AN11046

DSN0603-2 (SOD962) soldering requirements

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Document information

Info	Content
Keywords	DSN0603-2 (SOD962), 0201 package size, reflow soldering, surface mount, solder paste, solder mask opening, Printed-Circuit Board (PCB), Surface-Mounted Device (SMD), footprint, landing pattern
Abstract	This application note provides soldering requirements for NXP Semiconductors ultra small DSN0603-2 (SOD962) 0201 size packages. This technical report provides recommendations for choosing landing pattern and solder paste type to achieve the most reliable solder results.

Revision history

Rev	Date	Description
1	20120601	Initial version

Contact information

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1. Introduction

Due to the trend in mobile application to reduce thickness and size of devices, there is an increasing request from the industry for extremely small 0201 size components. With its new DSN0603-2 (SOD962) diode package of only 0.6 mm × 0.3 mm × 0.3 mm (0201), NXP Semiconductors offers an extremely small surface-mount packaging technology. Because the component is very small, it is important that the mounting process follows the guidelines suggested in the document. These guidelines are relevant for Printed-Circuit Board (PCB) mounting pads, solder mask, stencil pattern and assembly process parameter.

Using the recommended dimensions for pads and stencil as described in this document leads to:

- self adjustment
- optimum stand-up height
- minimum tilt in all dimensions
- minimum rotation
- no shorts

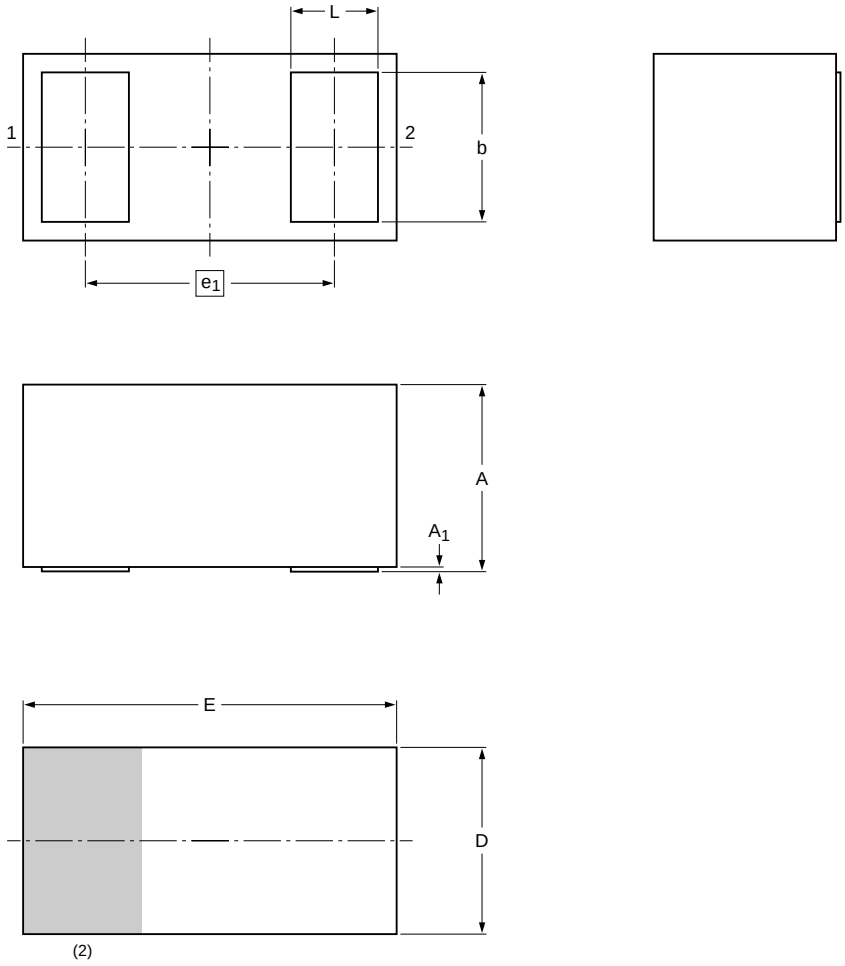
2. DSN0603-2 (SOD962) package overview

2.1 Package description

DSN0603-2 (SOD962) is a Wafer-Level Chip-Sized Package (WLCSP) using solderable metal contacts under the package. The package enables 100 % utilization of its area for active silicon, offering a performance per board area ratio, which is significantly improved compared to products in plastic-molded packages.

