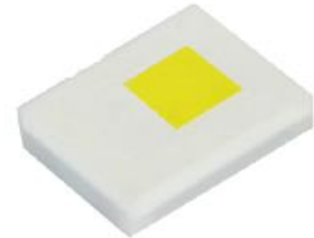
DOMINANT™
Opto Technologies
Innovating Illumination

APPLICATION NOTES:

Surface Mounting Guide for NagaJo 1216 LED

Introduction:

NagaJo is a very compact light source pack with high intensity to enhance design flexibility. It is particular suitable for application where space is a major constrain.



- Super high brightness surface mount LED
- 120° viewing angle.
- Compact package outline.
- Ultra-low height profile - 0.79mm.
- Low thermal resistance
- Compatible to IR reflow soldering.
- Environmental friendly; RoHS compliance.
- Superior corrosion resistance.
- Compliance to automotive standard; AEC-Q102.

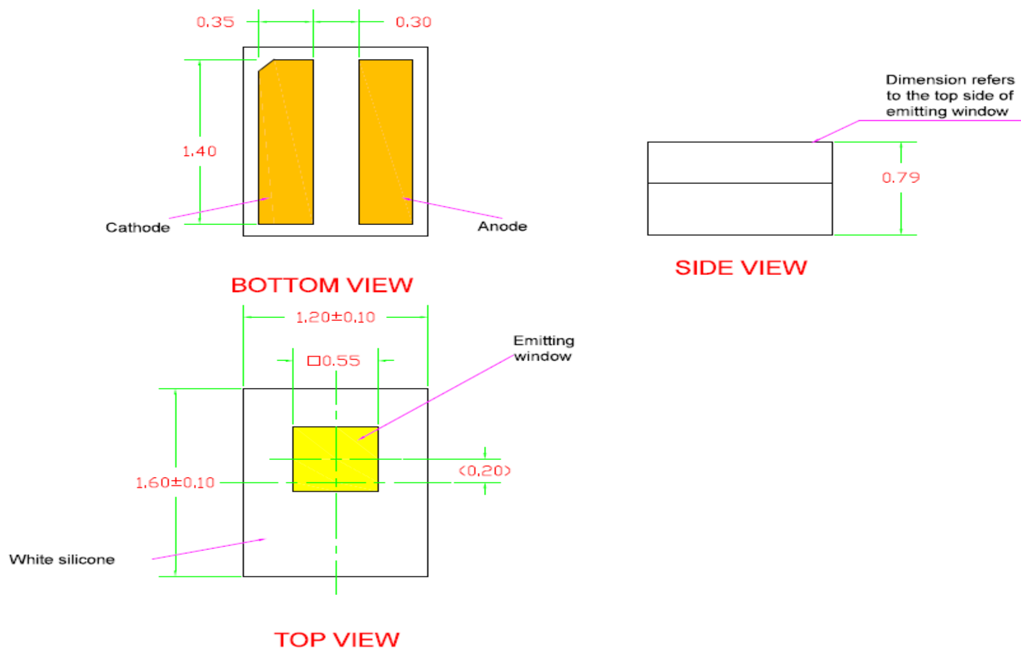


Figure 1: NagaJo 1216, JEW-EZHY, Package Dimension

Standard Soldering Process:

