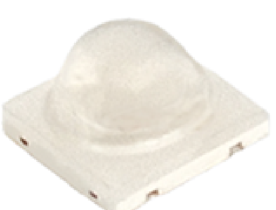
APPLICATION NOTES:

Surface Mounting Guide for L-Spice

Introduction:

L-Spice packs a powerful performance with its directional light output and efficient distribution. This specialized lens optimizes brightness and minimizes glare, enhancing both visual comfort and energy efficiency. It empowers designers with newfound flexibility, enabling the creation of sleek and visually appealing lighting solutions. Whether spotlighting, accentuating specific areas, or delivering precise illumination, L-Spice illuminates the way to a brighter and more focused future.



> Super high brightness surface mount LED automotive exterior applications.
> 60° viewing angle.
> Compact package outline (LxW) of 2.8 x 3.0 mm.
> Low height profile – 1.86mm.
> Low thermal resistance.
> Superior corrosion robustness.
> Compatible to IR reflow soldering.
> Compliance to automotive standard; AEC-Q102.
> Environmental friendly; RoHS compliance.
> The matt surface of the lens diffuses light and improve homogeneity.

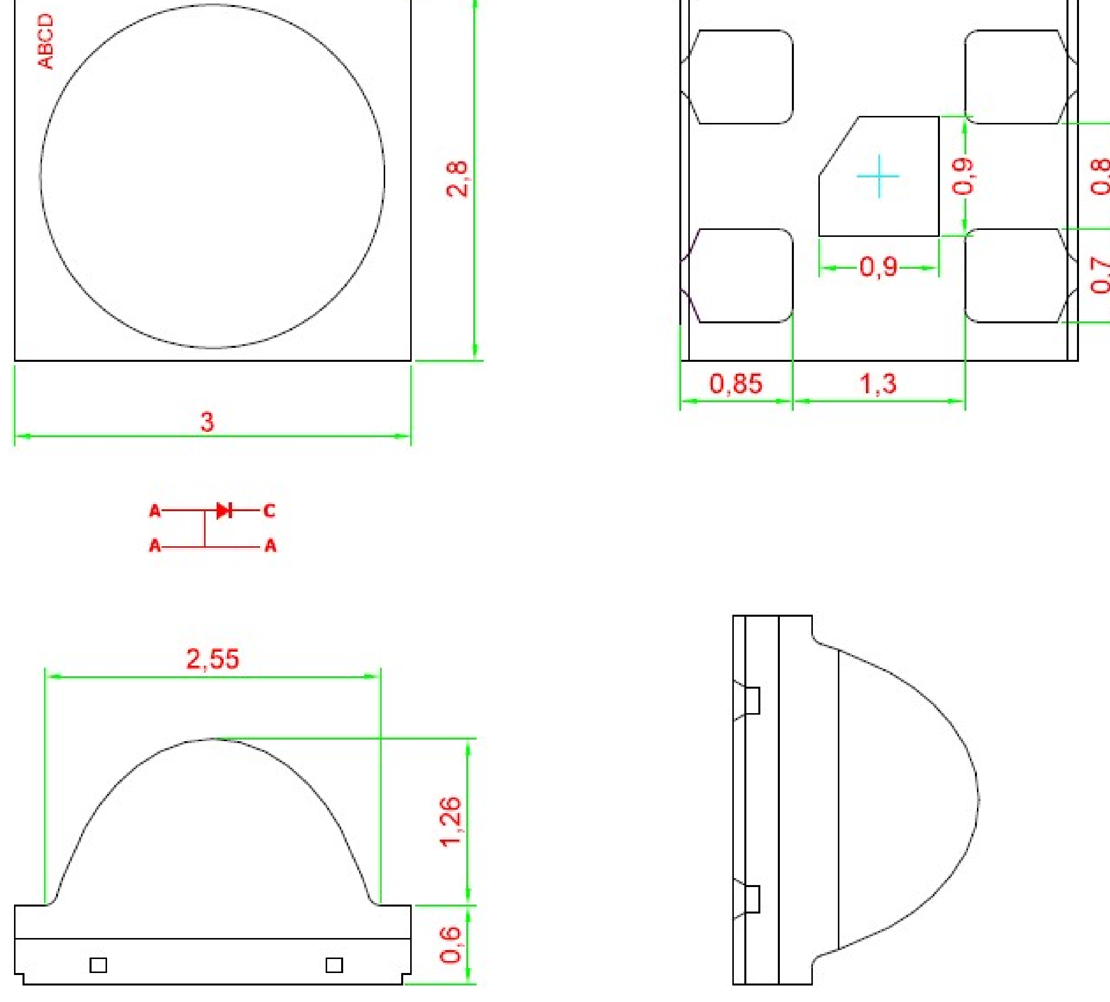


Figure 1: L-Spice AlInGaP: C6x-MHG, Package Dimension

L-Spice Soldering Process:

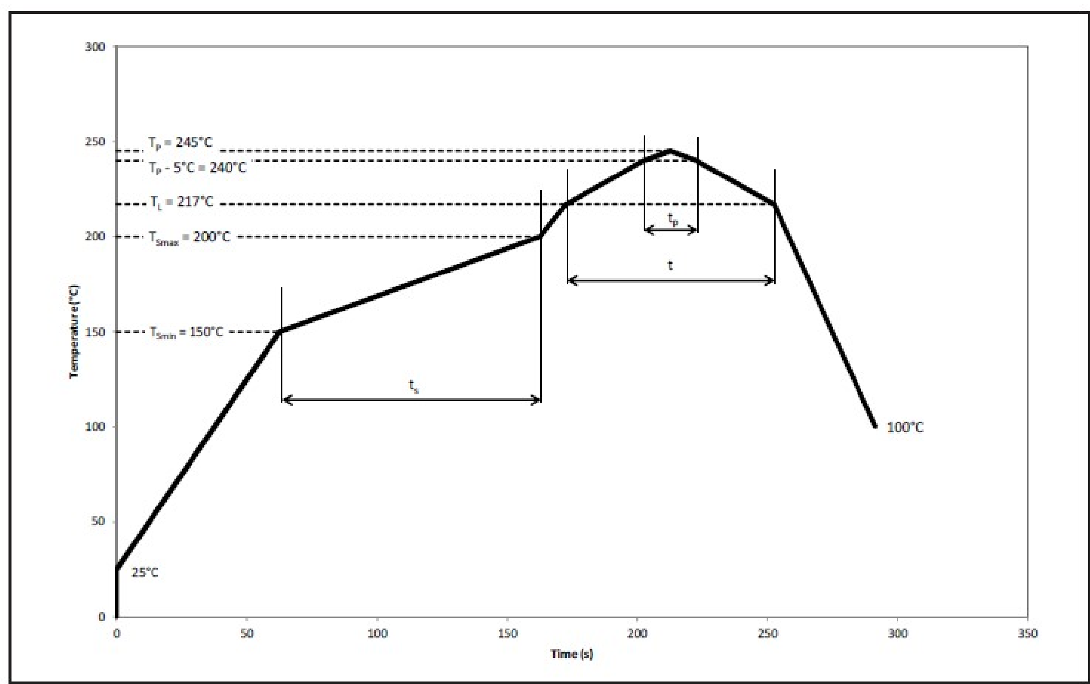
The L-Spice package soldering surfaces are plated with gold (Au) and are therefore RoHs compliant. The component is designed to be compatible to the existing industry SMT process and IR-reflow.

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 L-Spice. The following parameters have to be considered in order to optimize the surface mounting performance.