Fig 1. 0.6 mm × 0.3 mm 2-lead DSN0603-2 (SOD962) package

Leadless ultra small package; 2 terminals; body 0.6 x 0.3 x 0.3 mm **SOD962**



Dimensions

Unit		A(1)	A_1	b	D	E	e_1	L
mm	max	0.32	0.0076	0.25	0.325	0.625		0.15
	nom						0.4	
	min	0.28		0.23	0.275	0.575		0.13

Note
1. Dimension A is including coating foil thickness.
2. The marking bar indicates the cathode.

sod962_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOD962						~~10-11-03~~ 10-11-11

Fig 2. DSN0603-2 (SOD962) package outline with dimensions

3. PCB design rules

3.1 Printed-circuit board solder mask design

For surface-mount leadless style packages, two types of PCB solder mask openings are commonly used:

- Non-Solder Mask Defined (NSMD)
- Solder mask defined

3.1.1 Non-Solder Mask Defined Pad (NSMDP)

If the solder mask layer starts outside of the solder lands, and does not cover the copper solder lands, this is referred to as NSMDP. The effective solder pad is equal to the copper area.

In an NSMDP, the solder mask must be at least 75 μm away from the solder land on all sides. In other words, the solder mask dimension is 150 μm larger than the copper dimension. These values may vary depending on the class of PCBs used. The main requirement is that the solder mask has enough distance to the copper, so that it does not extend onto the copper (with respect to tolerances given in the solder mask application).

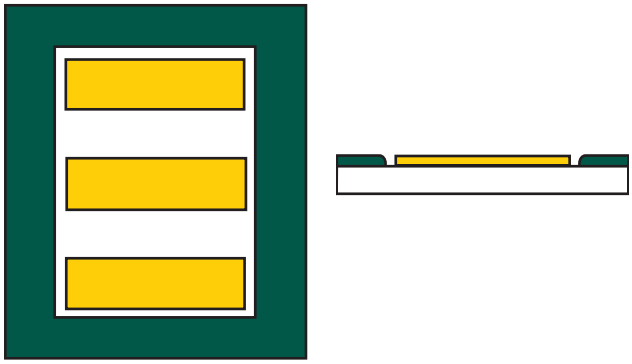


Fig 3. Cu defined footprint (NSMDP)

3.1.2 Solder Mask Defined Pad (SMDP)

If the solder mask extends onto the solder lands, the remaining solderable area is solder mask defined or SMDP. The effective solder pad is equal to the copper area which is not covered by solder mask (see Figure 4).

In an SMDP, the copper normally extends 75 μm underneath the solder mask on all sides. In other words, the copper dimension is 0.15 mm larger than the solder mask dimension. These values may vary depending on the class of PCBs used. SMDP allows tolerances in copper etching and solder mask placement during PCB production.

