

APPLICATION NOTES for SMD LEDs / PLCC

1. Scope: SMD LEDs is suitable for general electronic products (e.g. instrument equipment , consumer equipment and Home appliances etc.).
In the event that the product needs to be applied to certain special reliability , as well as when the product failure or failure may endanger life and health equipment (e.g. aviation, transportation, traffic control equipment, medical and life support systems etc.), it is necessary to contact with Opto Plus LED Corp.
2. SMD LEDs must be stored in a clean environment. Unopened moisture barrier bag shall be stored at temperature below 30°C with humidity below 60%RH.
3. After the moisture barrier bag has been opened , the SMD LEDs should be used according to the floor life specified in the table below:

| LEVEL | FLOOR LIFE | | LEVEL | FLOOR LIFE | |
|-------|------------|-----------------|-------|---------------------|-----------------|
| | TIME | CONDITIONS | | TIME | CONDITIONS |
| 1 | Unlimited | ≤ 30°C / 85% RH | 4 | 72 hours | ≤ 30°C / 60% RH |
| 2 | 1 year | ≤ 30°C / 60% RH | 5 | 48 hours | ≤ 30°C / 60% RH |
| 2a | 4 weeks | ≤ 30°C / 60% RH | 5a | 24 hours | ≤ 30°C / 60% RH |
| 3 | 168 hours | ≤ 30°C / 60% RH | 6 | Time on Label (TOL) | ≤ 30°C / 60% RH |

Unused products must be repacked in an anti-electrostatic package, folded to close any opening and then stored in Moisture-Proof Cabinet.

4. Baking
Baking before soldering is recommended when the package has been unsealed for 72 hours.
The conditions are as followings:
 - 60±3°C x(12~24hrs)and<5%RH, taped reel type.
 - B. 100±3°C x(45min~1hr), bulk type.
 - C. 130±3°C x(15min~30min), bulk type.
5. Soldering pads (cathode and anode) are plated with gold, tin, or other metals.
If soldering pads exposure to open in air under long-term, it is easy to cause pad oxidized and poor solder.
Therefore, opened but unused parts must be stored in Moisture-Proof Cabinet.
Suggest to store unused parts by original moisture barrier bag and Moisture-Proof Cabinet.
6. Moisture control for components already mounted on PCB:

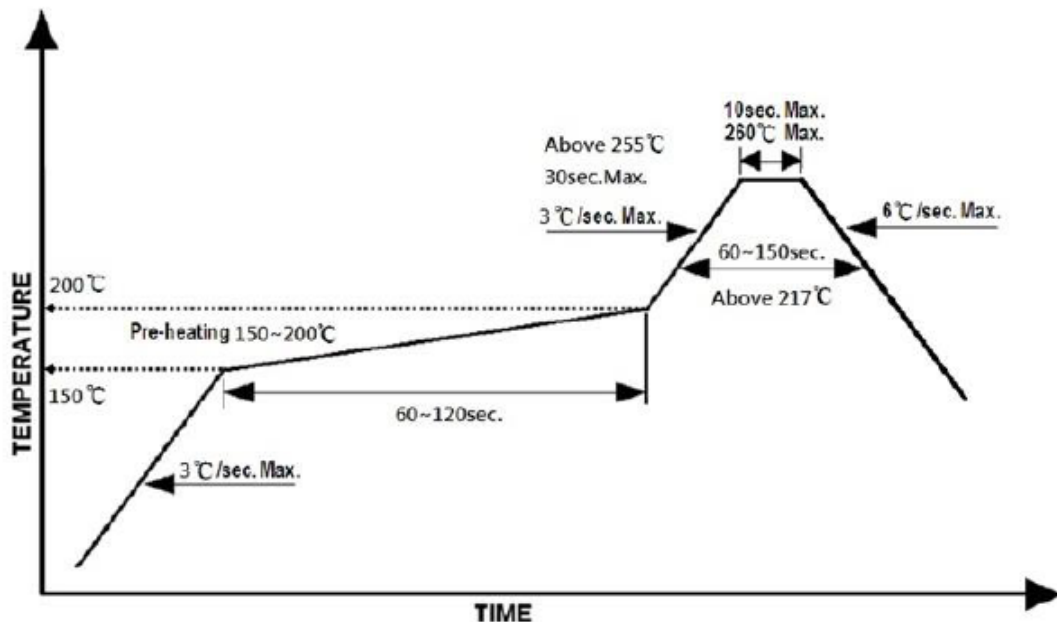
- If the PCB will not undergo additional reflow soldering or high-temperature processes, then no special treatment is required for the mounted moisture-sensitive SMD LEDs.
- If the PCB will undergo multiple reflow soldering or other high-temperature processes, including rework, then the SMD LEDs' cumulative exposure time until the final high-temperature process must be controlled to within the specified time limit.
(Please refer to floor life specification as Item 3)

