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APPLICATION NOTES:

SMD Handling and Application Precautions

The purpose of this document is to provide information regarding SMD LED handling and application precautions to the customers. The following precautions statement must be taken to protect the LED.

1. Moisture Barrier Bag

- SMD LED is a moisture sensitive device. If moisture is absorbed into the SMT package, it may vaporize and expand during soldering. This can damage the optical characteristics of LED. In order to prevent moisture absorption into LED during transportation and storage, moisture barrier bag is used for packing the LED.
- An aluminum moisture barrier bag is used to pack the LED. Moisture absorbent material (silica gel) is packed together with LED in the aluminum moisture barrier bag as the secondary protection. A humidity indicator card act as an indicator provides the information of humidity within SMD packaging by changing its colour.

2. Storage

- It is recommended to store the original sealed bag at <40 °C and <90% RH. The shelf life of LED in sealed bag is 24 months. If shelf life is expired, baking is required.
- After the package is opened the SMD LED must be stored under the condition ≤30 °C and < 60% RH and must be used (subject to re-flow) within specific period which depend on Moisture Sensitivity Level. Re-baking is required when floor life exceeds this time period.
- In case of SMD LED not used within the specific time frame and conditions, the SMD LED must be baked in oven at temperature 60 °C ± 5 °C and relative humidity ≤1% RH, for 20 hours.
- If unused LED remains, they should be stored in the original moisture barrier bag and reseal it again.
- It is recommended to solder SMD LED as soon as possible after opening the moisture barrier bag.

3. Cleaning

- It is recommended not to use unspecified chemical liquids as cleaning material for cleaning the LED. The chemical could harm the SMD LED.
- If cleaning is required after soldering, we suggest customer to use IPA as cleaning agent. Maximum recommended rinsing time is 10 seconds.
- When using other than alcohol as cleaning material, it should be confirmed that the material would not dissolve the LED package.
- When ultrasonic cleaning is used, the influence of ultrasonic cleaning on the LED depends on factors such as ultrasonic power, cleaning chemistry and the assembly condition. Verification should be done to ensure ultrasonic cleaning process would not damage the LED. This verification is particular critical for LED with silicone encapsulation, which ultrasonic power can adversely impact the crosslinking stability of this polymer material.

4. Electrostatic Discharge

- Electrostatic discharge (ESD) or surge current may damage the LED.
- It is recommended that ESD wrist strap; ESD shoe strap or anti-electrostatic glove be used whenever handling the LED.
- All devices, equipments and machinery must be properly grounded.
- It is important to eliminate the possibility of surge current during circuitry design.

5. Heat Management

- Heat management of LED must be taken into consideration during the design stage. It is necessary to avoid intense heat. Poor heat management will affect product life span and performance.
- The operating current should be de-rated appropriately when used in high temperature environment. Please refer to the de-rating curve attached on each product specification for the details.

6. Silicone Encapsulant

- Silicone encapsulant is normally used for white and high power LEDs. This silicone material will enhance the performance and reliability of these parts.
- If the encapsulation material of the LEDs is silicone, the LEDs will have a soft surface on the emitting area. Any stress or pressure to this surface will influence the reliability and performance of the LEDs. Precautions should be taken to avoid exerting strong pressure on the encapsulated part while picking the LEDs. When using the chip mounter during SMT, the picking up nozzle setting must be optimized so that it does not damage the silicone resin.
- Silicone material will also be easily contaminated by particles. However a small amount of particles on the LEDs does not affect the lifetime or the brightness of the LEDs. Therefore a small amount of particles on the surface of LEDs can be ignored.

7. Manual Soldering using Soldering Iron

- We do not recommend customer to manual solder the SMD LED using soldering iron. Improper temperature ramp rate during manual soldering can damage the LED
- For prototyping purpose which manual soldering cannot be avoided, the use of a soldering iron of less than 25W is recommended and the temperature of the iron must not be higher than 300°C (572°F). Maximum soldering time of three seconds is allowed.
- The heated soldering iron tip must not touch the resin portion of SMD LED.
- Mechanical force must not be applied to the SMD LED while it is soldered.

