

## Package Information

# Design Guide and Example of Stencil for Exposed Pad

To improve heat dissipation efficiency of surface mounted devices, an exposed pad (pad exposed for heat dissipation) is installed on the back surface of the package to dissipate heat to the PCB. The exposed pad and the copper foil surface of the PCB are connected with reflow soldering. If the dimensions of the stencil to be used are not properly designed, problems with mounting may occur. This application note provides a design guide and example of the stencils for the exposed pad parts.

ROHM also provides the dimensions of reference land patterns (footprints) for the packages in Design Resource “Package Information” and as CAD data. However, information on the actual stencils (also referred to as metal masks) is not provided at this time (October 2021), because adjustments may be required according to each manufacturing environment. The land pattern of the exposed pad often has a large area. Problems with mounting may occur if soldering paste is printed using a stencil that is designed with the same dimensions as the land pattern.

### Stencil for gull wing package including SOP and QFP

The opening of the stencil is basically designed with the same dimensions as the exposed pad. However, the opening may be divided in order to improve the release property of the gas that is generated during reflow and prevent voids from occurring (examples 1 and 2). SOP and QFP have leads extended from two or four sides of the package. Since they have a gull wing form, there is a standoff (distance between the board installation surface and the back surface of the package) (Figure 1). Therefore, failures in mounting can also be prevented by selecting a stencil thicker than the standoff and applying a larger amount of solder. Note that care must be taken regarding solder sucking if a thermal via (through-hole, through-via) is set up under the exposed pad. If a large amount of solder is sucked into the thermal via, the thermal resistance may deteriorate due to a reduction in the bonding strength and the solder fusion ratio.

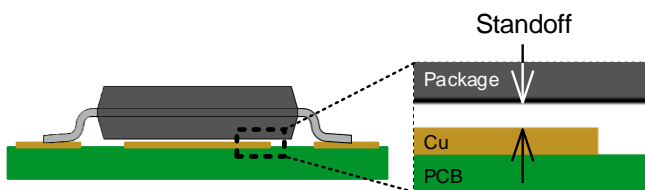


Figure 1. Presence of standoff with gull wing package

### Stencil for flat lead package including QFN, SON, and SOF

Since the flat lead packages represented by the QFN packages have no standoff, care must be taken regarding the following problems with mounting.

1. An excessive amount of soldering paste applied during printing may cause soldering bridges, floating of the entire part, or solder balls
2. An insufficient amount of soldering paste may cause a failure in solder bonding and deteriorate the reliability
3. Uneven transfer of soldering paste may increase inconsistency in the standoff, causing partial floating of the pins
4. Gas release during reflow may cause large voids

The opening of the stencil is basically designed with the same dimensions as the exposed pad. However, as a countermeasure against the problems above, it is recommended that a stencil with multiple small openings is used, instead of setting up one large opening (examples 3 and 4). In this way, the print area of soldering paste is limited and the solder thickness can be controlled. In addition, this measure is effective for reducing the occurrence of voids, because it also improves the release property of the gas that causes excessive voids. It is common to set the print area of soldering paste to 50% to 80% of the exposed pad area.

The results will depend on the mounting equipment and conditions, the thickness, cross-sectional shape and material of the stencil, and other factors. Therefore, customers must design the stencils that are most suitable for their manufacturing lines to be used.

