DOMINANT™
Opto Technologies
Innovating Illumination

APPLICATION NOTES:

Surface Mounting Guide for NagaJo 1519 LED

Introduction:

NagaJo

With continuous driven state of art mindset NagaJo is released to support today's market demand for new performance setting and economical standards. Its compact and robust in design, high efficiency, NagaJo also contributes to weight reduction. The small package outline with enhanced durability, enhanced heat dissipation and superior light performance.

Features:

> Super high brightness surface mount LED automotive exterior applications.

> 120° viewing angle.

> Compact package outline (LxWxH) of 1.5 x 1.9 x 0.79 mm.

> Small LES 1.05 x 1.05 mm.

> Low thermal resistance, RthJS; 5.3K/W.

> Superior corrosion robustness.

> Compatible to IR reflow soldering.

> Compliance to automotive standard; AEC-Q102.

> Qualified according to JEDEC moisture sensitivity Level 2.

> Environmental friendly; RoHS compliance.

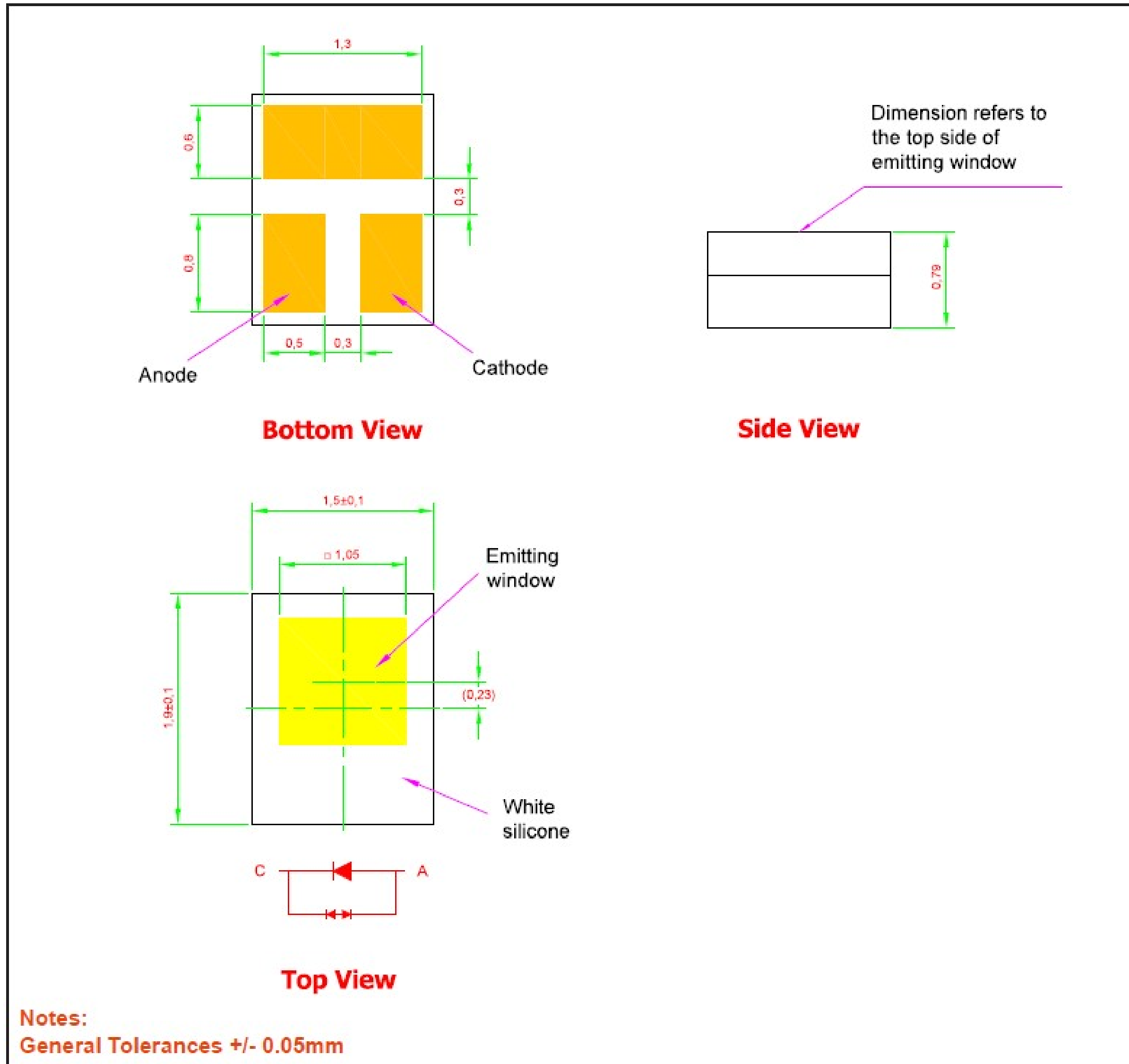


Figure 1: NagaJo 1519 InGaN : JKW-TZHY-VNBN Package Outlines

NagaJo Soldering Process:

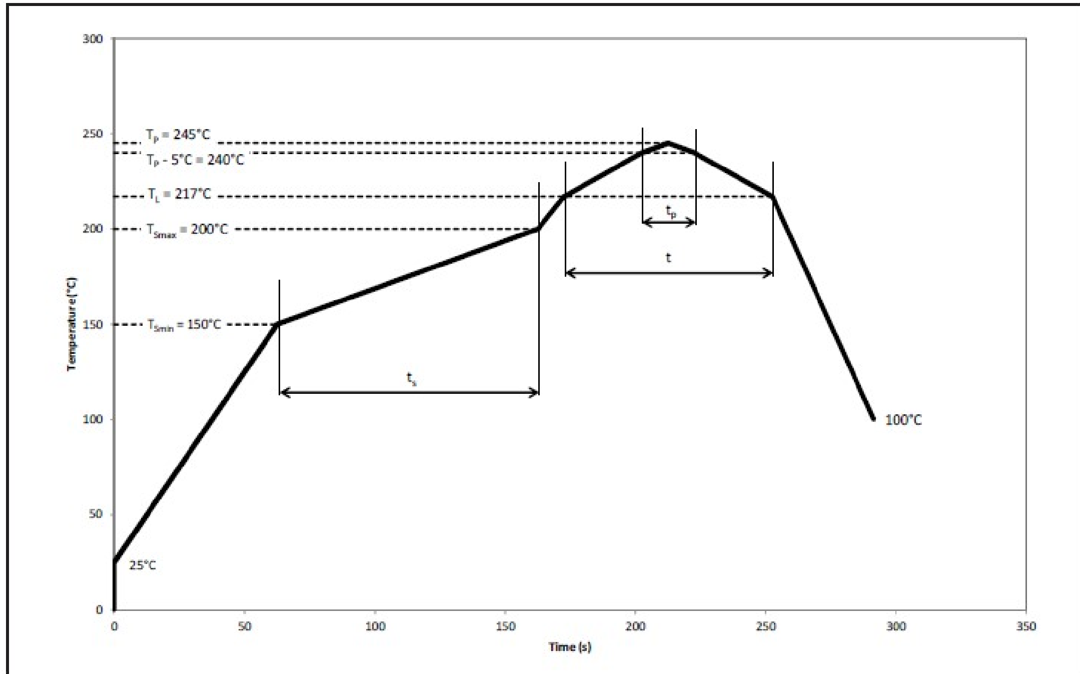
The NagaJo package soldering surfaces are plated with gold (Au) and are therefore RoHs compliant. The component is designed to be compatible to the existing industry SMT process and IR-reflow.

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.

As for the soldering process, the component is qualified for Pb-free soldering profile. The profiles are 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 1519. 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 quality check after SMT Process

Solder Pad Size

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

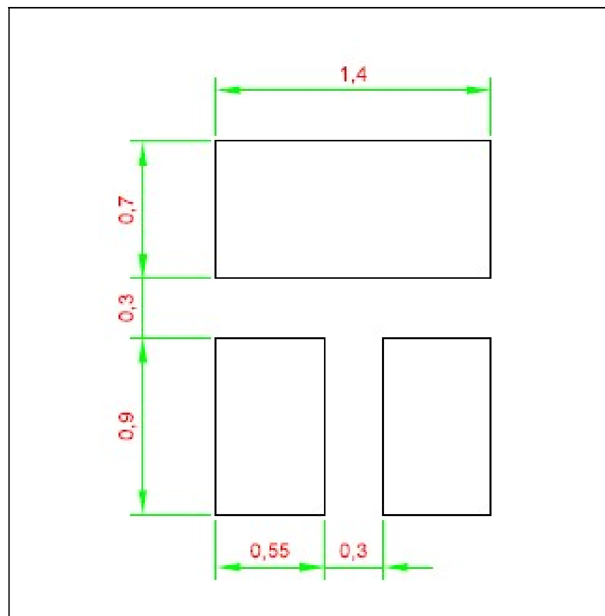


Figure 2: Recommended solder pad size

Solder Stencil Size

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 65% of the recommended solder pad design.

