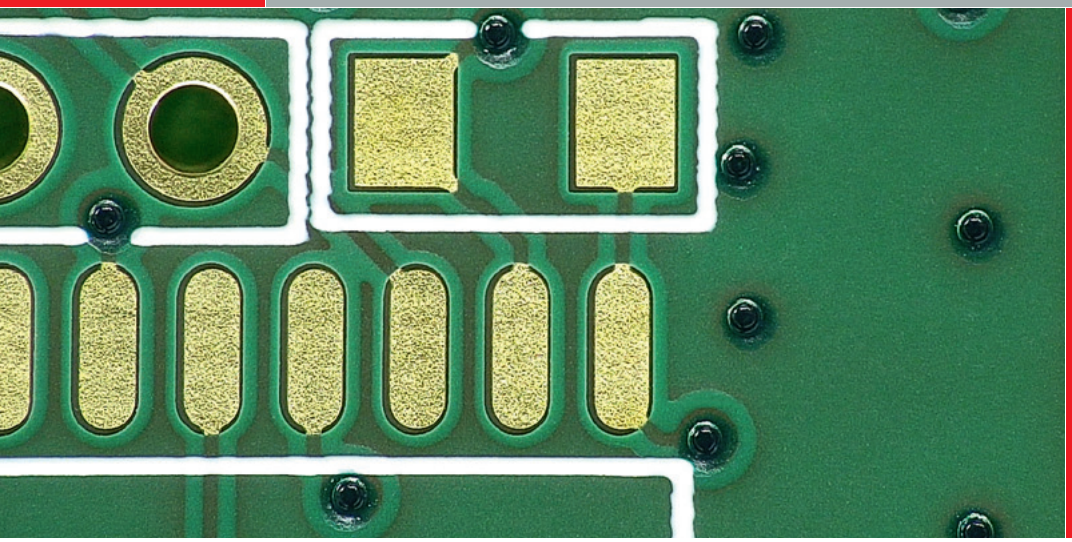
DESIGN GUIDE
Plugging – Filling – Tenting

WÜRTH ELEKTRONIK

Design Guide
Plugging – Filling – Tenting



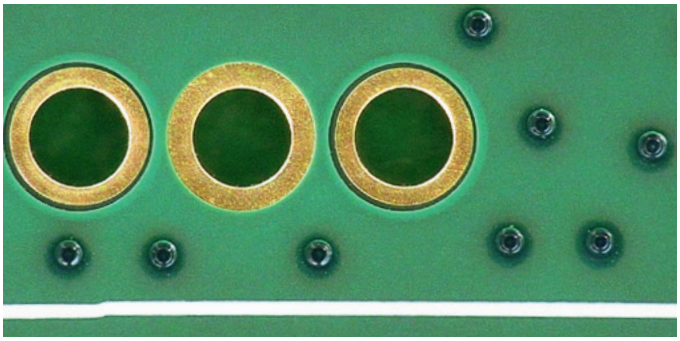
Plugging – Filling – Tenting

Overview of Possibilities

In the course of further miniaturization in electronics, the requirements for via holes are also growing. They are not only used for electrical connection, but are also of decisive importance, for example in terms of assembly capability, reliability and heat dissipation. In this Design Guide we have summarized not only the basic definitions of terms, but also the individual versions of vias with their respective objectives. So you will find the right solution for each of your applications – within the IPC-4761 and beyond.

Plated Through Hole

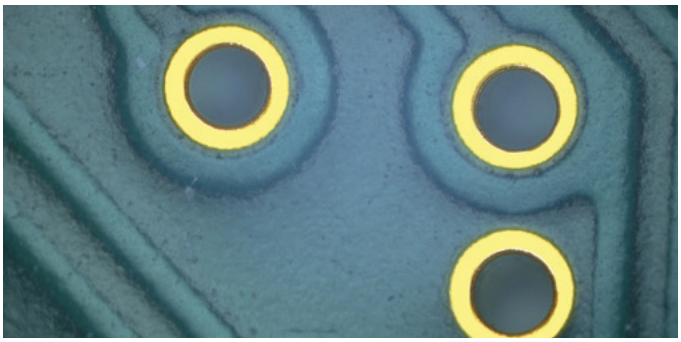
Plated through holes for assembly are completely open as standard, coated with solder surface and with clearance in the solder mask.



Plated through holes for assembly with full clearance

Recommendation for customer data:
Solder mask clearance = pad diameter

Plated through holes as via holes are only used for electrical and / or thermal connection between the copper layers. The solder mask can cover the annular ring partially.

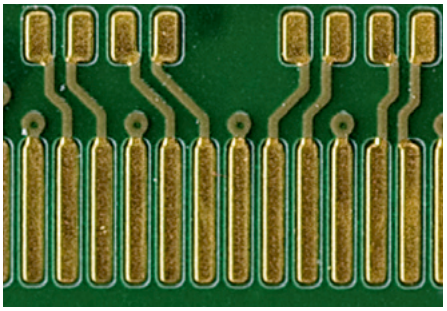


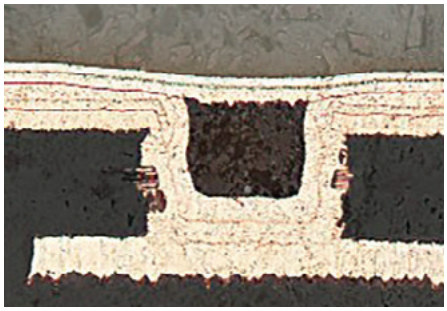
Plated through holes as via holes covered with solder mask partially

Recommendation for customer data:
No solder mask clearance

Microvia

Microvias are blind vias, which are covered with solder mask as standard when designed as a pure electrical connection.





