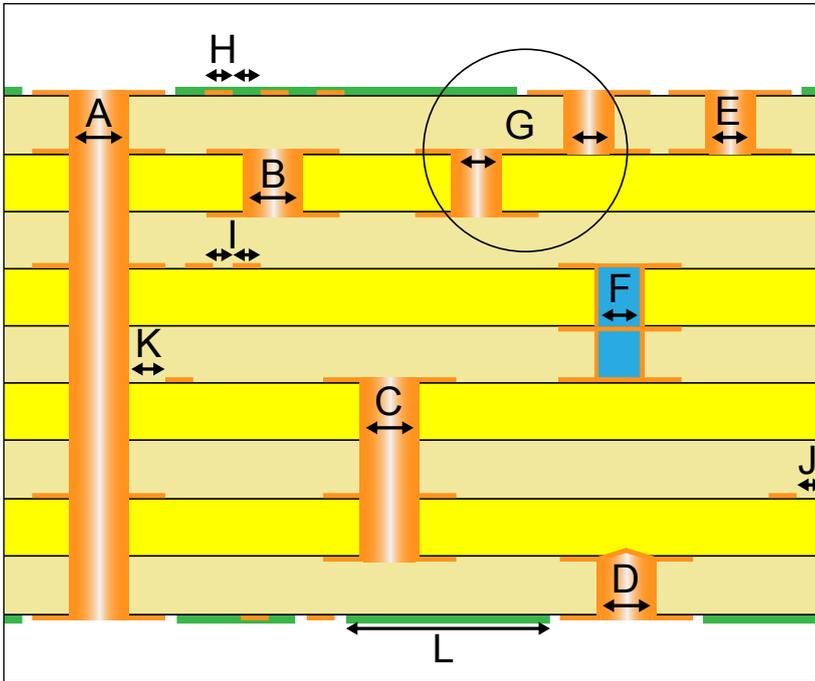


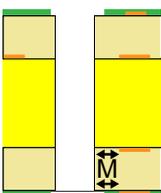
1. Design Parameters



| Outer & inner layers: Cu thickness / min. conductor | | | |
|---|--|----------------------|----------------------------|
| copper thckn. | Min. trace width -space annular ring | | |
| | Standard | | Special production |
| 18µm | 100µm | 100µm 100µm | 75µm 75µm 75µm |
| 35µm | 100µm | 100µm 100µm | 90µm 90µm 100µm |
| 70µm | 150µm | 150µm 150µm | 150µm 150µm 130µm |
| 105µm | 225µm | 225µm 225µm | 200µm 200µm 170µm |
| 140µm | 300µm | 300µm 300µm | 250µm 250µm 200µm |
| 175µm | 400µm | 400µm 400µm | 280µm 280µm 240µm |
| 210µm | 450µm | 450µm 450µm | 300µm 300µm 280µm |
| 245µm | 475µm | 475µm 475µm | 350µm 350µm 320µm |
| 280µm | 500µm | 500µm 500µm | 380µm 380µm 350µm |
| 315µm | 525µm | 525µm 525µm | 380µm 380µm 350µm |
| 350µm | 550µm | 550µm 550µm | 380µm 380µm 350µm |
| 385µm | 575µm | 575µm 575µm | 380µm 380µm 350µm |
| 400µm | 600µm | 600µm 600µm | 380µm 380µm 350µm |
| 455µm | 700µm | 700µm 700µm | 380µm 380µm 350µm |
| 490µm | 700µm | 700µm 700µm | 380µm 380µm 350µm |
| 525µm | 700µm | 700µm 700µm | 380µm 380µm 350µm |
| 560µm | 800µm | 800µm 800µm | 380µm 380µm 350µm |

