

APPLICATION NOTES

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Descriptions:

HOW TO USE COTCO LED PRODUCT SAFELY

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Change History

ECN No.	Date	Rev. No.	Changes/Reason of Changes
ECN-H20030431	2003-12-15	D	Add P2 and P4 LEDs wave soldering temperature profile
ECN-H20040312	2004-11-10	05	Add min cathode pad area and 3mm conventional LEDs is not AUTO-insertable
ECN-H20040331	2004-12-27	06	<ol style="list-style-type: none"> 1. Reformat document/ for easy reference. 2. Update soldering condition of P2 , P4 & SMD/ Make it easier for reference. 3. Update SMD storage requirement/ Make it easier for reference. 4. Add recommended solder pad design for 6-pin SMD package.
FCN20050369	2005-11-10	07	<ol style="list-style-type: none"> 1.Update soldering condition of P2, P4/ Maker it easier for reference. 2.Update SMD storage requirement/ Maker it easier for reference.
FCN20050404	2005-11-28	08	Update soldering condition of P2, P4/ Maker it easier for reference.
FCN20060023	2006-01-23	09	<ol style="list-style-type: none"> 1. Updata soldering condition of P2, P4. 2. Add recommended solder pad design for small 6-pin SMD package. (Changes annotated with)
FCN20060135	2006-04-21	10	Add to note to temperature surrounding LED in application.
FCN20060214	2006-06-27	11	<ol style="list-style-type: none"> 1.Add recommended solder pad design for Small Top & Mini side 0.8mm SMD. 2.Add important notes information for Small Top & Mini side 0.8mm SMD.
FCN20060226	2006-07-06	12	Update Important Notes (Modify recommended Nozzle figure size).^[12]

Features

The purpose of this document is to provide a clear understanding to the customers and users, on the ways how to use our LED lamps appropriately.

Description

Generally, LED can be used the same way as other general-purpose semiconductors. When using Cotco's Lamps, the following precautions must be taken to protect the LED.

P2 and P4

1. Cleaning

- ✧ Don't use unspecified chemical liquids to clean the LED; the chemical could harm the LED. When washing is necessary, please immerse the LED in alcohol at normal room temperature for less than 1 minute and dry at normal room temperature for 15 minutes before use.
- ✧ The influence of ultrasonic cleaning on the LEDs depending on factors such as ultrasonic power and the way LEDs are mounted. Ultrasonic cleaning shall be pre-qualified to ensure this will not cause damage to the LEDs.

2. Forming

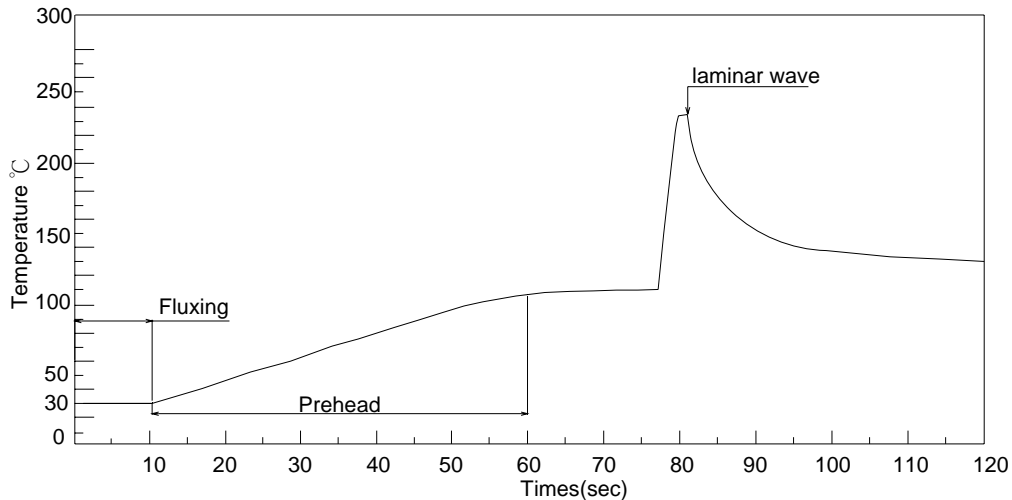
- ✧ During leads forming, the leads should be bent at a point at least 3mm from the base of the package.
- ✧ Don't form the leads during or after soldering, if forming is required, this must be done before soldering.
- ✧ Avoid stressing LED package during leads forming.
- ✧ When mounting the LEDs onto PCB, the PCB holes must be aligned exactly with the lead position of the LEDs

3. Soldering

- ✧ Minimal Cathode PAD Area $0.18 \times 0.18 \text{ inch}^2$ is recommended for P2 LEDs and $0.18 \times 0.18 \text{ inch}^2 \times 2$ for P4 LEDs
- ✧ Soldering LEDs at not less than 3mm from the base of the package and below the tie-bar is recommended.
- ✧ The LED soldering specification is shown as below (suitable for both leaded solder & lead free solder).