- Solder pad size
- Solder stencil dimension
- Nozzle
- Solder paste thickness

Solder Pad Size

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

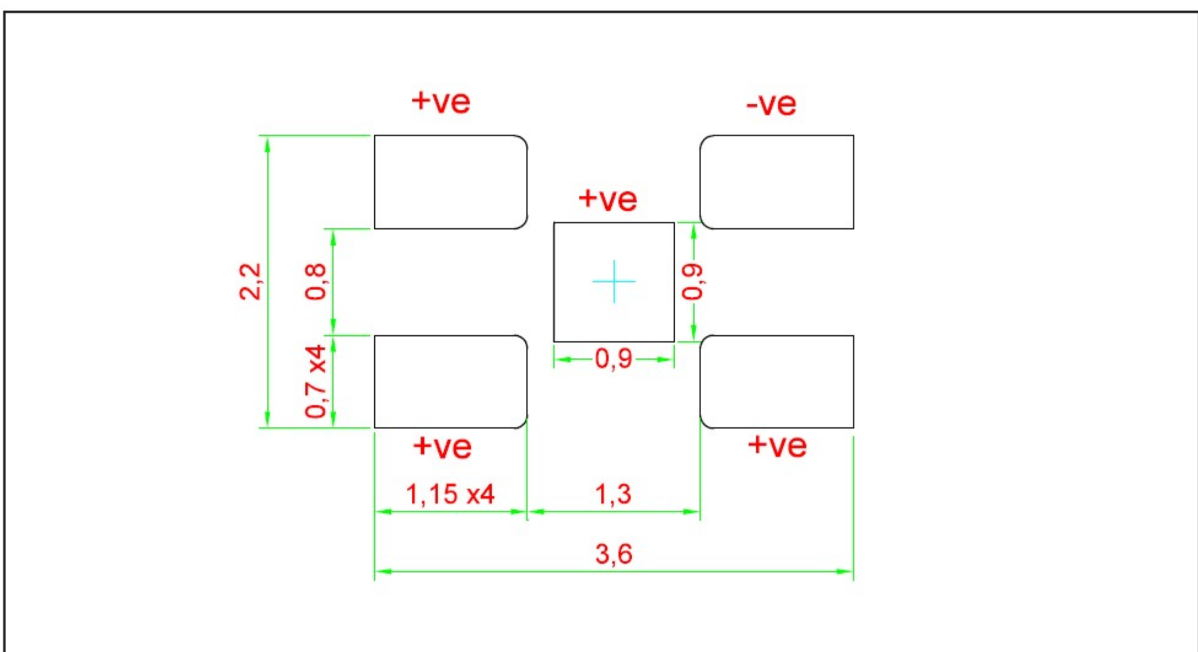


Figure 2: Recommended solder pad size

Solder Stencil Dimension

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.

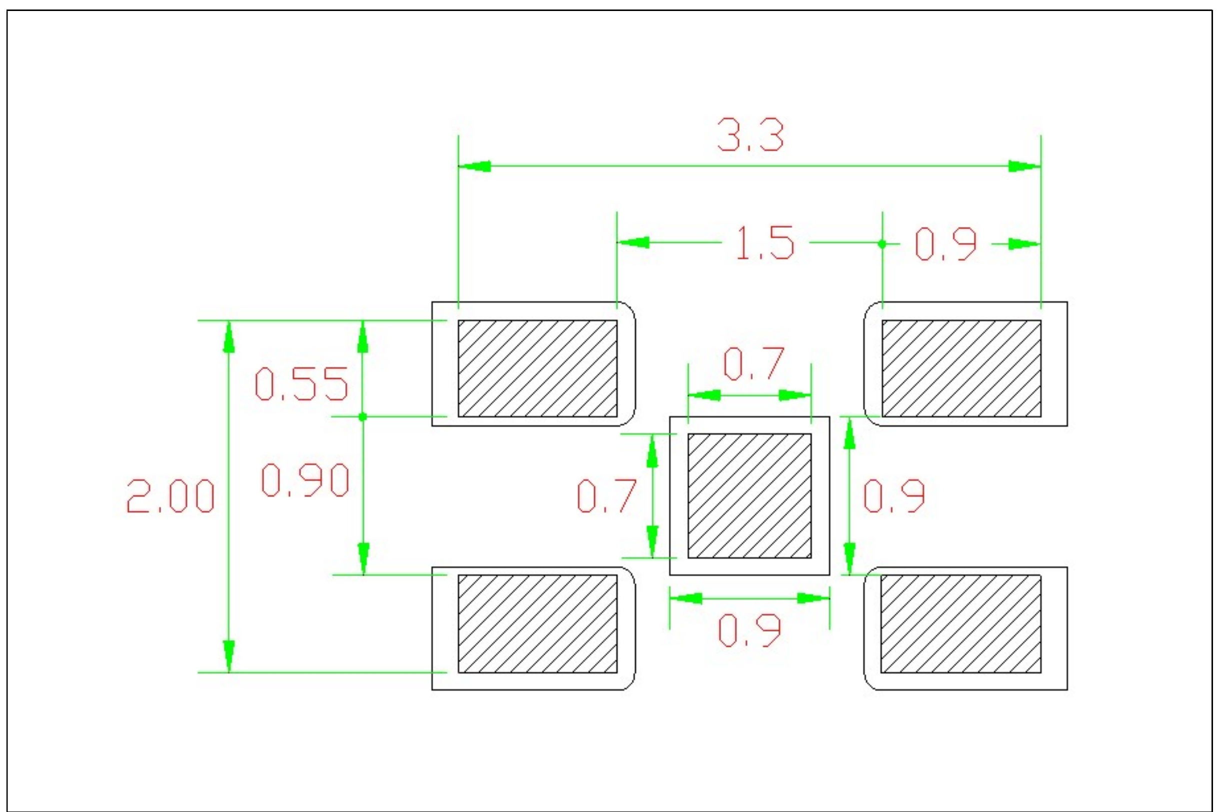
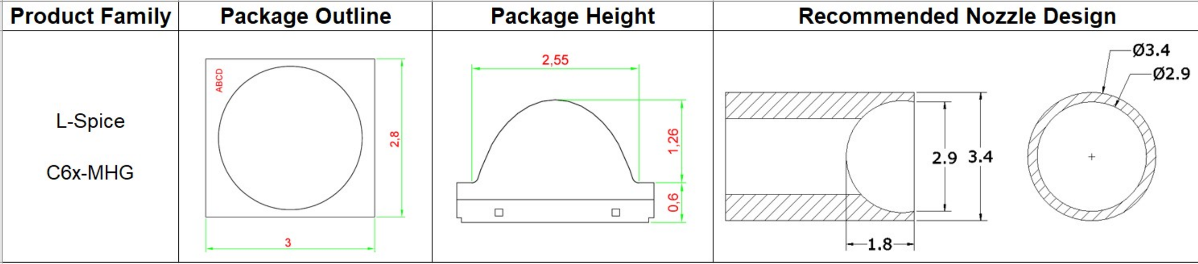