8. Soldering Using Re-flow Soldering

- The soldering paste should be applied to the necessary soldering pads by the screen-printing or with the dispenser.
- In the case of the screen-printing, it is desirable to have the thickness of 0.1mm (0.0039 inch) to 0.2mm (0.0079 inch) depend on package type.
- It is recommended to use a re-flow furnace with upper and lower heater type.
- The temperature profile as shown in Figure 1 is recommended for SMD LED soldering.

- Mechanical force must not be applied to the SMD LED while it is soldered.

- Repairing should not be done after the LEDs have been soldered. When repairing is unavoidable, a double-head soldering iron should be used if the LED needs to be removed.

Recommended IR-Reflow Profile

Product complies to MSL Level 2 acc. to JEDEC J-STD-020E

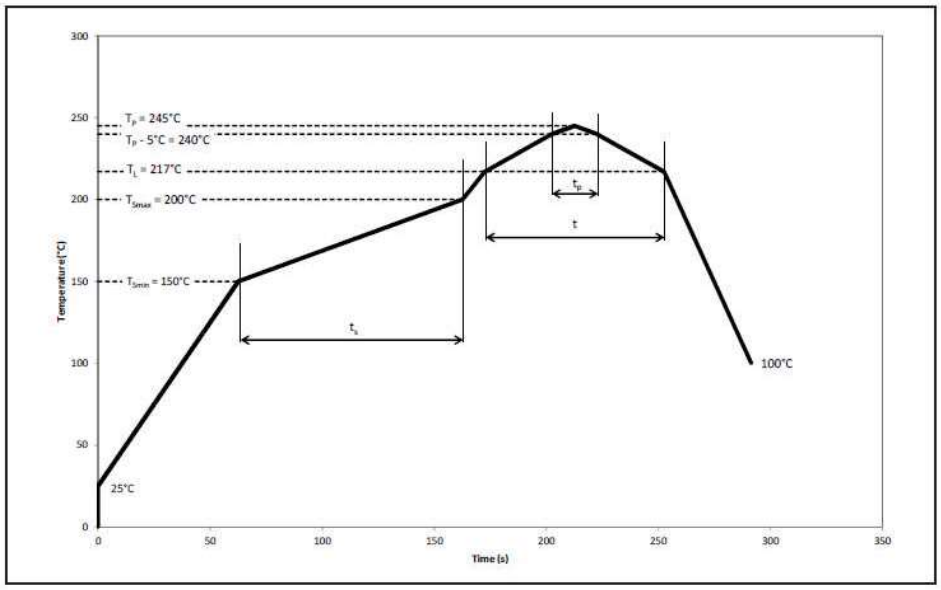

Figure 1: Recommended Pb-free Soldering Profile

Profile Feature	Symbol	Pb-Free Assembly			Unit
		Min.	Recommended	Max.	
Ramp-up rate to preheat 25°C to T_{smin}	-	-	2	3	°C/s
Time t_S T_{smin} to T_{smax}	t_S	60	100	120	s
Ramp-up rate to peak T_L to T_P	-	-	2	3	°C/s
Liquidous temperature	T_L	-	217	-	°C
Time above liquidous temperature	t	60	80	150	s
Peak temperature	T_p	-	245	260	°C
Time within 5°C of the specified peak temperature T_p - 5°C	T_p	10	20	30	s
Ramp-down rate T_p to 100°C	-	-	3	6	°C/s
Time 25°C to T_p	-	-	-	480	s

9. PCB Assembly Cleanliness And Ionic Contamination Control

- To ensure long term reliability of the SMD LED, it is critical to ensure the PCB Assembly has minimal amount of ionic contamination. The maximum limit of ionic contamination is specified by J-STD-001, Chapter 8, to be < 1.56um/cm2 NaCl equivalent. But for PCB assembly for automotive application, the ionic contamination level should be controlled at much lower level.
- High concentration of Ionic contamination from PCB assembly, couple with moisture from environment, can trigger electrochemical migration within SMD LED package and cause pre-mature LED failure.
- Halogen contained ionic contamination, particularly chlorine base contamination, is strong oxidation agent. This type of contaminants not only can induce electrochemical migration of metal within SMD LED package, it could also cause corrosion of metal layer within SMD LED.
- The common source of halogen base ionic contamination includes bleach, disinfectant and other sanitizing solution use for general contagious diseases control and prevention. All these solutions should not be applied on SMD LED.