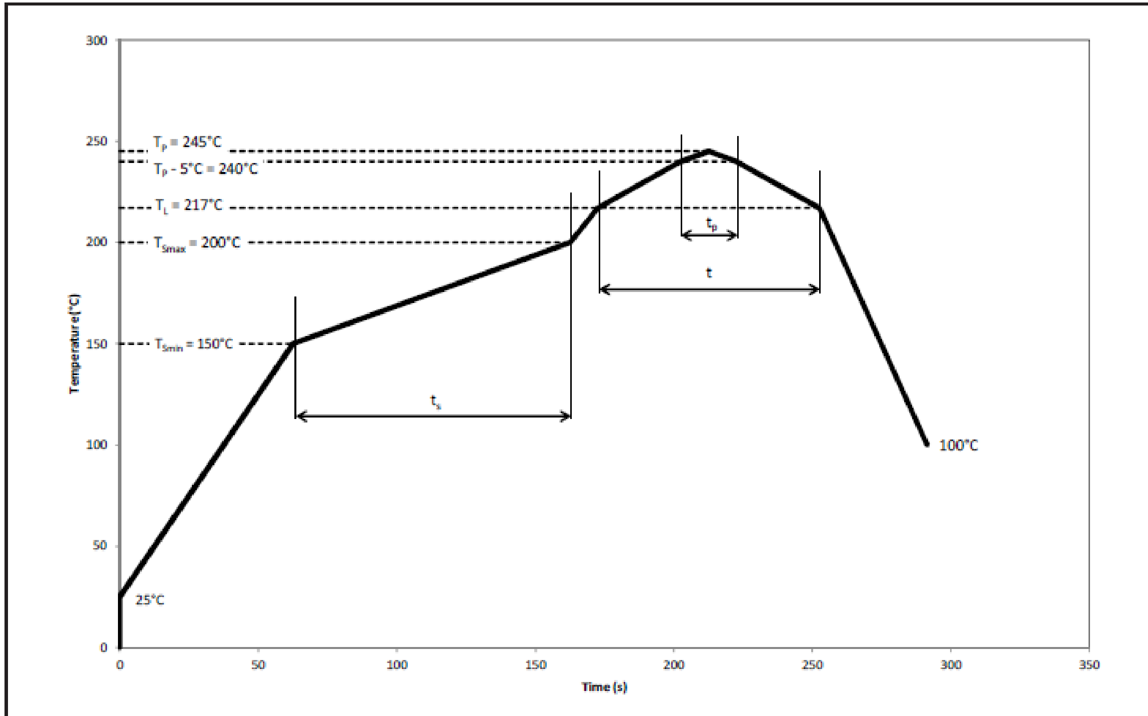
The NagaJo package soldering surfaces are plated with gold (Au) and are therefore RoHs compliant. The component is designed to be compatible to the existing industry SMT process and IR-reflow.

However, due to the unique design, all the soldering terminals are located at the bottom surface of the component. This greatly reduces the space required and also enhances the thermal dissipation capability of the component. Heat from the LED chip is directly conducted via the soldering terminals to the external environment. Thermal path is kept to the very minimum.

As for the soldering process, the component is qualified for Pb-free soldering profile. The profiles is as per described in the datasheet.

Recommended IR Reflow Profile:

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



Profile Feature	Symbol	Min.	Pb-Free Assembly Recommended	Max.	Unit
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

Surface Mounting – Factors to Consider:

This application note provides a guideline for the surface mounting of NagaJo 1216 LED. The following parameters have to be considered in order to optimize the surface mounting performance.

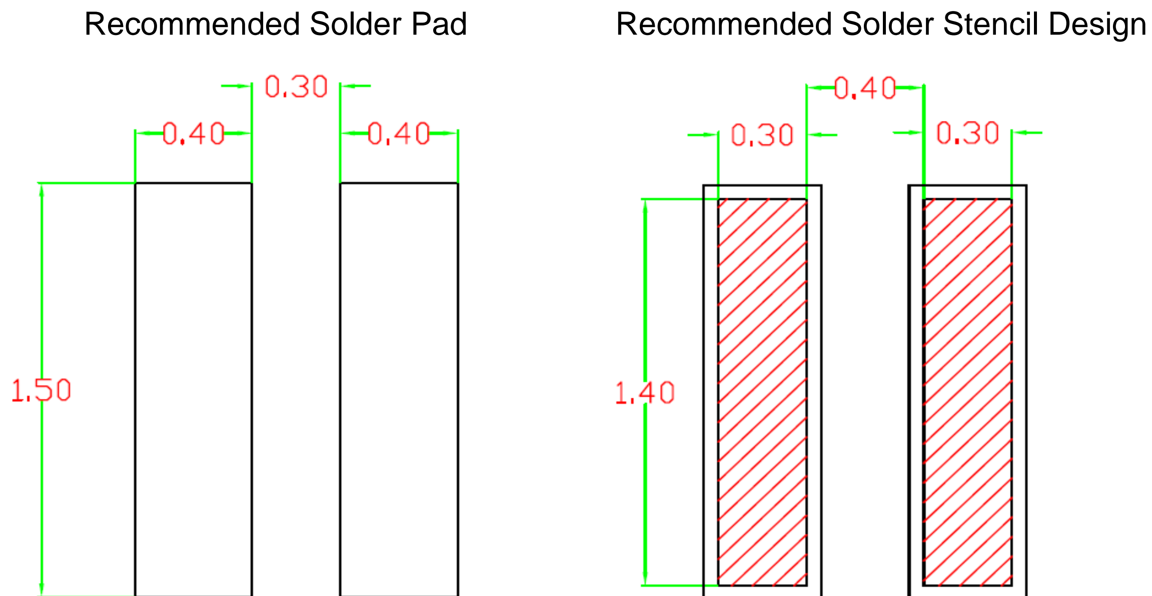
> Solder pad size
> Solder stencil size
> Pipette (nozzle)
> Solder paste thickness

