APPLICATION NOTES for LED Display

1. Scope: Through Hole LED Display / SMD LED Display is suitable for general module design products。
   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, it is necessary to contact with Opto Plus LED Corp.

2. Through Hole LED Display should not be exposed to an environment where high level of moisture or corrosive gases are present.
   ◆ When the package is unopened, the standard storage condition:

Through Hole (DIP) LED Display		**SMD LED Display**	
Temperature Condition	Humidity Condition	Temperature Condition	Humidity Condition
5°C ~ 30°C	Below 60%RH	5°C ~ 30°C	Below 60%RH

   If the storage conditions do not meet specification standards, the pins may become oxidized Suggest to do re-plating and re-sorting before use, and suggest customers use out the products as soon as possible, and avoid long-term storage of large inventories.

   ◆ When the package is opened, the storage condition:

Through Hole (DIP) LED Display		
Temperature Condition	Humidity Condition	Storage Time
5°C ~ 30°C	Below 60%RH	Unlimited (MSL as Level 1)

SMD LED Display		
Temperature Condition	Humidity Condition	Storage Time
5°C ~ 30°C	Below 60%RH	Within 4 weeks (MSL as level 2a)

3. The Pin of LED Display and 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 in Moisture-Proof Cabinet.

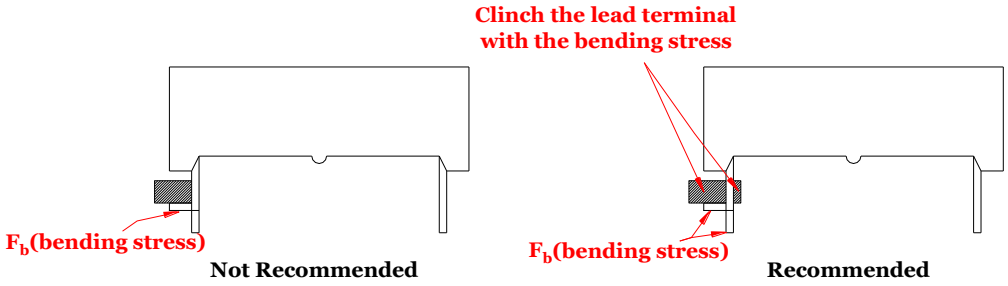
4. Moisture control for components already mounted on PCB:
   - If the PCB will not undergo additional reflow soldering or high-temperature processes, then no special treatment is required for the mounted moisture-sensitive SMD LEDs.
   - If the PCB will undergo multiple reflow soldering or other high-temperature

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.

5. Through Hole Display Mounting Method

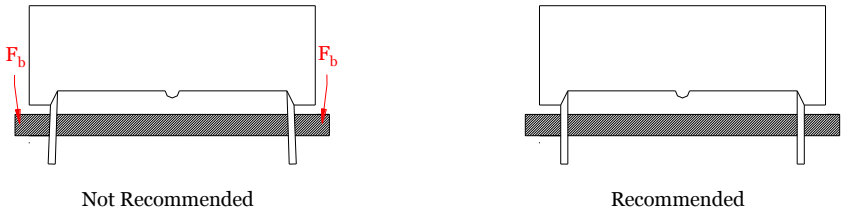
■ **Lead Forming:**

- Do not bend the component pins by hand without proper tools.
- The pin should be bent by clinching the upper part of the pin firmly so that the bending force is not damage the plastic body.

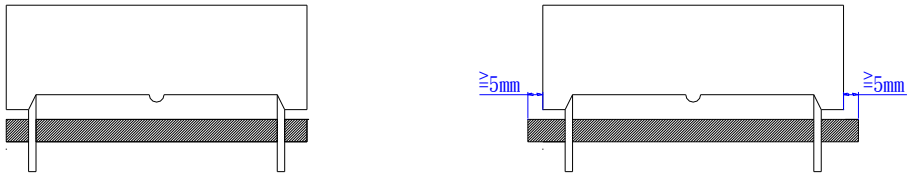


■ **Installation:**

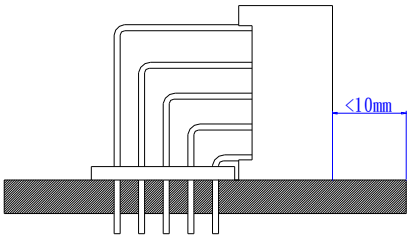
- The installation process should not apply stress to the pins.
- When inserting for assembly, ensure the pin pitch matches the customer's PCB hole pitch to prevent spreading or pinching the pins.