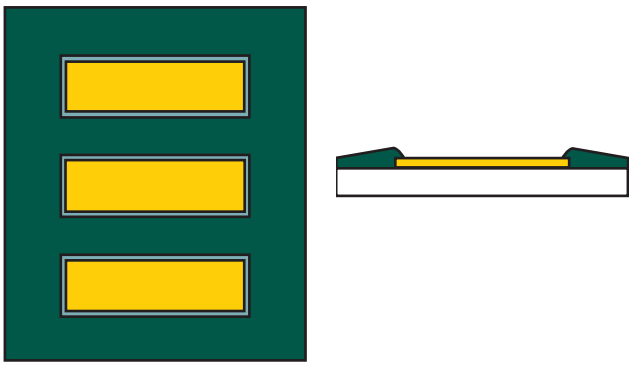


Fig 4. Solder mask/resist defined footprint (SMDP)

3.2 Printed-circuit board solder pad design

3.2.1 NSMDP design for DSN0603-2 (SOD962) package

In order to achieve the most reliable soldering results for the DSN0603-2 (SOD962) package using an NSMDP design, NXP Semiconductors recommends the pads and solder mask openings shown in Figure 6. This requirement is based on results from multiple board mounting tests (see Figure 5).

In NSMDP designs, use copper-filled micro-vias to contact the copper pads.

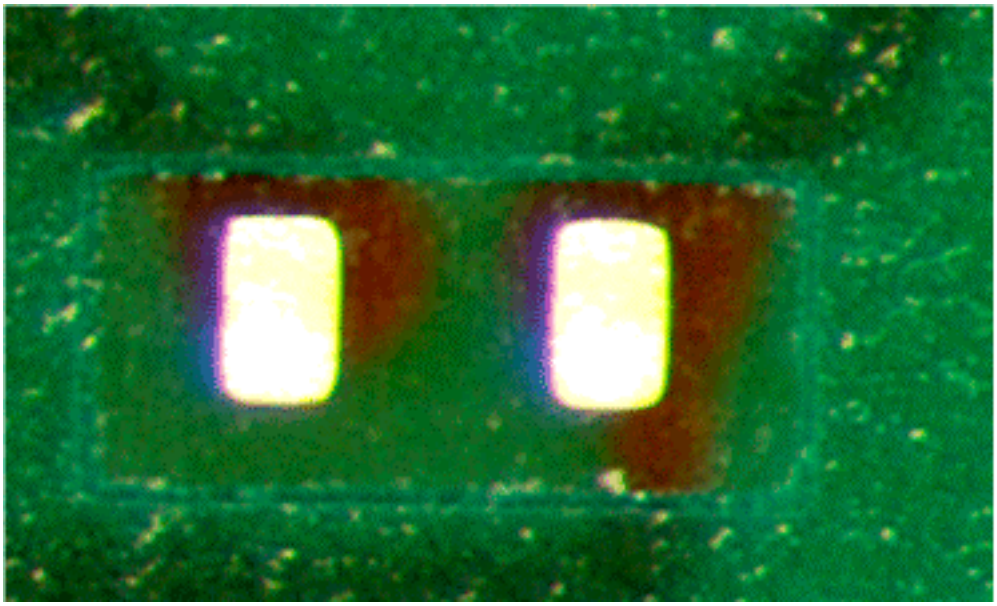


Fig 5. NSMDP design for DSN0603-2 (SOD962) board mounting test with micro-via connection