Solder Pad Size

The recommended solder pad design is as illustrated in the data-sheet.

NagaJo solder pad and stencil design:

NagaJo 1216



Solder Stencil

In order to minimize solder bridging problems, it is common to design stencil aperture size smaller than the recommended solder pad. Excessive amount of solder paste deployed will result to tilted parts and inaccurate placement position. It is recommended that the aperture is reduced to 75% of the recommended solder pad design.

Pipette

Pick and place machine should be able to process NagaJo 1216 devices with the required placement accuracy. The material of the pipette should be non-metal e.g. Vespel (plastics) to avoid scratches on the phosphor plate. Care should be observed that the surface of the pipette which is in contact with the LED is flat and smooth. Because NagaJo 1216 device construction is different compare to conventional LED package, the pick up position of the pipette should be on the hard phosphor plate as depicted in the photo below. Both vacuum suction force and placement force of the pipette should be <2N/mm^2 during SMT to prevent damage to the LED. If excessive force is applied to the phosphor plate, it may cause the plate to be damaged, chip, crack or deformed.

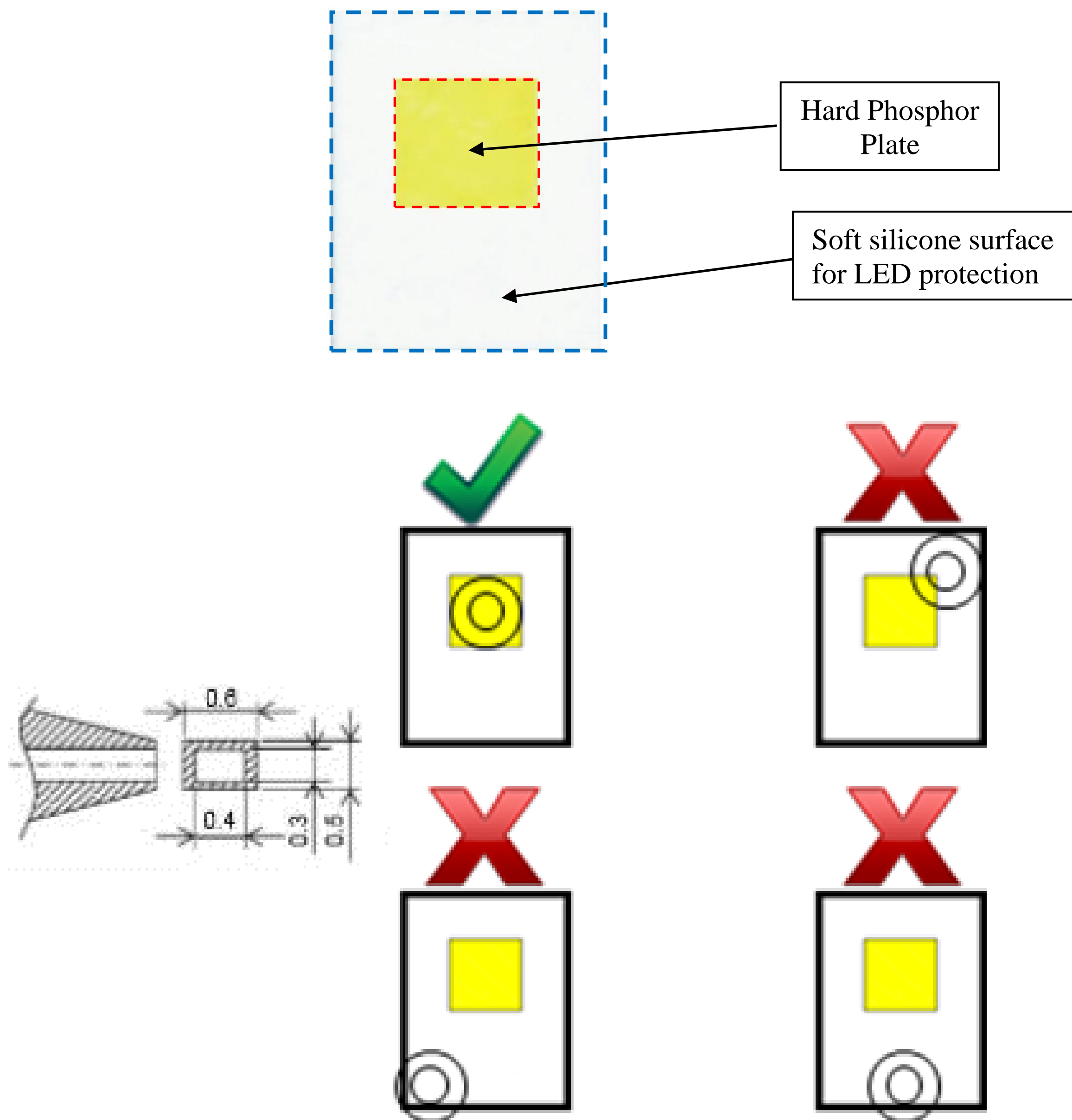
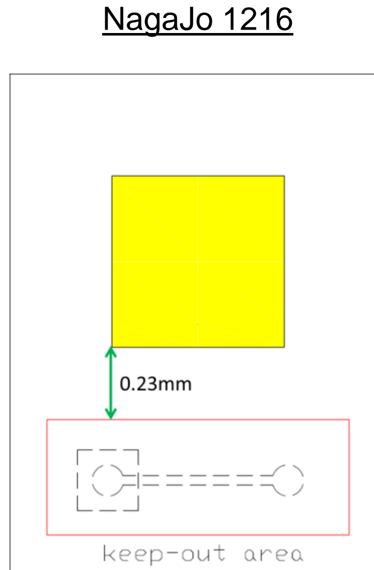


Figure 2: Recommended LED Pick & Place Nozzle Size And Pick Up Position For NagaJo 1216

If the nozzle is off-centre during pick & place and make contact with edges of phosphor plate, it may cause the phosphor plate to chip or crack.

The keep-out areas for the pipette, which should prevent the risk of wire bond damage, are shown in diagram below:

NagaJo 1216



Solder Paste Thickness

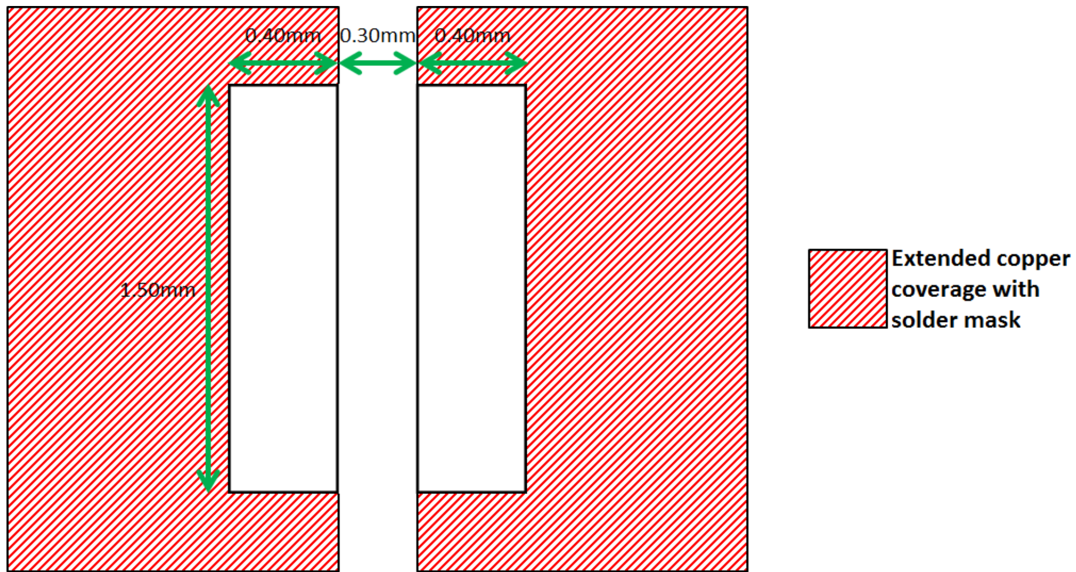
We recommend using minimum solder paste in order to achieve a good solder formation. A solder paste thickness of 0.125 mm will be optimum.

Solder Paste Type

Dominant has tested the Alpha P39 Maxrel and Henkel Innolot (90iSC) base solder paste with satisfactory results. However, since application environments vary widely, we recommend that customers perform their own solder paste evaluation in order to ensure it is suitable for the targeted application.

Printed Circuit Design For Enhance Heat Dissipation

For NagaJo 1216 package, the base substrate is built with high thermal conductivity ceramic substrate, so all the lead can be primary thermal path to carry heat away from the package. Since the NagaJo 1216 LED is small in package size, the heat density per area size is high, it is recommended to use MCPCB to surface mount this LED to enhance heat dissipation performance. Copper coverage dimension on PCB board can be extended beyond the solder pad in order to improve heat dissipation.



Solder Quality Check After SMT Process

For NagaJo 1216 LED, the primary soldering surfaces are at the bottom of the LED component. Thus no solder fillet will be observed on the part after SMT. Current industry practice is to install AOI after solder paste printing to ensure solder paste is perfectly print on pad before component landing. Alternately, inline X-ray can be used for solder void check after SMT process.

LED	Void Percentage		
	0.54%	0.67%	1.12%
NagaJo 1216 (Single Chip) Specification Limit < 25% (CPK > 1.67)			

Figure 3: Inline X-Ray Solder Void Inspection After SMT

Storage Method After SMT

For PCB assembly that mounted with NagaJo LED, it should not be stack together after IR reflow, else it would have high chance of damaging the NagaJo LED. Recommended method is have a dedicated carrier so that each PCB assembly is with at least 5mm away from each other

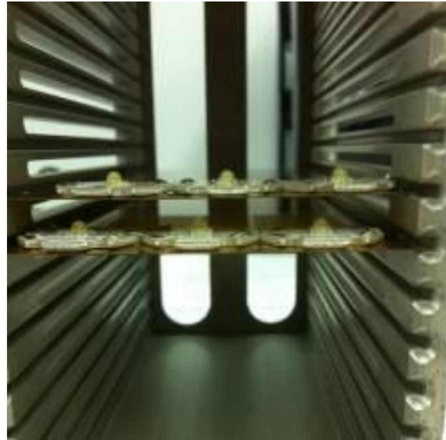
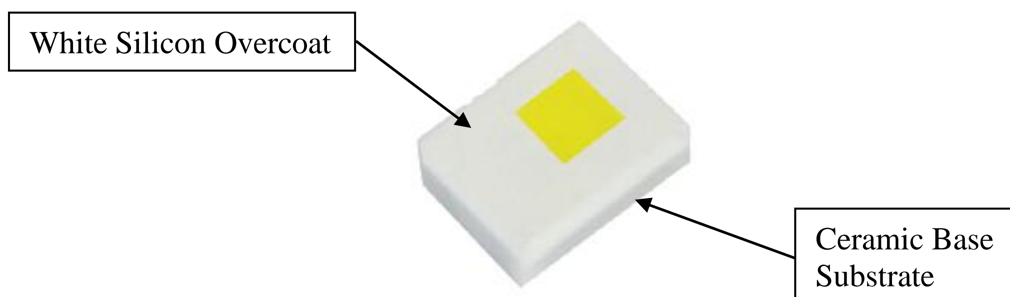