Manual Soldering		Solder Dipping	
Soldering Iron :	35W Max	Preheat :	110°C Max
Temperature :	280°C Max (63/37 Solder)	Preheat Time :	60 Seconds Max
	300°C Max (Pb free Solder)	Solder bath temperature:	63/37 Solder: 235°C(245°C Max)
Soldering Time:	3 Seconds Max		Pb free Solder : 255°C (260°C Max)
Position :	Not less than 3mm from the base of the package.	Dipping Time :	3 Seconds Max
		Position :	Not less than 3mm from the base of the package.

- ✧ Manual soldering onto PCB is not recommended because soldering time is uncontrollable.
- ✧ The recommended wave soldering is as below:



Solder = Sn63-Pb37	Solder = Lead-free
Peak Preheat Temperature 100°~110°C.	Peak Preheat Temperature 100~110°C.
Total Preheat time 50~ 60 second.	Total Preheat time 50~ 60 second.
Peak Profile Fit Temperature 235°C (max 245°C).	Peak Profile Temperature 260°C (max) *
Dwell Time above 200°C do not excess 3s.	Dwell Time above 200°C do not excess 3s.
(For individual parts, refer to product spec)	(For individual parts, refer to product spec)

* Different lead-free Solder is in need of different Solder conditions. Please contact with us for the details.

- ✧ Do not apply any stress to LED package particularly when heated.
- ✧ The LEDs must not be re-used once it has been extracted from PCB.
- ✧ After soldering the LEDs, the package should be protected against mechanical shock or vibration until the LEDs reached 40°C or below.
- ✧ Precautions must be taken as mechanical stress on LED may be caused by PCB warpage or from the clinching and cutting of the LED leads.
- ✧ When clamping of LEDs during soldering is required, it is important to ensure no mechanical stress exerted on the LEDs.
- ✧ Lead cutting must be performed at normal room temperature. Lead cutting at elevated temperature may lead to LED failures.

4. Electrostatic Discharge and Surge current

- ✧ Electrostatic discharge (ESD) or surge current (EOS) may damage LEDs.
- ✧ Precautions such as ESD wrist strap, ESD shoe strap or antistatic gloves must be worn whenever handling of LEDs.
- ✧ All devices, equipment and machinery must be properly grounded.
- ✧ It is recommended to perform electrical test to screen out ESD failures at final inspection.
- ✧ It is important to eliminate the possibility of surge current during circuitry design

5. Heat Management

- ✧ Heat management of LEDs must be taken into consideration during the design stage of LED application. The current should be de-rated appropriately by referring to the de-rating curve attached on each product specification.
- ✧ Temperature surrounding LED shouldn't be overhigh so that make it failed when application, and temperature surrounding LED in application should refer to de-rating curve in our LED spec. ^[10]

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6. Others

- ◇ Care must be taken so that reverse voltage will not exceed the absolute maximum rating.
- ◇ The leads are plated with solder. Leads will get tarnished if contacting hydrogen sulfide and other gaseous chemicals. Precaution must be taken to maintain a cleaned storing atmosphere.
- ◇ The power of high brightness LED is very strong and may injure human eyes. Precautions must be taken such as avoiding from looking directly into lighted LEDs for few seconds.
- ◇ 3mm conventional LEDs is not Auto-insertable

SMD

1. Cleaning

- ◇ Don't use unspecified chemical liquids to clean the SMD LED; the chemical could harm the SMD LED. When washing is necessary, please immerse the SMD LED in alcohol at normal room temperature for less than 1 minute and dry at normal room temperature for 15 minutes before use.
- ◇ The influence of ultrasonic cleaning on the SMD LED depending on factors such as ultrasonic power and the way SMD LED are mounted. Ultrasonic cleaning shall be pre-qualified to ensure this will not cause damage to the SMD LED.