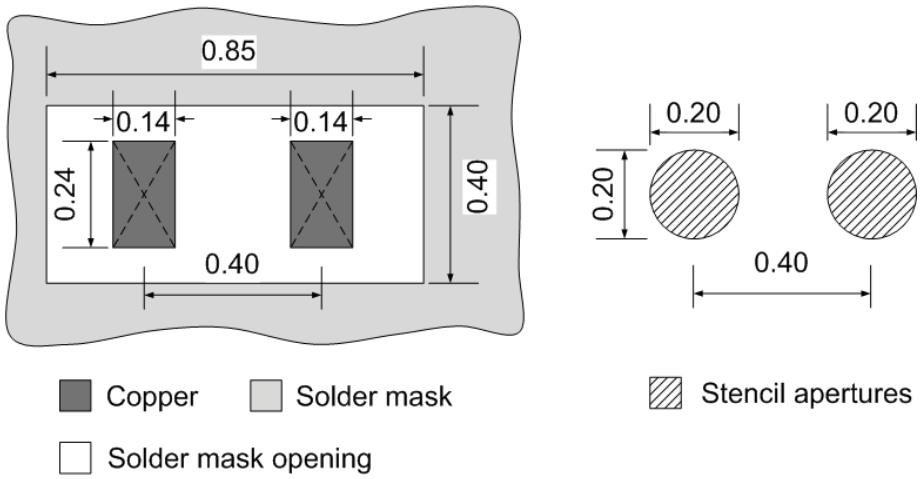


Fig 6. Required solder pad design and solder paste deposit area for NSMD

Figure 7 illustrates the maximum allowed solder pads and solder mask opening as well as the solder paste deposit area which was tested without any fails.

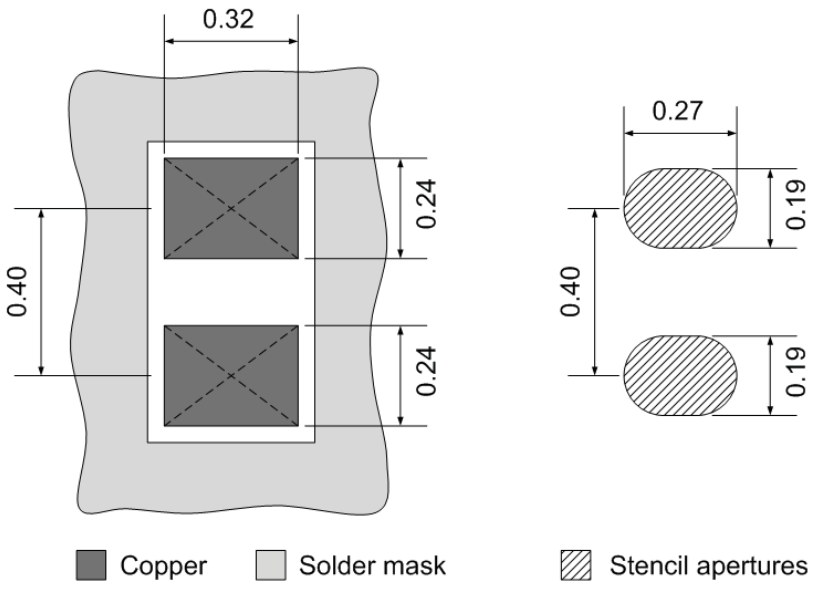


Fig 7. Maximum solder pad and solder paste deposit area dimensions for NSMD

3.2.2 Pass-through pad design

For a pass-through design as shown in Figure 8, NXP Semiconductors recommends the pads and solder mask opening shown in Figure 9. Multiple tests show that the combination of NSMDPs (copper-defined, vertical direction in Figure 8 and 9) and SMDPs (horizontal direction in Figure 8 and 9) leads to the most reliable soldering results for the DSN0603-2 (SOD962) package.