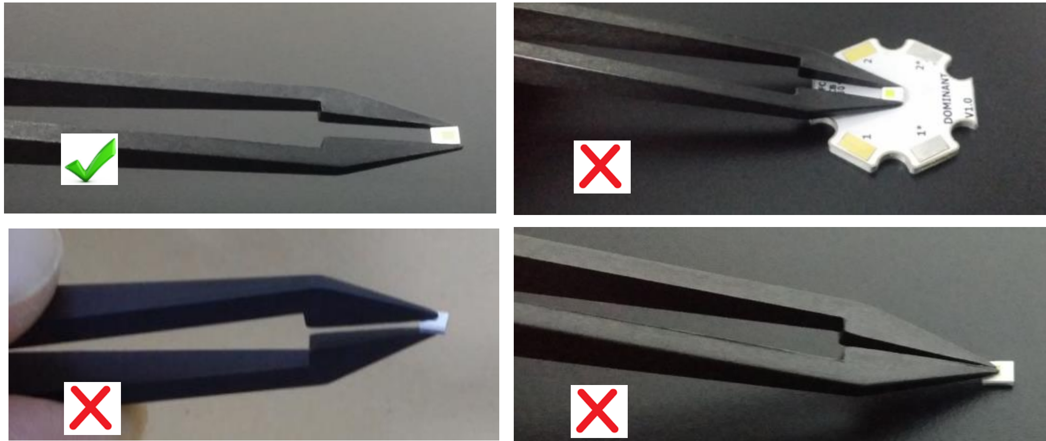
Figure 4: No stacking of LED is allowed after SMT

Handling Precautions

- Mechanical forces exerted onto the white silicone overcoat layer of NagaJo LED should be minimized.



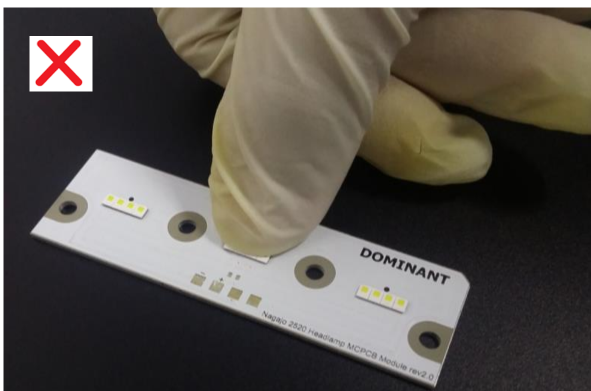
- For manual handling, anti-static/conductive plastic tweezers should be use, always pick up from the sides of the ceramic substrate and never from the sides where white silicone will be pressed. Handling with metal tweezers can possibly inducing package crack at ceramic layer.



- A better alternative for manual handling of NagaJo package is using vacuum pen. The suction tip should be made of a soft material such as rubber to minimize the mechanical force exerted onto the top surface of the white silicone layer. Care should be taken to avoid the soft material from contaminating the top side surface of the LED emitting area.

- In order to avoid any mechanical damage to the LED, do not apply more than 2N of shear force (200g-f) on the LED package

- Do not touch the top surface of LED with fingers or apply any pressure to it when handling finished boards containing NagaJo LED.



Cleaning Of LED

- If cleaning is required after soldering, we suggest customer to use IPA as cleaning agent. Maximum recommended rinsing time is 10 seconds. Ultrasonic cleaning might damage the LED and thus we do not recommend customer to use this method to perform cleaning.

Water Interaction With LED

- Similar to majority of the electronic ICs, LED should not be in direct interaction with water. Water will cause lead frame corrosion and device short circuit.