2. Moisture Proof Packing

- ◇ In order to prevent moisture absorption into SMD LED during the transportation and storage, SMD LED is packed in a moisture barrier bag. Desiccants and a humidity indicator are packed together with SMD LED as the secondary protection. The indication of humidity indicator card provides the information of humidity within SMD packing.

3. Storage

- ◇ Shelf life in original sealed bag at storage condition of $<40^{\circ}\text{C}$ and $<90\%RH$ is 12 months. Baking is required whenever shelf life is expired.
- ◇ Before opening the packaging , Please check whether bag leak air or not.
- ◇ After bag opening, the SMD LED must be stored under the condition $< 30^{\circ}\text{C}$ and $< 60\%RH$. Under this condition, SMD LED must be used (subject to reflow) within 24 hours after bag opening, and re-baking is required when exceeding 24 hours.
- ◇ For baking, place SMD LED in oven at temperature $80^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and relative humidity $\leq 10\%RH$, for 24 hours.
- ◇ Take out the material from packaging bag for re-bake. Do not open the door of oven frequently during the baking process.

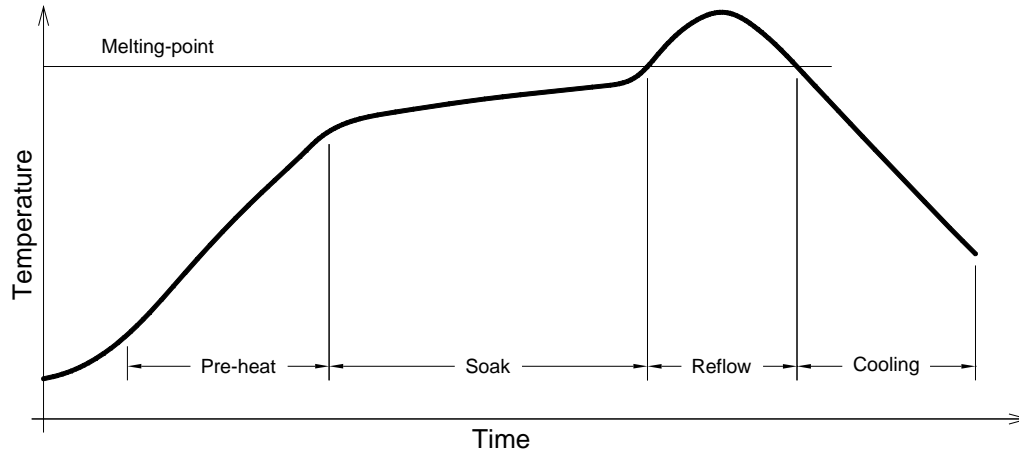
4. Soldering

. Manual soldering by soldering iron

- ◇ The use of a soldering iron of less than 25W is recommended and the temperature of the iron must be kept at below 315°C , with soldering time within 2 seconds.
- ◇ The epoxy resin of SMD LED should not be in contact with tip of soldering iron.
- ◇ No mechanical stress should be exerted on the resin portion of SMD LED during soldering.
- ◇ Handling of SMD LED should be done when the package has been cooled down to below 40°C or less. This is to prevent the SMD LED failures due to thermal-mechanical stress during handling.

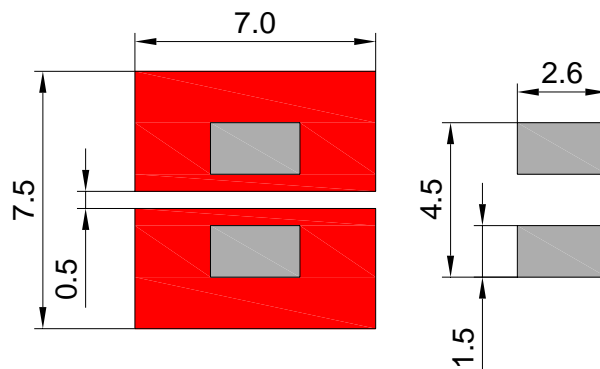
. Reflow Soldering

- ◇ The temperature (Top surface of SMD LED) profile is as below:

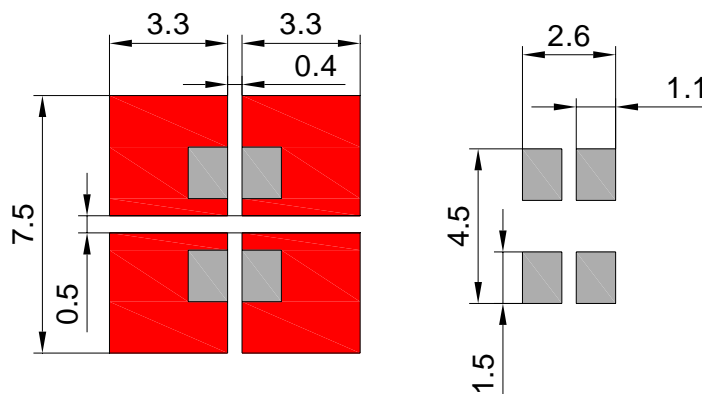


Solder = Sn63-Pb37	Solder = Lead-free
Average ramp-up rate = 4°C/s max.	Average ramp-up rate = 4°C/s max
Preheat temperature = 100°C ~150°C	Preheat temperature = 150°C ~200°C
Preheat time = 100s max.	Preheat time = 100s max.
Ramp-down rate = 6°C/s max.	Ramp-down rate = 6°C/s max.
Peak temperature = 230°C max.	Peak temperature = 250°C max.
Time within 5°C of actual Peak Temperature = 10s max.	Time within 5°C of actual Peak Temperature = 10s max.
Duration above 183°C is 80s max.	Duration above 217°C is 80s max.

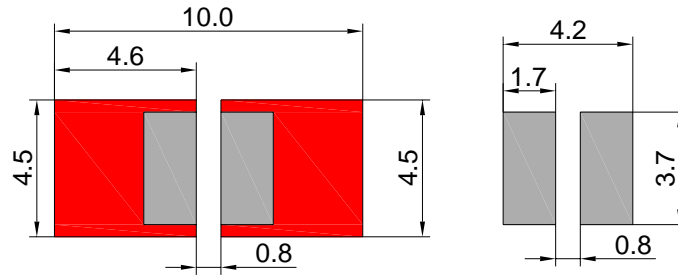
✧ Recommended solder pad design for heat dissipation (2-pin SMD LED):



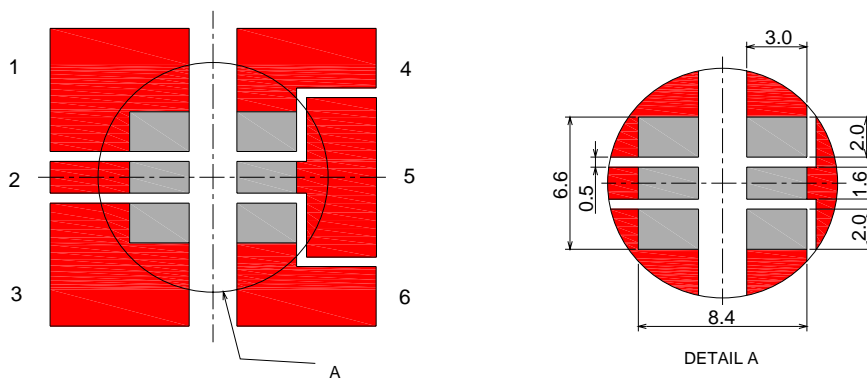
✧ Recommended solder pad design for heat dissipation (4-pin SMD LED):



✧ Recommended solder pad design for heat dissipation (Side SMD)



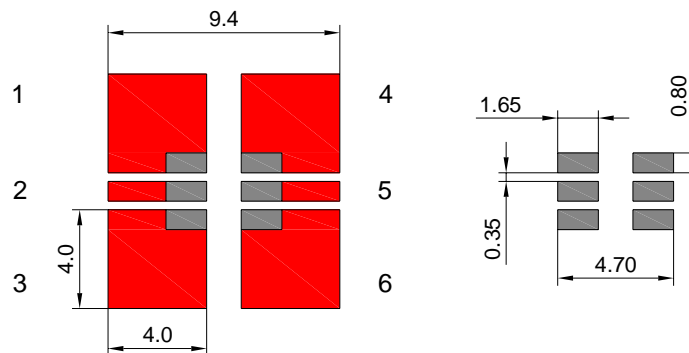
✧ Recommended solder pad design for heat dissipation (6-pin SMD)



Note:
Metal area at 4, 5, 6 should not be less than 40mm² each for sufficient heat dissipation.