| Name (Parameters exemplary for 35µm copper) | | Standard (min.) | | | | Special production (min.) | | | |
|--|---|---------------------|-------|------------------------|-----------------------|---------------------------|-------|--------------------------|-----------------------|
| | | aspekt ratio | ∅ | via-pad | annular ring circular | aspekt ratio | ∅ | via-Pad | annular ring circular |
| A, B, C | via, buried Via (component hole: annular ring circular 25µm larger) | 1:10 | 200µm | 400µm | 100µm | 1:12 | 150µm | 330µm | 75µm |
| D | blind via, mechanical | 1:1 | 200µm | 400µm | 100µm | 1:1.2 | 150µm | 350µm | 100µm |
| E | blind via, laser | - | - | - | - | 1:1 | 100µm | 280µm | 90µm* |
| F | stacked vias <i>Disproportional high effort.</i> | - | - | - | - | - | - | - | - |
| G | staggered vias (microvias) | 1:1 - 1:10* | 200µm | 400µm | 100µm | 1:1 - 1:12* | 100µm | 300µm | 90µm |
| H, I | conductor trackwidth / -space | width space | | 100µm 100µm | | width space | | 75µm 75µm | |
| J | conductor, pad <> milling edge conductor, pad <> scoring edge | space space | | 200µm 500µm | | space space | | 200µm 500µm | |
| K | conductor, pad <> via | space | | 200µm | | space | | 200µm | |
| L | solder-stop, green | clearance bridge | | 50µm circular 100µm | | clearance bridge | | 25µm circ. (BGA) 80µm | |
| | solder-stop, other colours | - | | - | | clearance bridge | | 50µm 125µm | |

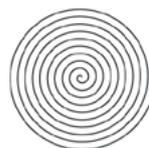
* see buried via, blind via | * For special production (min.) possible data check necessary.



NPT - Holes

min. ∅: 200µm
aspekt ratio: 1:10 (o.r. 1:12)

M conductor, pad <> NPTH: min. 200µm



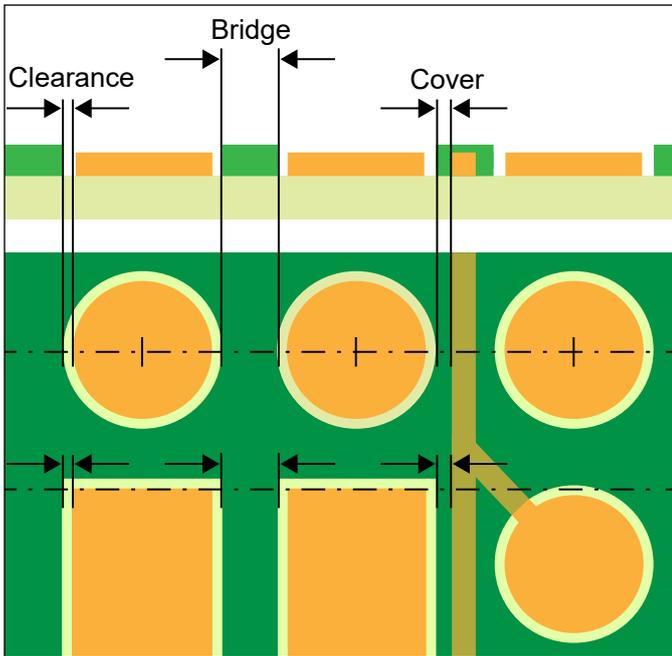
Coil

Coils on the inner layers:
min. conductor width / space of 125µm.

Coils on the outer layers:
min. conductor width / space of 100µm.

Pilot or mounting holes (usually with ∅ = 3,05mm) should be created in the same drill program as NPT-holes. Please label mounting holes in the dimension layer, as such.

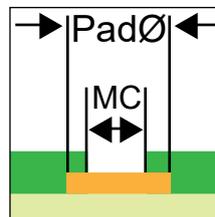
2. Solder-stop



| Solder-stop = green | | |
|---------------------|----------|-------------------|
| | standard | on request (data) |
| clearance | 50µm | 40µm 25µm (BGA) |
| bridge width | 100µm | 80µm |
| cover | 100µm | 80µm |

| Solder-stop = black, blue, white, red, yellow | | |
|---|----------|-------------------|
| | standard | on request (data) |
| clearance | 50µm | 40µm |
| bridge width | 125µm | 100µm |
| cover | 150µm | 125µm |

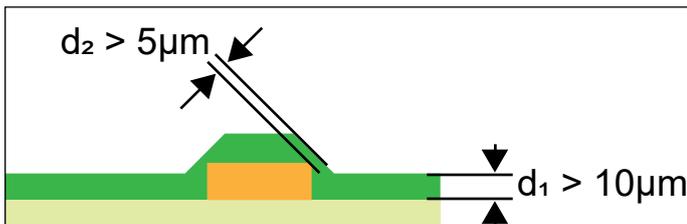
SMD-Pads (Solder-Mask-Defined Pads)



For solder pads, which are defined by the solder-mask, please use the following parameters:

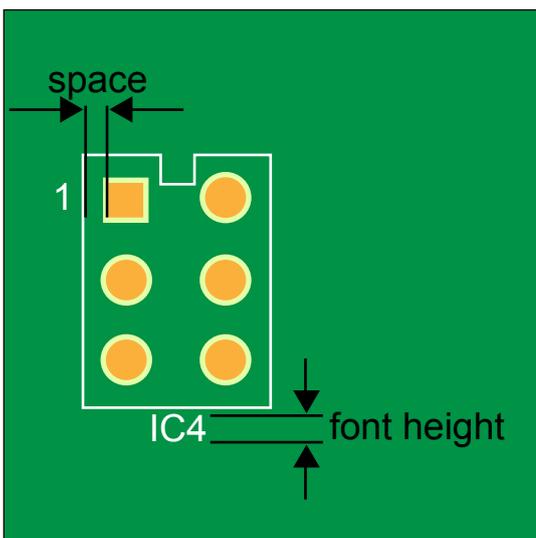
$MC \varnothing$ (Mask Clearance) = $Pad \varnothing - 80\mu m$

Process capable for drill $\varnothing \geq 0,3 \text{ mm}$



| Solder-stop Parameters | |
|---------------------------|---------------|
| | thickness |
| d1: on the PCB | > 10µm < 25µm |
| d2: on the conductor edge | > 5µm < 25µm |
| electric strength | 500VDC min. |

3. Legend print



| Legend print Parameters | | |
|----------------------------------|------------------|------------------|
| font height | ideal font width | min. font width* |
| 1,2mm | 150µm | 100µm |
| 1,5mm | 180µm | 125µm |
| 1,8mm | 200µm | 150µm |
| spacing to pad min. | 150µm | |
| spacing to solder-stop clearance | 100µm | |

Never place legend print on pads > will be clipped by Multi-CB before production.

* Can lead to surcharge > special production

For EAGLE-Users



Before exporting your data, you should always activate the option

- "Always vector font"

which is found under: Options/User interface. Otherwise your legend print will probably be applied incorrectly (EAGLE V. 5+).



PRINTED CIRCUIT BOARDS

BASIC DESIGN RULES

4. Tolerances and Design Limits

The production of printed circuit boards is carried out according to the valid IPC guidelines and standards and on the basis of following technical specifications. HDI or MFT boards can be produced with smaller tolerances. Differing requirements of the customer must be explicitly agreed!

| Pattern tolerances | |
|---|-----------|
| | Tolerance |
| Drilling (PTH) to conductive pattern outer layers | ±0,10mm |
| Drilling (PTH) to conductive pattern inner layers | ±0,15mm |
| Drilling (PTH) to milling pattern / contour | ±0,10mm |
| Drilling (NPTH) to milling pattern / contour | ±0,10mm |
| Drilling (PTH) to marking print | ±0,15mm |
| Conductive pattern to solder resist | ±0,10mm |
| Conductive pattern to marking print | ±0,20mm |
| Hole to hole, one pass* PTH-PTH or NPTH-NPTH | ±0,05mm |
| Hole to hole, two passes PTH-NPTH | ±0,10mm |
| * Also applies for PTH-NPTH if they are drilled in one run (e.g. location holes for SMD stencils) | |

| Conductor (acc. to IPC-6012) | | |
|------------------------------|----------|---------------------------------|
| Conductor width | min. 80% | in comparison to the data |
| Conductor space | max. 30% | reduction in comparison to data |

| Impedance control | |
|----------------------|-----|
| Tolerance (normal) | 10% |
| Tolerance (extended) | 5% |

| Milling | |
|----------------------|-----------|
| | Tolerance |
| Milling offset | ±0,10mm |
| Z-Axis milling depth | ±0,20mm |

| Base material | |
|--|-----------|
| | Tolerance |
| FR4 thickness | ±10% |
| The information about the base material thickness exclusively defines the thickness of the dielectric including base copper. The other layer structures such as electroplated Cu layers or solder resist layers result in increased final thickness. | |

| Rigid PCB thickness | |
|---|----------------|
| | Tolerance |
| Producibility level B (standard) | ±10% or ±178µm |
| Thickness tolerances for pressed multilayers according to IPC-2222A. The higher value is valid. When measured over metallizations or coatings, those thicknesses and tolerances must be considered. | |

| Flexible PCB thickness | |
|-------------------------|-----------|
| | Tolerance |
| Flexible part thickness | ±50µm |
| Stiffener thickness | ±50µm |

| Vias & Drills | |
|--|------------|
| | Final-Ø |
| Plated-through-holes (PTH) and component holes | ±0,10mm |
| Non-plated-through-holes (NPTH) | ±0,08mm |
| Press-fit technology (drilled) | ±0,05mm |
| > on request | +0,10mm/-0 |
| Press-fit technology (milled*) | ±0,075mm |
| * From a final diameter of approx. 6.0mm (depending on the surface) the holes are milled, not drilled. | |