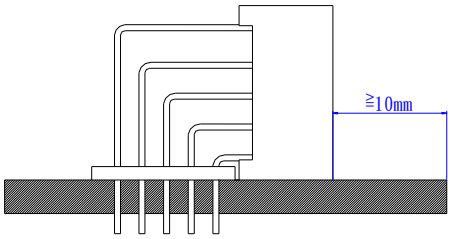
- Through Hole Display shall be placed at least 5mm from edge of PCB to avoid damage caused excessive heat during wave soldering.



- For LED Display with 90-degree pin bends, OPTO PLUS recommends at least 10mm of clearance between the display and the edge of the PCB during soldering and assembly.



Not Recommended

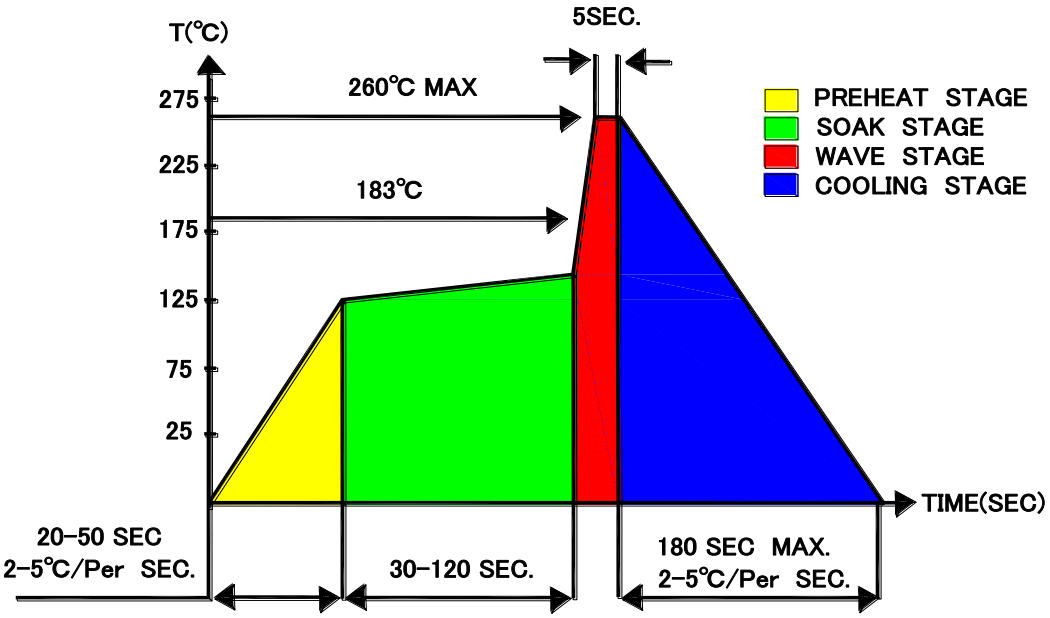


Recommended

6. Soldering Condition

◆ Through Hole LED Display

WAVE SOLDER PROFILE



- Recommend pre-heat temperature of 105°C or less (as measured with a thermocouple attached to the LED pins) prior to immersion in the solder wave with a maximum solder bath temperature of 260°C
- Peak wave soldering temperature between 245°C ~ 225°C for 3 sec (5 sec max)
- No more than one wave soldering pass

