

Via Protection - Tenting vs. Plugging

A via or “feed-thru” hole connects the top circuitry of the printed circuit board to the bottom circuitry or any layer(s) in between. A via can be used as a test point when exposed or when a clearance or opening is given in the soldermask artwork. The via is usually the smallest hole of the board and is subject to all the processes of manufacture and the possibilities of failure—especially as today’s designs get more and more complicated—the days of the simple via are no longer. (see Figure 1)

The term “tenting” began when dry-film LPI was used during the manufacture of printed circuit boards. The dry film would “lay” across the top of the via hole providing a cover or “tent” to protect the via hole as shown in Figure 2. Because of cost and quality concerns with today’s fine line or dense technology, dry film LPI is rarely used. However, the vernacular to “tent” remains in use.

In today’s terminology, the term tenting means the complete covering of the via pads with LPI soldermask—covering most of the metal in the barrel as shown in Figure 3 and partial plugging of the holes caused by “flooding” of LPI mask on both sides of the board may occur. A tented via using LPI mask will discourage the wicking of solder and prevent the use of the via as a test point. Some printed circuit board designs will have both “open” vias used for test points and tented vias on the same board.

A plugged via is a feed-thru that has been tented with LPI mask and then run through an additional soldermask process using a dot pattern artwork of only those vias that are to be plugged or filled with soldermask. Via plugging is most often applied from the bottom side of the circuit board. Soldermask is forced into the hole from the one direction only filling most if not all of the hole barrel as shown in Figure 4. Do not attempt to plug from both sides as shown in Figure 5 as this would lead to entrapment of air and during the curing (baking process) will cause the heated air to blow out resembling a volcano. It is not uncommon and perfectly acceptable to have partially filled vias—meaning the mask does not come completely to the top of the hole. A quick inspection of the vias to ensure that light does not pass through is all that is required for a hole to be considered plugged.

Research for the above information may be from, but is not limited to IPC reference manuals, the PCB Handbook, The Bare Board PCB design manual and consultation with industry professionals. Please consult a process engineer familiar with your companies PCB assembly process before making any procedure changes.

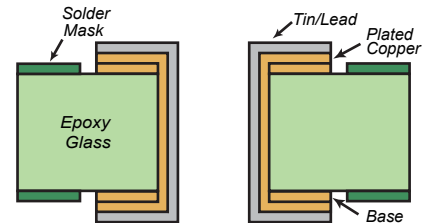


Figure 1

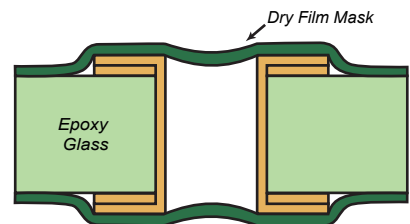


Figure 2- Dry Film Mask

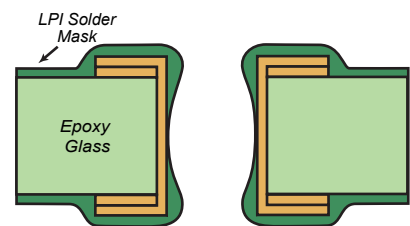


Figure 3- LPI- Tented

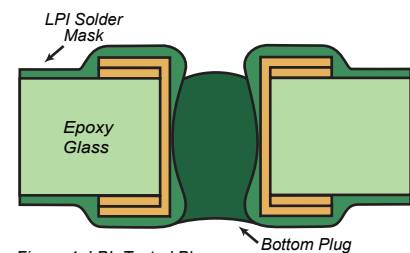


Figure 4- LPI- Tented Plug

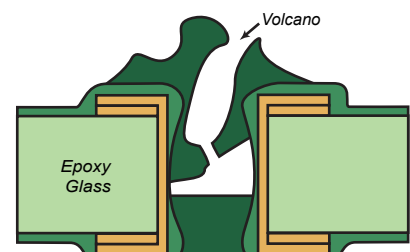


Figure 5- Solder Mask plus Volcano