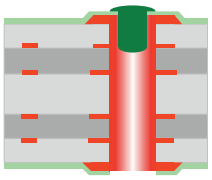
Microvia filled with resin, capped

Microvia filled with copper (not described in IPC-4761)

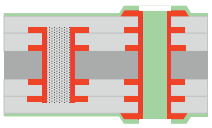
Buried Via

Vias become buried vias by subsequent sequential lamination. These can be plated through holes as well as microvias.

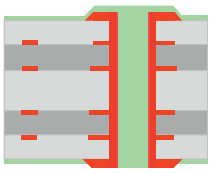
Via Versions



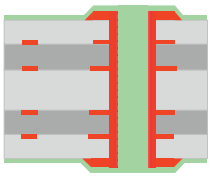
Plugged Via
A via with material applied allowing partial penetration into the via. (IPC-4761)



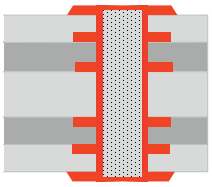
Filled Via
A via with material applied into the via targeting a full penetration and encapsulation of the hole. (IPC-4761)



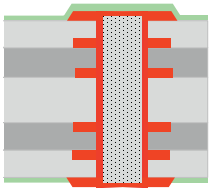
Covered Via
A plugged or filled via covered with solder mask (no clearance in the solder mask) – IPC-4761, Type VI-a, only possible with HASL lead-free or ENIG.



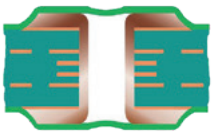
IPC-4761, Type VI-b, only possible with HASL lead-free or ENIG.



Capped Via
A filled via capped with copper.



Covered with solder mask on one side.



Source: IPC-A-600

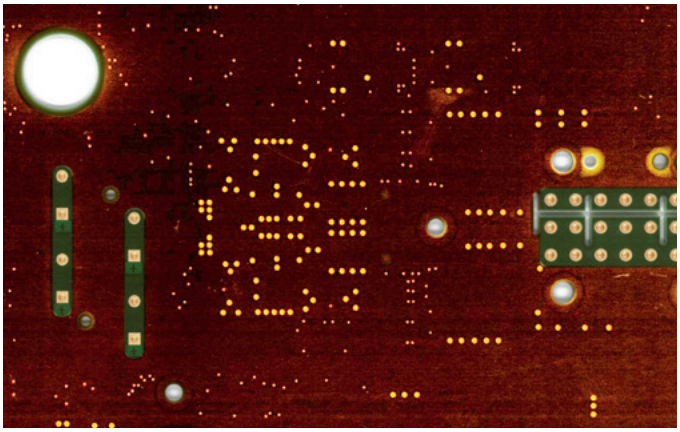
Tented Via (not available)
Tenting refers to a via with a mask material applied bridging over the via wherein no additional materials are in the hole. It may be applied to one side or both sides of the via structure. (IPC-A-600)

Tented Via not available!

Solution for safe insulation towards housing or heatsink

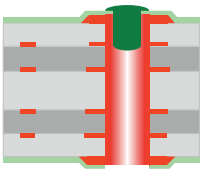
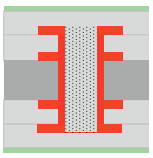
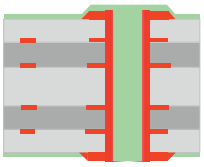
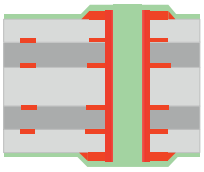
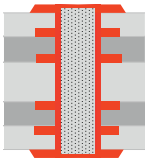
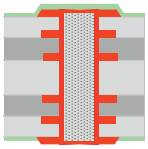
Würth Elektronik offers a solution for safe insulation towards housing or heatsink, which combines the following advantages:

- Protection against mechanical impact
- High abrasion resistance
- Secure tenting of vias
- Low thermal resistance combined with high dielectric strength



Aims of Different Via Versions

Vias can be treated by the procedures described below to achieve the following aims – depending on the requirements:

Versions	**Plugged Via** IPC-4761, Type III-a 	**Filled Via** IPC-4761, Type V 	**Filled & Covered Via** IPC-4761, Type VI-a  Type VI-b 	**Filled & Capped Via** IPC-4761, Type VII  Covered with solder mask on one side 
Aims				
Maintaining the vacuum during the incircuit test	✓	✓	✓	✓
Closure of the via against penetration of media into the via, e.g. solder, adhesive or casting compound	✓ on one side	✓	✓ Type VI-a: on one side Type VI-b: on both sides	✓
Electrical protection of the via annular ring	✓ on one side, when covered with solder mask		✓ Type VI-a: on one side Type VI-b: on both sides	✓ when covered with solder mask
Optimization of surface planarity by filling holes, e.g. before further lamination		✓		✓
Improvement of heat dissipation				✓
Improvement of the soldering result due to non solderable vias (formation of solder ball)	✓ on one side		✓ Type VI-a: on one side Type VI-b: on both sides	✓ when covered with solder mask
Soldering components on vias (via-in-pad)				✓
Production site				
Costs indicator				

 Produced in Germany

 Produced in China

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