Blind vias

1. Introduction

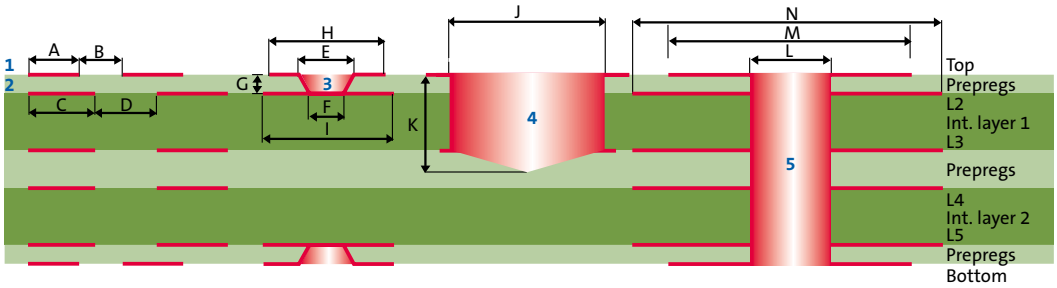
The integration density of modern electronic modules increases constantly. Apart from the components (µBGA, CSP, FC), the printed circuit board to carry them is particularly affected by this. Apart from the general reduction in track widths and spacing, blind vias are a necessary and tried & tested aspect for new design and layout options of printed circuit boards.

When one talks of blind vias today, laser drilling often comes to mind. For series manufacture, this is certainly the only economic, but not the only technically possible solution. Using the most modern CNC (mechanical) drilling machine and special, innovative tools, it is possible, especially when prototyping, to produce mechanically drilled holes of an equal quality and at least equal cost effectiveness.

contag has this technology available and of course can also offer these complex circuits as a rush service. This technology information sheet should help you to design a technically optimised and cost-optimised circuit.

2. Explanation of terminology

Structure of a 6 layer board with blind vias:



Symbol	Description	Layout specifications	Comment
1	**Outer layer structure**		
A	Track width	≥75 µm	Depends on Cu thickness
B	Track spacing	≥75 µm	Depends on Cu thickness
2	**Inner layer structure**		
C	Track width	≥75 µm	Depends on Cu thickness
D	Track spacing	≥75 µm	Depends on Cu thickness
3	**Micro via from top to L2,** standard or conic micro drill tool		
E	Hole diameter at entrance	≥0.10 mm	If conical tool, then depends on hole depth (thickness of dielectric)
F	Hole diameter target pad	≥0.10 mm	Is defined by the tool
G	Hole depth	Dielectric thickness top to L2	Note aspect ratio of ≥ 1:1
H	Micro via entry pad	≥ E + 200 µm	100 µm is required all around the hole
I	Micro via pad	≥350 µm	F + 125 µm all around the hole diameter on the land pad
4	**Blind via from top to L3,** standard tool		
J	Hole diameter	0.10 - 6.05 mm	
K	Hole depth	≤J	Note aspect ratio of ≥ 1:1
5	**Through hole**		
L	Hole diameter	≥0.15 mm	Note aspect ratio of ≥ 1:8
M	Pad diameter Outer layers	>L + 200 µm	100 µm is required all around the hole
N	Pad diameter Internal layers	≥L + 250 µm	125 µm is required all around the hole

3. Technical details for blind vias

Outer diameter	Tool	Dielectrics	Aspect ratio
0.10 mm – 0.40 mm	Standard or conic	Any, standard: FR4	≥1:1
0.30 mm – 0.55 mm	Standard (α=130)		
0.55 mm – 6.05 mm	Standard (α=130)		

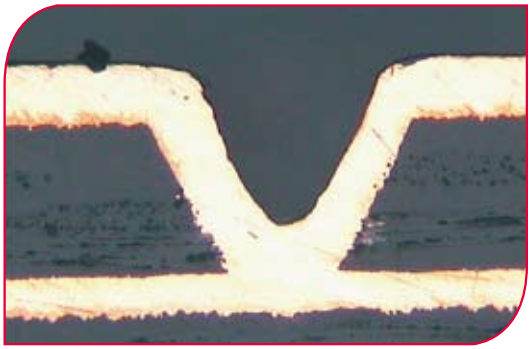
4. Advantages of mechanically drilled blind vias

- Connections over several layers are no problem
- Even larger diameters blind vias are no problem to produce
- Any dielectric materials can be processed
- Maximum connection reliability due to the geometry of the tool
- Maximum precision and reproducibility of the blind via depth by mechanical drilling (±15 µm)
- Very economic when prototyping

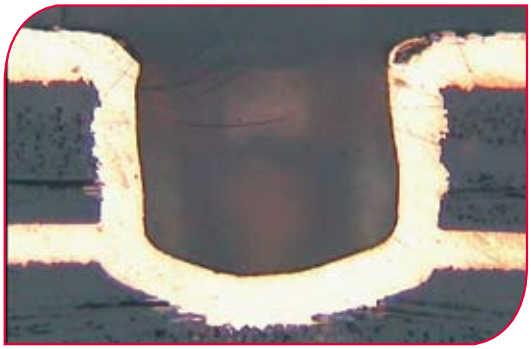
=> Maximum quality for a low price and fast delivery time!

5. Quality assurance

Regular checks of the machines and processes as well as set up checks and cutting sections for analysis for particular jobs ensure highest precision in the hole depth, the alignment to the connecting layers as well as the Cu metallisation of the blind vias. We guarantee ≥20 µm Cu thickness in blind vias.



Blind via with conical tool



Blind via with standard tool

6. Layout guidelines

You will find guidelines on the basic structure of multilayer boards in the "Multilayer" product information sheet. For layout guidelines, especially on the subject of blind vias, the values in the table in section 2 "Some terms explained" will be of use.

7. Summary

For mechanical drilling to depth, vias of any diameter with ideal geometry and maximum connection quality are introduced. When considering the permissible aspect ratios, connections over several layers are just as possible as are microvias with a diameter ≤0.20 mm.

For further technological questions concerning circuit boards, please contact our team of technologists (Tel. 030/351 788 – 155)..