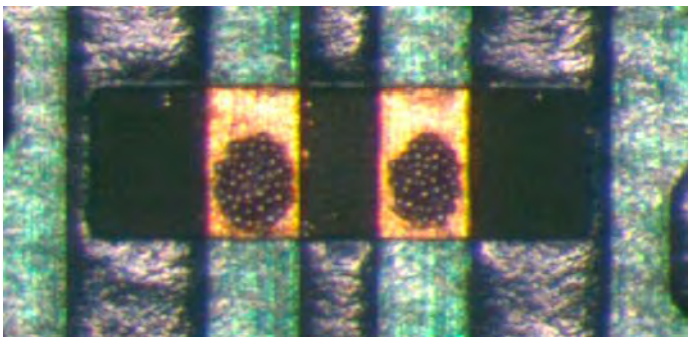


Fig 8. Example of a pass-through connection design

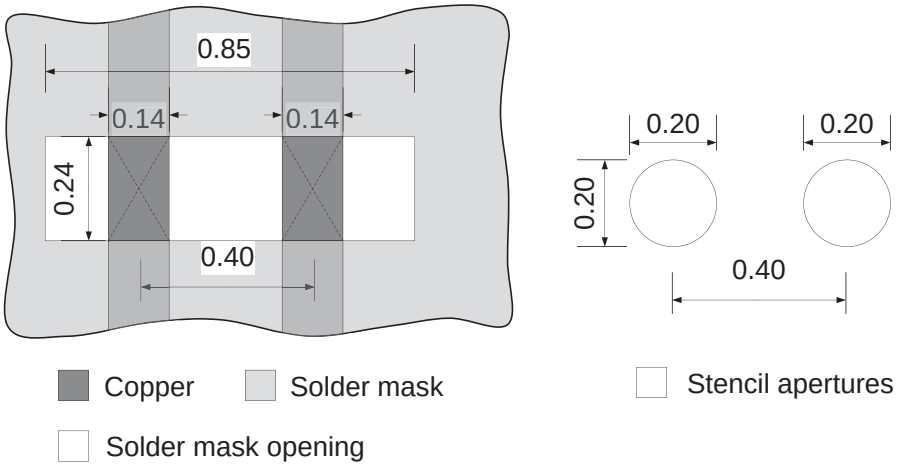


Fig 9. Recommended solder pad design and solder paste deposit area for SMDP

3.3 Solder stencil opening

The stencil opening defines the amount of solder paste material.

Stencil screening of the solder paste onto the PCB is commonly used in the industry. DSN0603-2 (SOD962) requires a stencil thickness of 0.1 mm.

The best soldering results for the DSN0603-2 (SOD962) package are achieved using a circular stencil opening with a diameter of 200 μm.

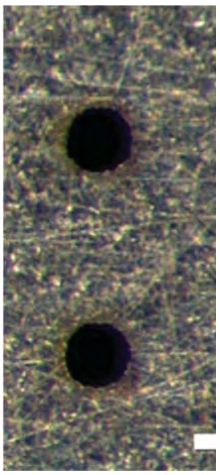


Fig 10. Stencil opening with 200 μm diameter

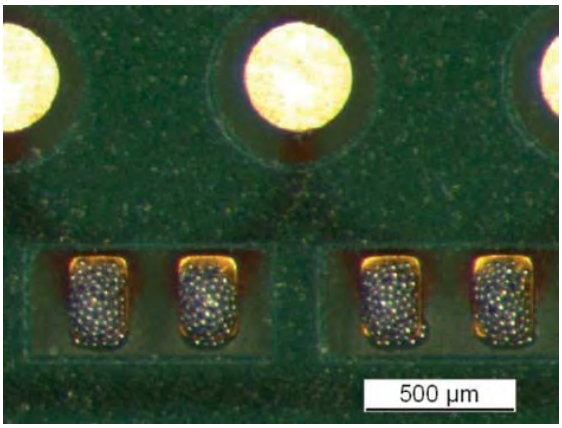


Fig 11. Solder paste placement using a stencil opening of 140 μm x 240 μm

3.4 Solder paste type

NXP Semiconductors recommends solder pastes with a type 4 or smaller sphere size. Examples of such solder pastes are SENJU M705-GRN360-MZ (type 4) or AIM NC257 (type 5).

4. Recommendation overview

- Prefer NSMDPs for soldering process.
- Prefer connection by filled micro-via.
- Copper pad size on the PCB must be identical to the device pad size. (Section 3.2.1)
- Connection by line or pass-through also possible. (Section 3.2.2)
- Solder mask bars between PCB pads are not allowed.
- Due to self alignment, misplacement of the DSN0603-2 (SOD962) package within ±50 μm is tolerable.
- Use solder paste type 4 or higher (smaller sphere size).
- The stencil openings should have the same area as the device pads (Section 3.3).
- Stencil thickness: 100 μm.

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