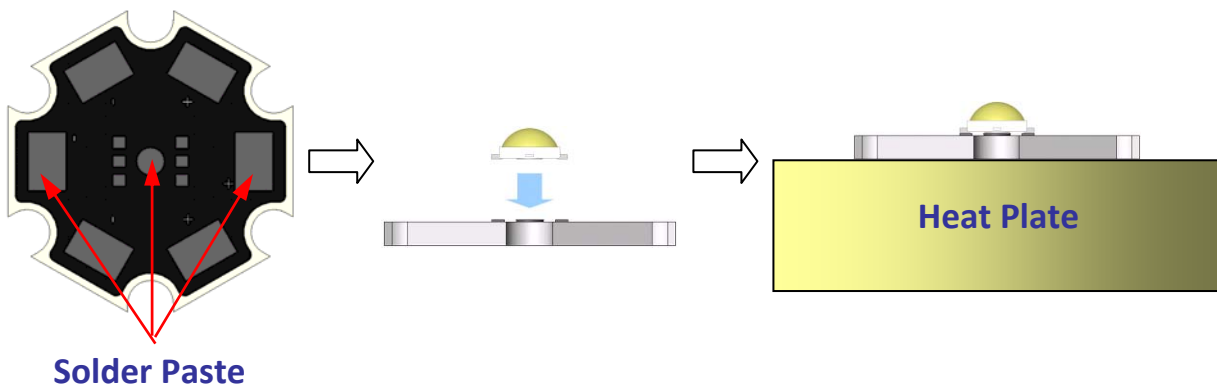
Note: All temperature refer to topside of the package, measured on the package housing surface.

Heat Plate Soldering

ProLight recommends the following steps for the heat plate soldering.

- A. Use an automated dispensing system or a solder stencil printer to print solder paste on the MCPCB.
- B. Place the Crab LEDs on the MCPCB.
- C. Put the MCPCB on the heat plate until the solder paste melt. The solder paste should be melted within 10 seconds. Take out the MCPCB out from the heat plate within 15 seconds.

Note: ProLight recommends using the 58Bi-42Sn eutectic solder paste for low-temperature lead-free soldering (melting point = 138 °C). The temperature of the heat plate should be less than 230 °C.



Moisture Sensitivity

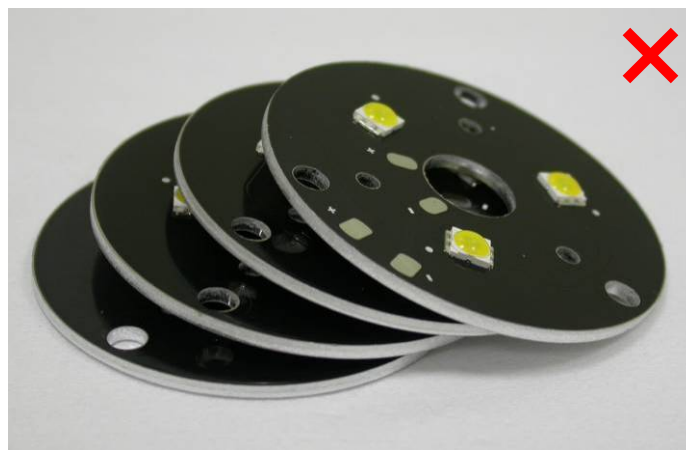
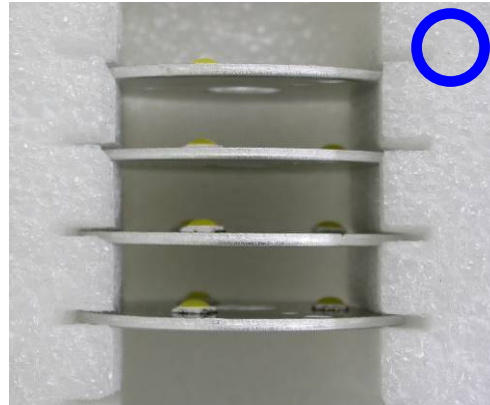
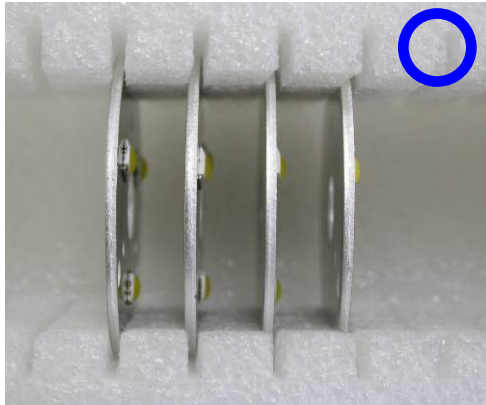
Crab LEDs are qualified as JEDEC J-STD-020 level 1 class. Table below presents the moisture sensitivity level 1 definitions. Crab LEDs have unlimited floor life in condition ≤ 30 °C / 85% relative humidity (RH). Moisture testing included a 168 hour soak at 85 °C / 85% RH followed by 3 reflow cycles, with visual and electrical inspections at each stage.

Level	Floor Life		Soak Requirements			
			Standard		Accelerated Environment	
	Time	Conditions	Time (hours)	Conditions	Time (hours)	Conditions
1	Unlimited	≤ 30 °C / 85% RH	168 +5/-0	85 °C / 85% RH	NA	NA

Note: The standard soak time includes a default value of 24 hours for semiconductor manufacture's exposure time (MET) between bake and bag and includes the maximum time allowed out of the bag at the distributor's facility.

Assembly Storage and Handling

Do not stack MCPCBs or assemblies containing Crab LEDs so that anything rests on the LED lens. Force applied to the LED lens may result in the LEDs being damaged. MCPCBs or assemblies containing Crab 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 Crab LEDs. Force from the bubble wrap can potentially damage the LED.



About ProLight Opto

Founded in October 2004, ProLight Opto Technology Corporation is a professional manufacturer of LED packaging, dedicated to the research, development, and manufacturing of mid-to-high-power, high-reliability LED packaging. Through our products, we create value for our customers with best-in-class optics and heat dissipation. For more information, visit www.ProLightopto.com.