Figure 3: Recommended solder stencil size

Nozzle

Pick and place machine should be able to process L-Spice devices with the required placement accuracy. The material of the nozzle should be non-metal e.g. ESD rubber to avoid scratches on the lens. Care should be observed that the surface of the nozzle which is in contact with the LED is flat and smooth. Parameter settings for the pick and place process should also be evaluated to ensure no damage to the LEDs.



Product Family	Package Outline	Package Height	Recommended Nozzle Design
L-Spice C6x-MHG	ABCD, 2.8, 3	2,55, 1,26, 0,6	Ø3.4, Ø2.9, 2.9, 3.4, 1.8

Figure 4: Recommended LED Pick & Place Nozzle Size

Solder Paste Thickness

We recommend using minimum solder paste in order to achieve a good solder formation. A solder paste thickness of 0.100 mm will be optimum to ensure good planarity of the LED after reflow process.

Solder Quality Check After SMT Process

For L-Spice, the primary soldering surfaces are at the bottom of the LED component. There are wetting flank at package side wall. The purpose is to provide a visual indicator of lead solderability and minimize the inspection time.

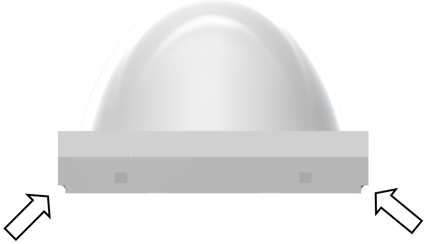
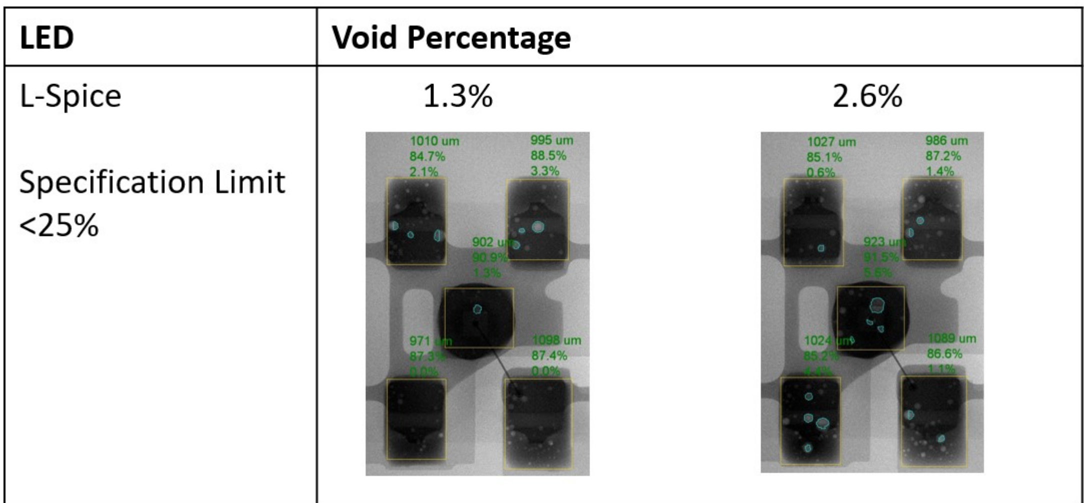


Figure 5 Wetting flank at package side wall

It has excellent solderability and solder fillet can be observed at this section after SMT process. Areas which are copper exposed that are not plated will only be partially solderable. Anyway, this feature will not impact the product quality & reliability in any aspect. Below pictures are the examples of LED lead with good solderability.