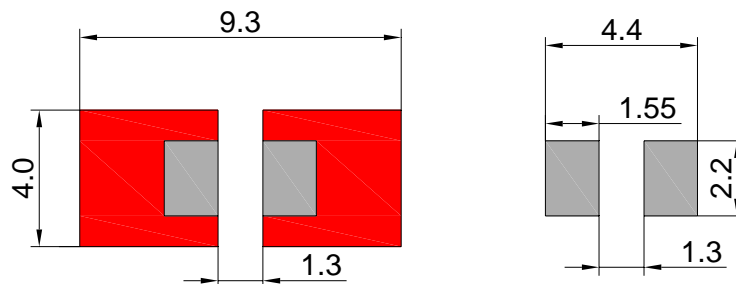
NOTE:
Metal area on 4 5 6 should not be less than 40mm² for efficient heat dissipation

✧ Recommended solder pad design for heat dissipation (Small 6-pin SMD)

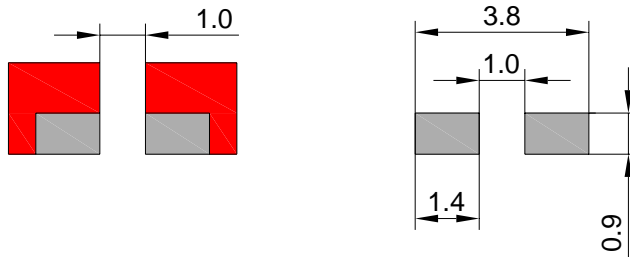


Note:
Metal area at 1, 4, 6 should not be less than 16mm² each for sufficient heat dissipation.

✧ Recommended solder pad design for heat dissipation (Small Top SMD)



- ✧ Recommended solder pad design for heat dissipation (Mini side 0.8mm SMD)



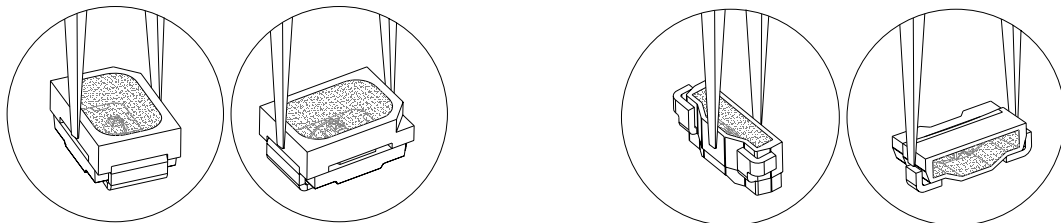
- ✧ Modification is not recommended on SMD LED after soldering. If modification cannot be avoided, the modifications must be pre-qualified to avoid damaging SMD LED.
- ✧ Reflow soldering should not be done more than one time.
- ✧ No stress should be exerted on the package during soldering.
- ✧ PCB should not be wrapped after soldering; this is to allow natural cooling of the PCB board and SMD LED.

5. Important Notes (Small Top & Mini side 0.8mm SMD product)

- ✧ The packaging sizes of these SMD products are very small and the Resin is still soft after solidification. Users are required to handle with care, never touch the Resin surface of SMD products.
- ✧ To avoid damaging the products surface and interior device , it is recommended to choose special Nozzle to pick up SMD products during the process of SMT production . If handling is necessary, it should take more careful to pick up these products . The following two methods are necessary :

Fig. 1a : For Small Top SMD .

Fig. 1b : For Mini side 0.8mm SMD .



- ✧ For Small Top SMD series , it is recommended to use rubber material Nozzle to pick up SMD products .Two figure size for reference :

a.) Circular Nozzle : inner diameter: $\varnothing 1.8\text{mm} \pm 0.05\text{mm}$, outer diameter: $\varnothing 2.3\text{mm} \pm 0.05\text{mm}$. [12]

b.) Rectangle Nozzle: inner size: 1.3mm x 2.3mm , outer size > SMD size . [12]

6. Electrostatic Discharge and Surge current

- ✧ Electrostatic discharge (ESD) or surge current (EOS) may damage SMD LED.
- ✧ Precautions such as ESD wrist strap, ESD shoe strap or antistatic gloves must be worn whenever handling of SMD LED.
- ✧ All devices, equipment and machinery must be properly grounded.
- ✧ It is recommended to perform electrical test to screen out ESD failures at final inspection.
- ✧ It is important to eliminate the possibility of surge current during circuitry design

7. Heat Management

Heat management of SMD LED must be taken into consideration during the design stage of SMD LED application. The current should be de-rated appropriately by referring to the de-rating curve attached on each product specification. Data is subject to change without prior notice.