7. Reflow Soldering

Recommend soldering paste specifications:

- Operating temp.: Above 217°C, 60~150 sec
- Peak temp.: 260°C Max., 10sec Max.
- Reflow soldering should not be done more than two times.
- Never attempt next process until the component is cooled down to room temperature after reflow.
- The recommended reflow soldering profile (measured on the surface of the LED terminal) is as following:

Lead-free Solder Profile

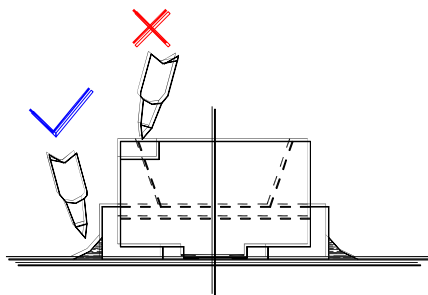


Note:

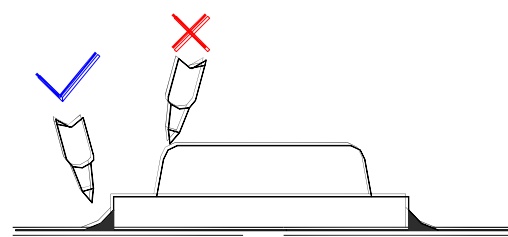
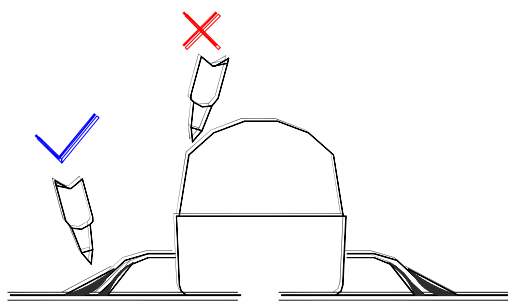
1. Don't cause stress to the LEDs while it is exposed to high temperature.
2. The maximum number of reflow soldering passes is 2 times.
3. Reflow soldering is recommended. Other soldering methods are not recommended as they might cause damage

to the product.

8. Manual soldering is not recommended unless necessary such as when repair or rework is required.
9. Soldering iron power shall not exceed 30 W. The recommended maximum temperature for lead and unlead soldering is 300°C and 350°C respectively. For blue (typical λ_d 465 nm), green (typical λ_d 525 nm), and all white SMD LEDs, the maximum soldering iron temperature is 280°C. Do not place the soldering iron on the component for more than 3 seconds.



The Tip of the soldering iron should never touch the LED body



The Tip of the soldering iron should never touch the lens

10. Reworking

- Rework should be completed within 5 seconds under 260°C.
- The iron tip must not come in contact with the copper foil.
- Twin-head type is preferred.

For the rework of SMD LEDs without side surface leads, refer to QFN rework methods. Special attention should be made for proper thermal isolation of surrounding electronic components.

11. Cleaning

Following are cleaning procedures after soldering:

- An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended.
- Temperature x Time should be 50°C x 30sec. or <30°C x 3min
- Ultra sonic cleaning: < 15W/ bath; bath volume ≤ 1liter
- Curing: 100°C max, <3min

12. ELECTROSTATIC DISCHARGE PROTECTION

SMD LEDs are electrostatic discharge (ESD) sensitive. Common symptoms observed in an ESD damaged device include unusual forward voltage and reverse current measurements. To prevent SMD LEDs from being damaged by ESD, please adhere to the advices listed below.