LED	Void Percentage	
L-Spice Specification Limit <25%	1.3%	2.6%

Figure 6: Inline X-Ray Solder Void Inspection After SMT

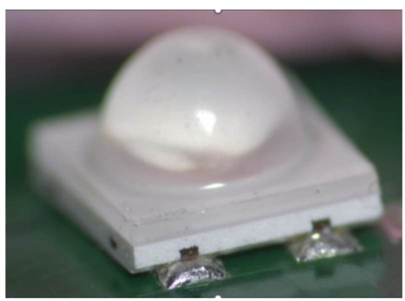
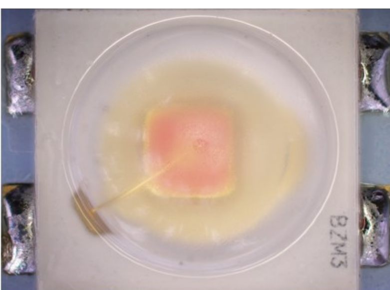



Figure 7: After Reflow

Storage Method After SMT

For PCB assembly that mounted with L-Spice, 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 8: Example of carrier to store the PCBA

Handling Precautions

- Mechanical forces exerted onto the L-Spice should be minimized in order to avoid any mechanical damage to the LED.
- For manual handling, anti-static/conductive plastic tweezers should be use, always pick up from the sides of the package and never pick up from the LED lens which is made of silicone resin. Handling with metal tweezers can possibly inducing package crack at silicone layer.
- Do not touch the lens of LED with fingers or apply any pressure to it when handling finished boards containing L-Spice. Also packaging material like bubble wrap must not touch the LEDs.
- Generally, all LED assemblies should return to room temperature after soldering, before subsequent handling, or next process step.

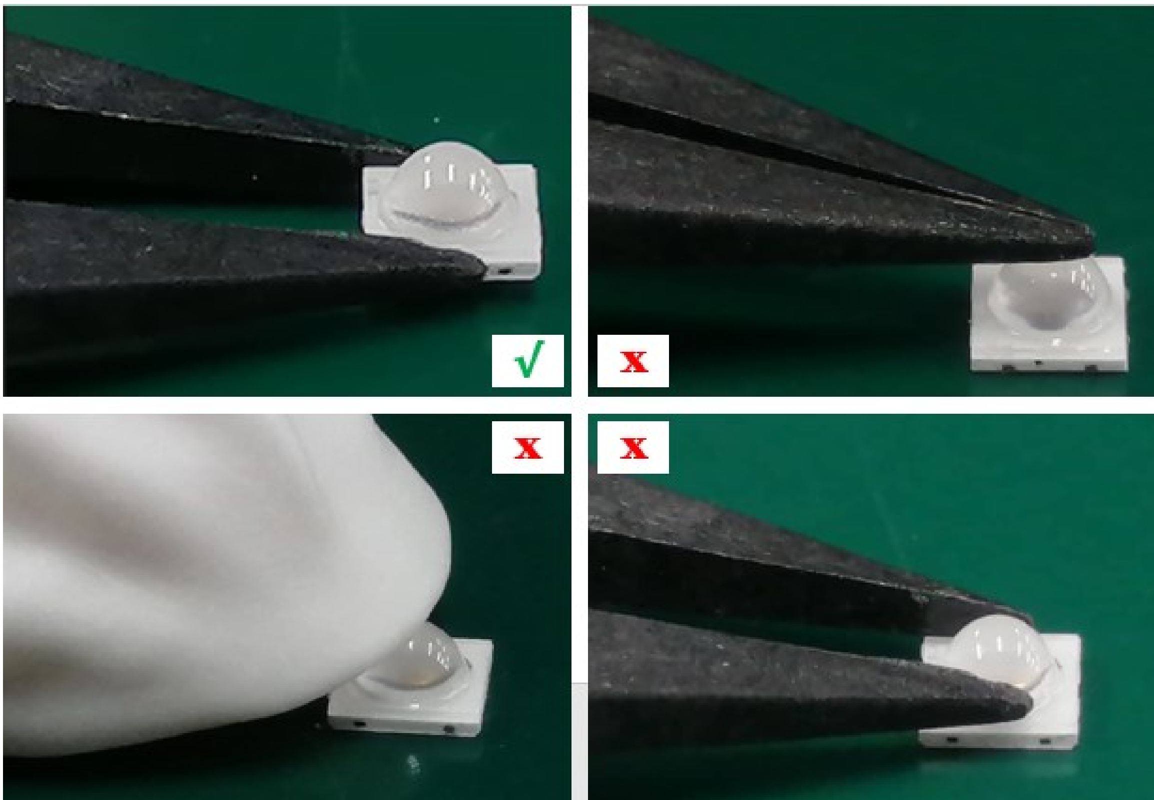


Figure 9: Handling Precautions

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.