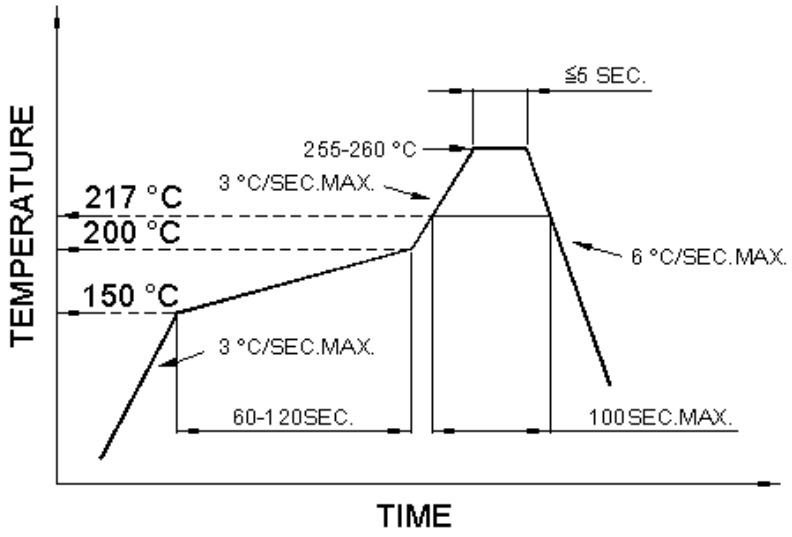
➢ Soldering General Notes:

- Through-hole displays are incompatible with reflow soldering.
- If components will undergo multiple soldering processes, or other processes where the components may be subjected to intense heat, please check with OPTO PLUS for compatibility

◆ SMD LED Display

SMT Soldering Profile

Pb free reflow soldering Profile



- We recommend the reflow temperature 245°C (+/- 5°C).
- The maximum soldering temperature should be limited to 260°C.
- Number of reflow process shall be 2 times or less.

7. Manual soldering is not recommended unless necessary such as when repair or rework is required.
   The soldering iron should not exceed 30W in power. The tip of the soldering iron should not touch the plastic body to avoid heat-damage.

MANUAL SOLDERING CONDITIONS (with 1.5mm Iron tip)

IRON TIP TEMPERATURE	TIME	POSITION
350°C Max	3s Max	The iron should be situated at least 2mm away from the root of the leads

8. Reworking
   - Rework need to be finished within ≦3 sec under 350℃.
   - The head of soldering iron cannot touch copper foil.

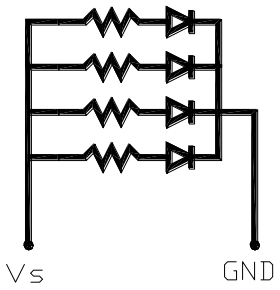
9. Cleaning:
   - Mild “no-clean” fluxes are recommended for use in soldering.
   - If cleaning is required, OPTO PLUS recommends to wash the parts with water only. Do not clean the parts by harsh organic solvents because they will damage the

plastic body.

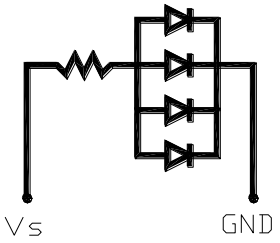
- The cleaning process should take place at room temperature and the parts should not be washed for more than one minute.
- When water is used in the cleaning process, suggest to remove excess moisture from the parts immediately with air drying afterwards

10. Circuit Design Notes:
    - Protective current-limiting resistors may be necessary to operate the LEDs within the specified range.
    - LEDs mounted in parallel should each be placed in series with its own current-limiting resistor.

Recommended Set-up



Invalid Set-up



- The driving circuit should be designed to protect the LED against reverse voltages and transient voltage spikes when the circuit is powered up or shut down.
- The safe operating current should be chosen after considering the maximum ambient temperature of the operating environment.
- Prolonged reverse bias should be avoided, as it could cause LED Display in leakage current or causing a short circuit.

11. ELECTROSTATIC DISCHARGE PROTECTION

Static discharge can result when static-sensitive products come in contact with the operator or other conductors.

To prevent LED Display 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.
- 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.

12. 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 Through Hole LED Display / SMD LED Display operating should refer to Data Sheet and Application Notes.