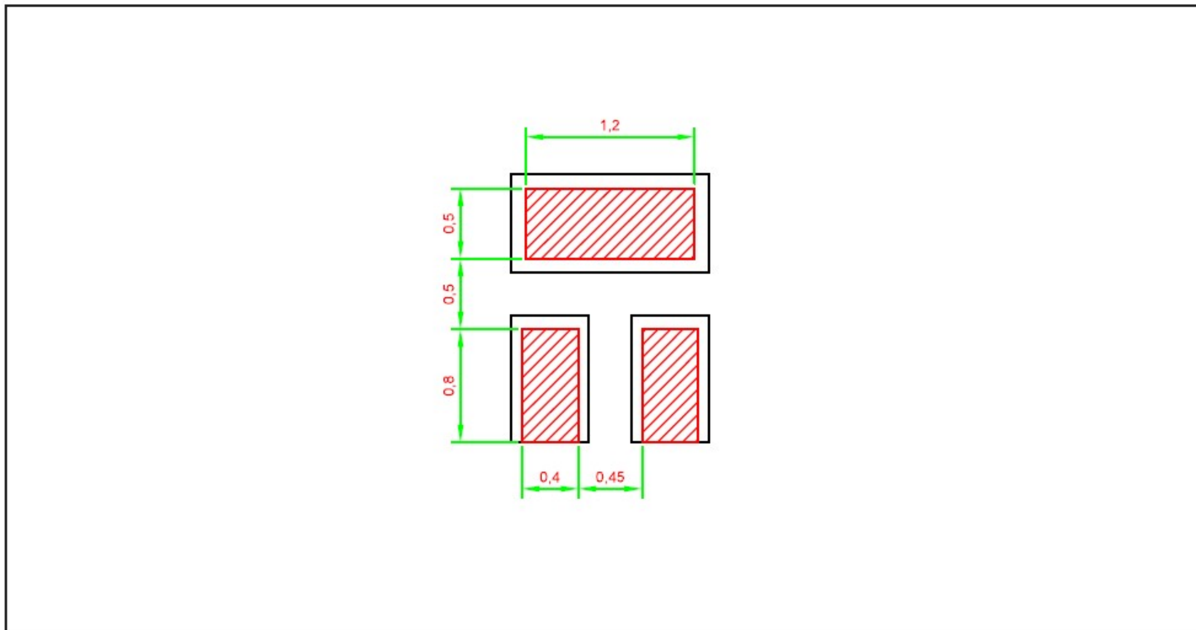
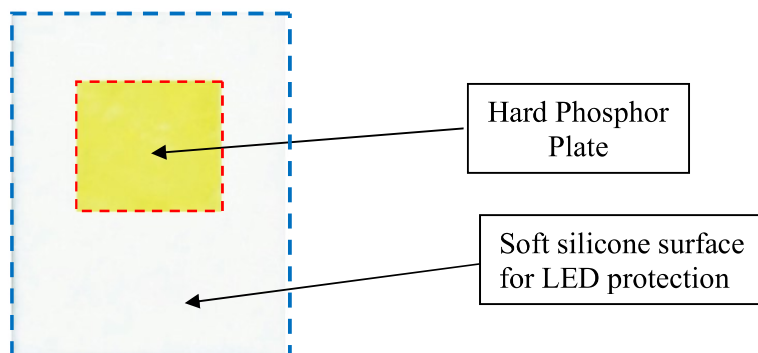


Figure 3: Recommended solder stencil size

Pipette

Pick and place machine should be able to process NagaJo 1519 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 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.



