

PowerPAD™ Made Easy

What is PowerPAD

The PowerPAD package is a thermally enhanced standard size IC package designed to eliminate the use of bulky heatsinks and slugs traditionally used in thermal packages. This package can be easily mounted using standard printed circuit board (PCB) assembly techniques, and can be removed and replaced using standard repair procedures.

The PowerPAD package is designed so that the leadframe die pad (or thermal pad) is exposed on the bottom of the IC. This provides an extremely low thermal resistance (θ_{JC}) path between the die and the exterior of the package. The thermal pad on the bottom of the IC can then be soldered directly to the printed circuit board (PCB), using the PCB as a heatsink. In addition, through the use of thermal vias, the thermal pad can be directly connected to a ground plane or special heat sink structure designed into the PCB.

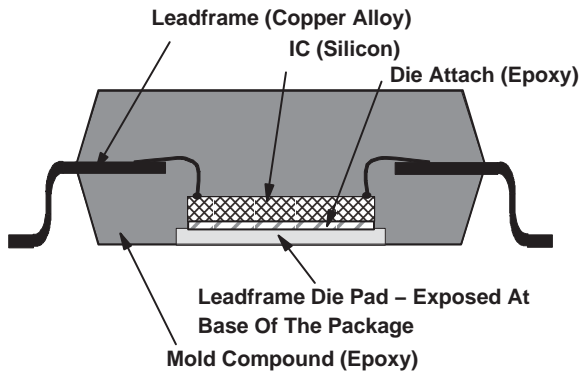


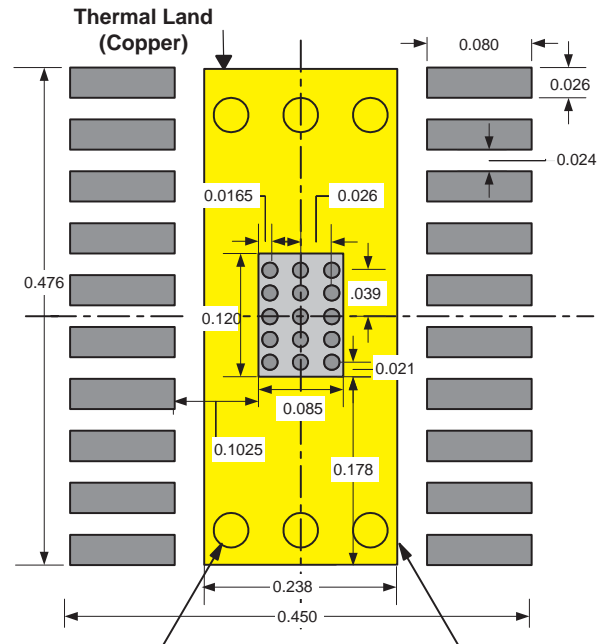
Figure 1. Section View of a PowerPAD Package

PowerPAD Assembly Process

1. Prepare the PCB with a top side etch pattern as shown in Figure 2. There should be etch for the leads as well as etch for the thermal land.
2. Place the recommended number of holes (or thermal vias) in the area of the thermal pad. These holes should be 13 mils in diameter. They are kept small so that solder wicking through the holes is not a problem during reflow. The recommended number of holes for each of the PowerPAD packages can be located in the SLMA002 Technical Brief, *PowerPad Thermally Enhanced Package*.

3. It is recommended, but not required, to place a small number of the holes under the package, but outside the thermal pad area. These holes provide additional heat path between the copper land and ground plane and are 25 mils in diameter. They may be larger because they are not in the area to be soldered, so wicking is not a problem. This is illustrated in Figure 2.

**REQUIRED STANDARD LAYOUT:
PowerPAD size (.085" x .120")
15 Vias with diameter = 0.013"**



**OPTIONAL LAYOUT:
Extended ground plane (0.238" x 0.476")
Addition 6 vias outside of thermal pad area but
under the package (Via diameter = 25 mils)
Solder resist should be used on areas outside
the PowerPAD area.**

All units in inches

Figure 2. 20-Pin DWP PowerPAD PCB Etch and Via Pattern

4. Connect all holes, including those within the thermal pad area and outside the pad area, to the internal ground plane or other internal copper plane.

- When connecting these holes to the ground plane, do **not** use the typical web or spoke via connection methodology. Web connections have a high thermal resistance connection that is useful for slowing the heat transfer during soldering operations. This makes the soldering of vias that have plane connections easier. However, in this application, low thermal resistance is desired for the most efficient heat transfer. Therefore, the holes under the PowerPAD package should make their connection to the internal ground plane with a complete connection around the entire circumference of the plated through hole.

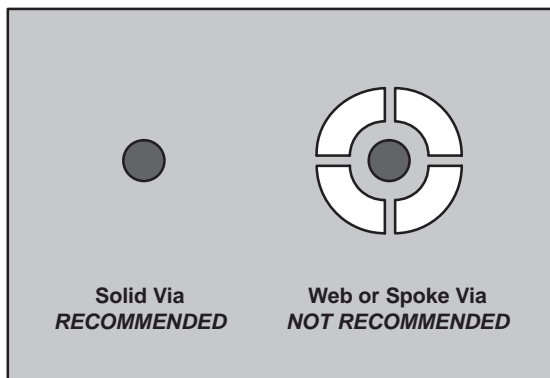


Figure 3. Via Connection

- As illustrated in Figure 2, the top-side solder mask should leave exposed the terminals of the package and the thermal pad area. The thermal pad area should leave the 13 mil holes exposed. The larger 25 mil holes outside the thermal pad area should be covered with solder mask.
- Solder mask should be applied to cover the entire bottom side of the PowerPAD vias to prevent solder wicking. This includes full solder mask coverage over the vias. Many layout programs default to not covering the vias. While this may work, the occurrence of solder wicking is possible. The solution is to make sure the solder mask covers all of the thermal vias.
- Apply solder paste to the exposed thermal pad area and all of the package terminals.
- With these preparatory steps in place, the PowerPAD IC is simply placed in position and run through the solder reflow operation as any standard surface mount component. This results in a part that is properly installed.

For detailed information on the PowerPAD package including thermal modeling considerations and repair procedures, please see SLMA002 Technical Brief *PowerPAD Thermally Enhanced Package*.

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