- Minimize friction between the product and surroundings to avoid static buildup.
- All manufacturing and testing equipment should be grounded.
- Avoid touching by hands without wear antistatic garments and wrist straps and usage of common plastic containers, transport mediums or tools.
- All personnel in an ESD protected area should wear antistatic garments and wrist straps.
- Set up ESD protection areas using grounded metal plating for component handling.
- All workstations that handle IC and ESD-sensitive components must maintain an electrostatic potential of 150V or less.
- Relative humidity levels maintained between 40% and 60% in production area are recommended to avoid the build-up of static electricity
- Use anti-static packaging for transport and storage.
- All anti-static equipment and procedures should be periodically inspected and evaluated for proper functionality.

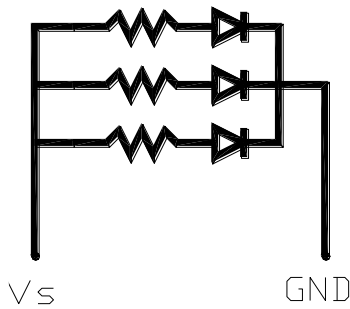
13. CIRCUIT DESIGN NOTES

- Protective current-limiting resistors may be necessary to operate SMD

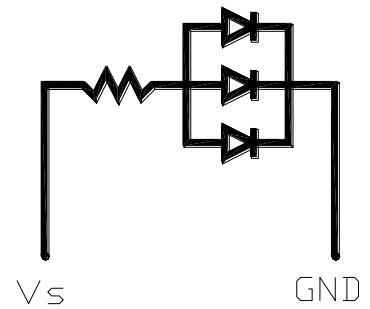
LEDs within the specified range.

- SMD LEDs mounted in parallel should each be placed in series with its own current-limiting resistor.

Recommended Set-up



Invalid Set-up



- Suggest customer needs to apply resistors for protection, otherwise slight voltage shift will cause big current change (Burn out will happen).
- The driving circuit of customer's main PCB should be designed to avoid reverse voltages and transient voltage spikes when the circuit is powered up or shut down.
- High temperatures can reduce SMD LEDs performance and reliability. Keep SMD LEDs away from heat sources for best performance.
- It is recommended to operate SMD LEDs at the binning current 20 mA to reduce visible difference in color and intensity. If SMD LEDs are to be driven at very small current (eg. 2mA or 5mA), please contact with Opto Plus first.
- Excess driving current and/or operating temperature higher than recommended conditions in Specification, may affect the life of SMD LEDs.

14. RESTRICTIONS ON PRODUCT USE

- If a reverse bias continuously applied to SMD LEDs, it can cause SMD LEDs damage.
- The information contained within this document is subject to change without notice. Before referencing this document, please confirm that it is the most current version available.
- Not all SMD LEDs type are available in every country.
- The light output from UV, blue, and white color SMD LEDs may damage to the human eye when viewed directly.
- Prolonged reverse bias should be avoided, as it could cause SMD LEDs

in leakage current or causing a short circuit.

- Avoid stress on the resin at elevated temperature.
- Avoid rubbing or scraping the resin by any object.
- Electric-static may cause damage to the component. Please ensure that the equipment is properly grounded. Use of an ionizer fan is recommended.

15. TERMS AND CONDITIONS FOR THE USAGE OF THIS DOCUMENT

- The information included in this document reflects representative usage scenarios and is intended for technical reference only.
- The part number, type, and specifications mentioned in this document are subject to future change and improvement without notice. Before production usage customer should refer to the latest datasheet for the updated specifications.
- When using the products referenced in this document, please make sure the product is being operated within the environmental and electrical limits specified in the datasheet. If customer usage exceeds the specified limits, OPTO PLUS will not be responsible for any subsequent issues.
- The information in this document applies to typical usage in consumer electronics applications. If customer's application has special reliability requirements or have life-threatening liabilities, such as automotive or medical usage, please contact with OPTO PLUS representative for further assistance.
- All SMD LEDs operating should refer to Data Sheet and Application Notes.