Examples of stencils

Example 1. HTSOP-J8

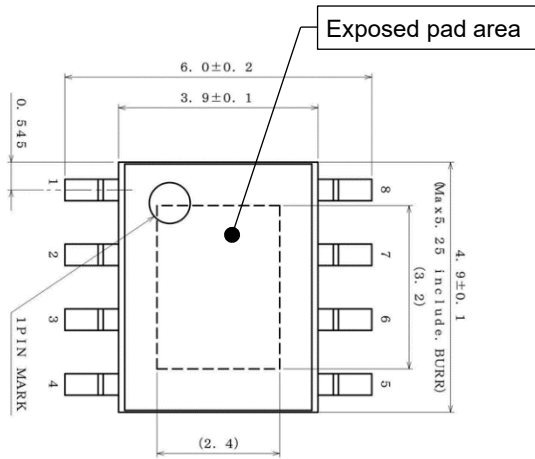


Figure 2. Outline drawing  
Top view

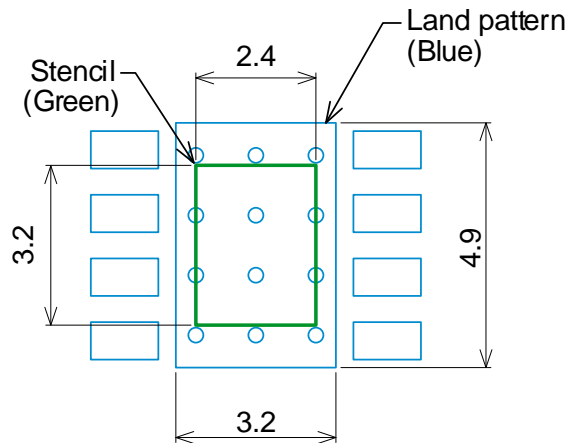


Figure 3. Example of stencil

\*The resist opening is equal to the exposed pad area (2.4 mm × 3.2 mm)

Example 2. HTSSOP-C48

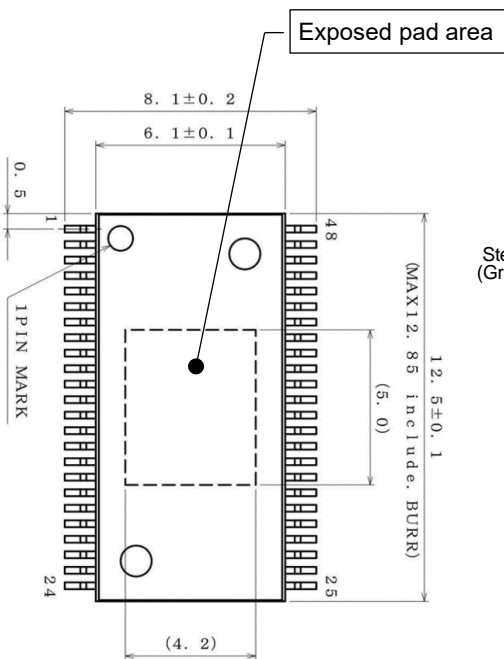


Figure 4. Outline drawing  
Top view

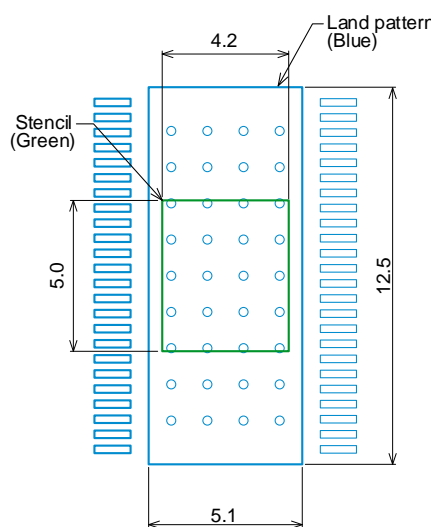


Figure 5. Example of stencil  
One opening

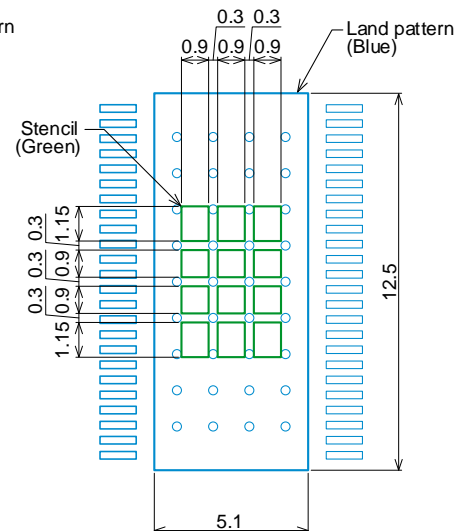


Figure 6. Example of stencil  
Divided openings  
Print area of soldering paste: 52.7%

\* The resist opening is equal to the exposed pad area (4.2 mm × 5.0 mm)