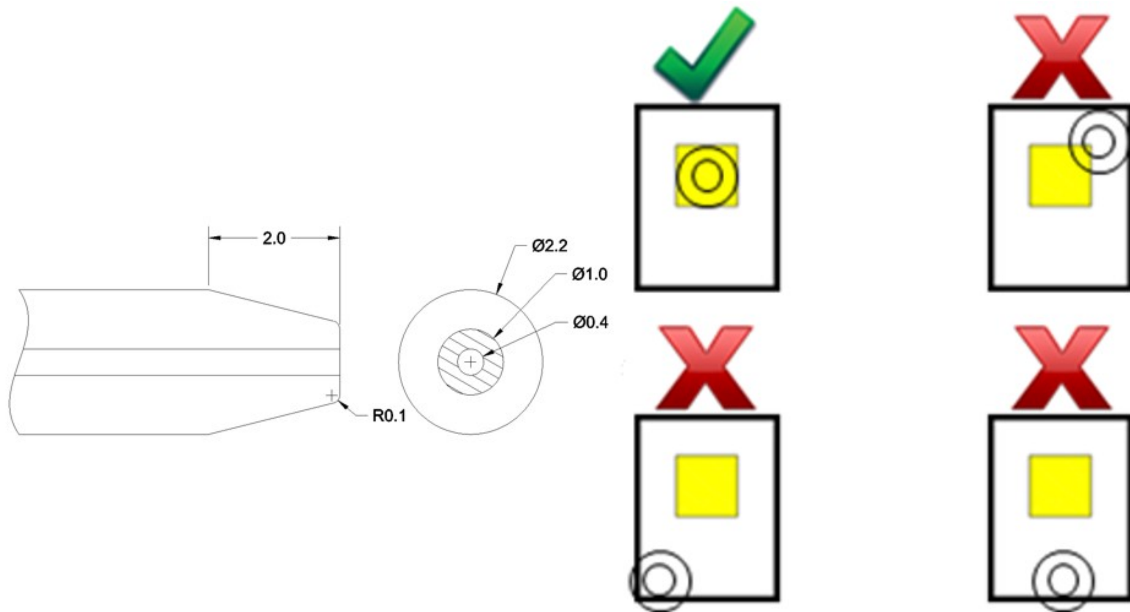
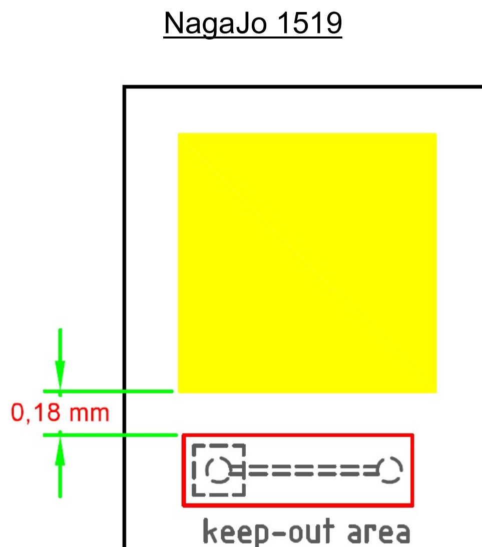


Figure 4: Recommended LED Pick & Place Pipette Size And Pick Up Position For NagaJo 1519

If the pipette 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 1519



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 1519 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 1519 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.

Solder Quality Check After SMT Process

For NagaJo 1519 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.

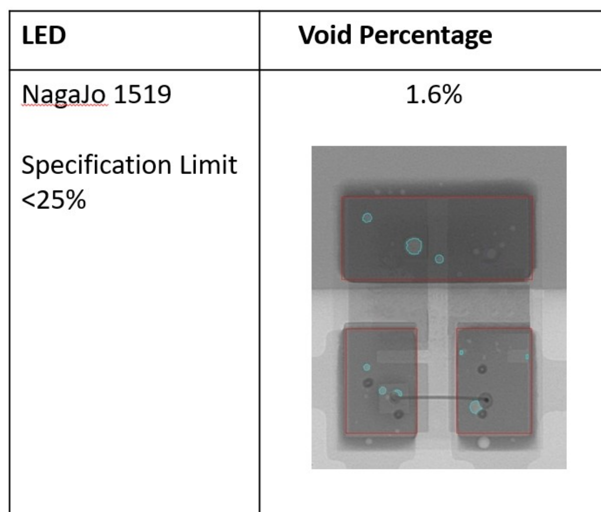
LED	Void Percentage
NagaJo 1519 Specification Limit <25%	1.6% 

Figure 5: Inline X-Ray Solder Void Inspection After SMT

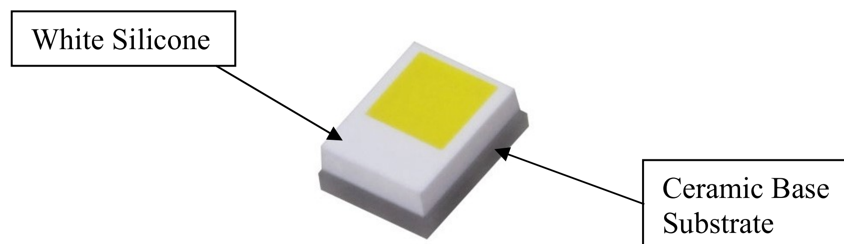
Storage Method After SMT

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 LED. To avoid the risk of damage or shear to the assembled LEDs, make sure that they are not exposed to compression forces of any kind. Recommended method is having a dedicated carrier so that each PCB assembly is with at least 5mm away from each other.

Figure 6: Example of carrier to store the PCBA

Handling Precautions

- Mechanical forces exerted onto the white silicone of NagaJo could cause sagging wire and 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.

Figure 7: Handling Precautions

- A better alternative for manual handling of NagaJo package is using vacuum suction 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.

Figure 8: Example of vacuum suction pen

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

- Generally, all LED assemblies should return to room temperature after soldering, before subsequent handling, or next process step.

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.