| Cu min. thickness of throughplating | | |
|-------------------------------------|-------------|-------------|
| | Class 2* | Class 3 |
| Via (> 150µm) | 20µm - 25µm | 20µm - 25µm |
| Microvia (≤ 150µm) | 18µm - 20µm | 20µm - 25µm |
| Blind Via | 10µm - 12µm | 10µm - 12µm |
| Buried Via | 10µm - 12µm | 10µm - 12µm |
| * Standard | | |

| Scoring | |
|------------------------------------|-----------|
| | Tolerance |
| Offset (to PCB center) | ±0,10mm |
| Drilling (PTH) to scoring pattern | ±0,15mm |
| Drilling (NPTH) to scoring pattern | ±0,20mm |
| PCB dimension x/y | ±0,15mm |
| Scoring depth | ±0,20mm |

| Bow & Twist | |
|---|-------------------|
| | Tolerance |
| For PCBs ≥ 0,8mm thickness | 0,75% with SMD |
| | 1,50% without SMD |
| Please note that the twist & bow value is increased above average, if the copper balance of the PCB is locally very unequal or if the circuit board is very thin. | |

| Delivery quantity | |
|---|---------------------------------------|
| Pieces | Tolerance |
| 1 - 20 pcs. | Excess or short delivery 0% |
| from 21 pcs. | Excess or short delivery of up to 10% |
| On request: quantities of more than 20 pieces in exact quantity. The (single) piece rule also applies when ordering as panel. | |

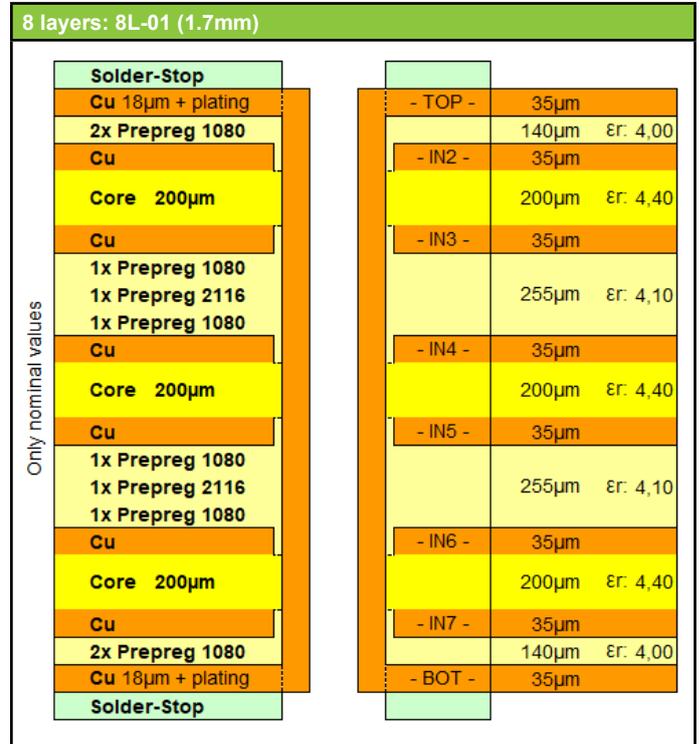
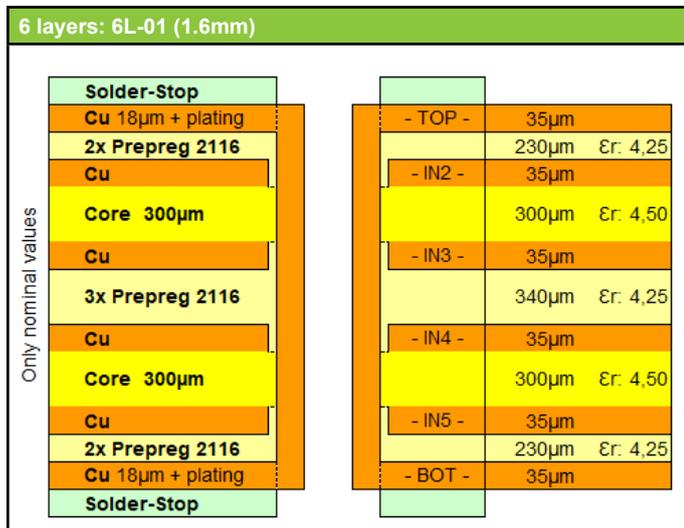
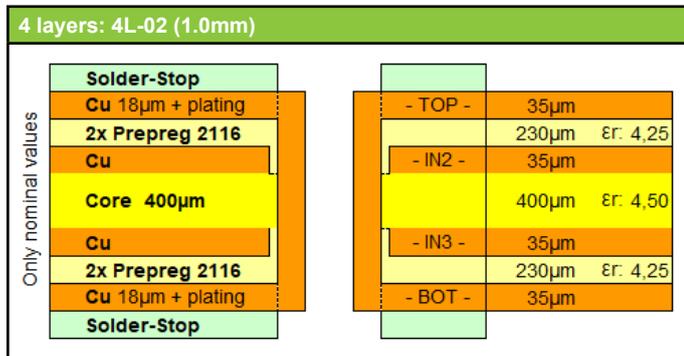
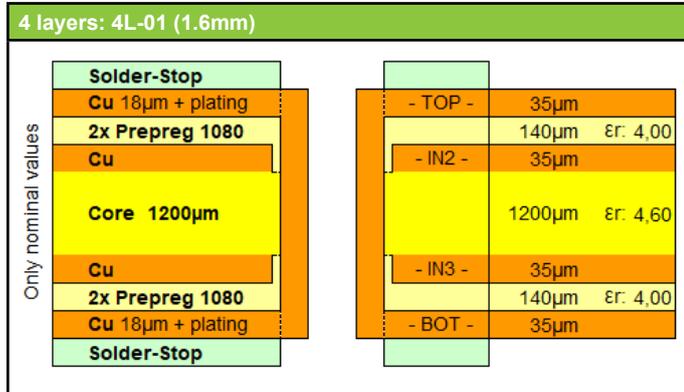