Example 3. VQFN028V5050

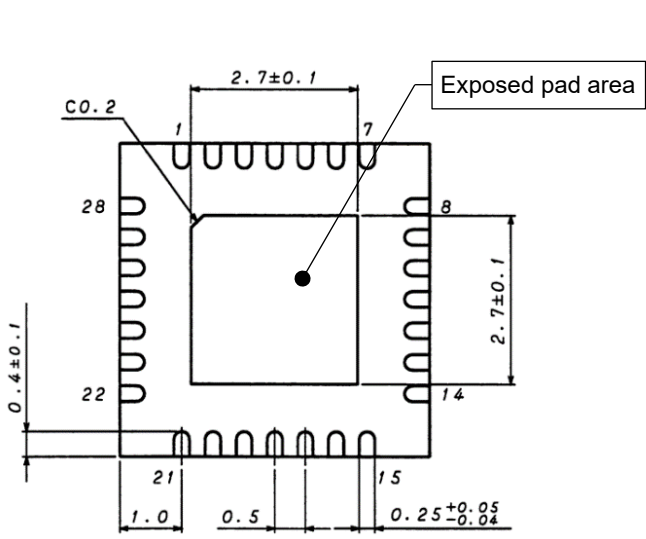
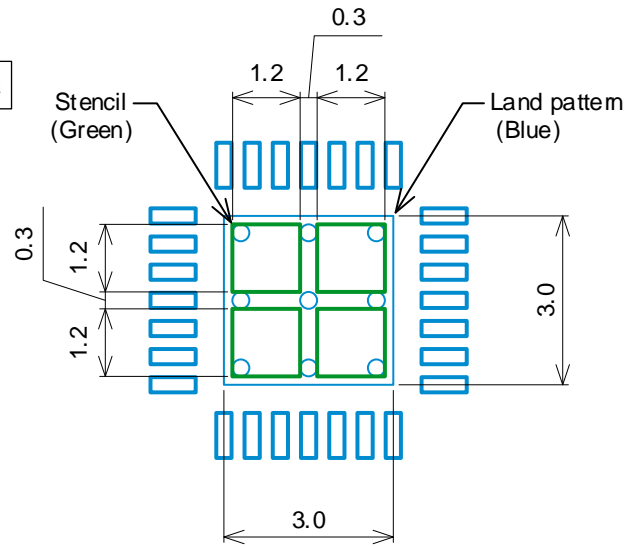


Figure 7. Outline drawing  
Bottom view



\*The resist opening is equal to the exposed pad area (2.7 mm × 2.7 mm)

Figure 8. Example of stencil  
Print area of soldering paste: 79%

Example 4. HSON8

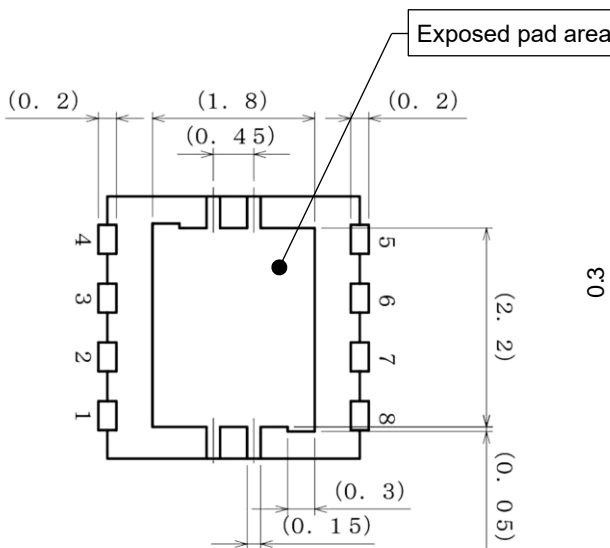
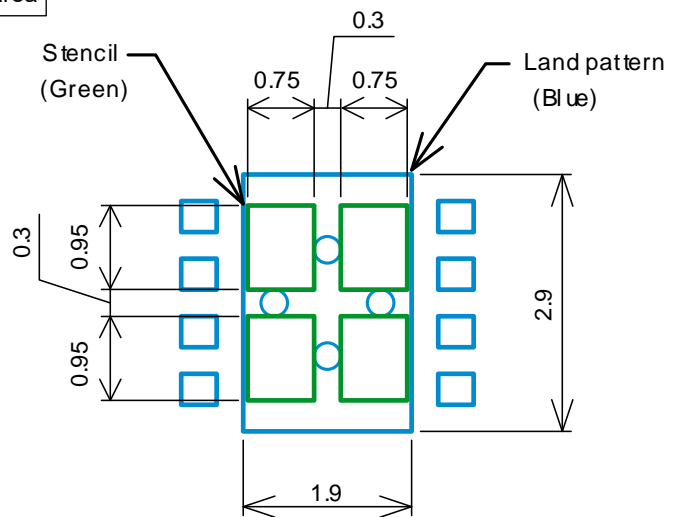


Figure 9. Outline drawing  
Bottom view



\*The resist opening is equal to the exposed pad area (1.8 mm × 2.2 mm)

Figure 10. Example of stencil  
Print area of soldering paste: 72%

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