PRINTED CIRCUIT BOARDS

BASIC DESIGN RULES

5. Defined layer buildup

For certain applications it is necessary that the layer isolation thicknesses are defined, e.g. for impedances. For this purpose, Multi-CB offers the following defined layer buildups at no extra charge. You can achieve your desired values with our [layout examples for impedances](#) (approx.).





PRINTED CIRCUIT BOARDS

BASIC DESIGN RULES

6. Hybrid layer buildup Rogers 4350B/FR4

A hybrid layer buildup of Rogers 4350B and FR4 material combines several advantages. The critical layers are built up with a high-tech Rogers core and then pressed with common FR4 prepreg. Your advantages: Optimised low loss material properties in the high-frequency layers, lower price due to material mix, greatly improved mechanical stability, defined layer buildup with [hybrid buildup - layout examples for impedances](#) (approx.).

4 layers: 4L-H01 (1.55mm) Hybrid Rogers 4350B 168µm core

| | | | |
|---------------------|----------------------------|--|--|
| Only nominal values | Solder-Stop | | |
| | Cu 18µm + plating | | |
| | RO 4350B core 168µm | | |
| | Cu | | |
| | FR4 PP 1080+2116 | | |
| | FR4 core 710µm | | |
| | FR4 PP 1080+2116 | | |
| | Cu | | |
| | RO 4350B core 168µm | | |
| | Cu 18µm + plating | | |
| Solder-Stop | | | |

| | | | |
|--|----------------|-------|----------|
| | - TOP - | 35µm | |
| | | 168µm | εr: 3.48 |
| | - IN2 - | 18µm | |
| | | 200µm | |
| | | 710µm | |
| | | 200µm | |
| | - IN3 - | 18µm | |
| | | 168µm | εr: 3.48 |
| | - BOT - | 35µm | |

4 layers: 4L-H02 (1.55mm) Hybrid Rogers 4350B 254µm core

| | | | |
|---------------------|----------------------------|--|--|
| Only nominal values | Solder-Stop | | |
| | Cu 18µm + plating | | |
| | RO 4350B core 254µm | | |
| | Cu | | |
| | FR4 PP 2116 | | |
| | FR4 core 710µm | | |
| | FR4 PP 2116 | | |
| | Cu | | |
| | RO 4350B core 254µm | | |
| | Cu 18µm + plating | | |
| Solder-Stop | | | |

| | | | |
|--|----------------|-------|----------|
| | - TOP - | 35µm | |
| | | 254µm | εr: 3.48 |
| | - IN2 - | 18µm | |
| | | 120µm | |
| | | 710µm | |
| | | 120µm | |
| | - IN3 - | 18µm | |
| | | 254µm | εr: 3.48 |
| | - BOT - | 35µm | |