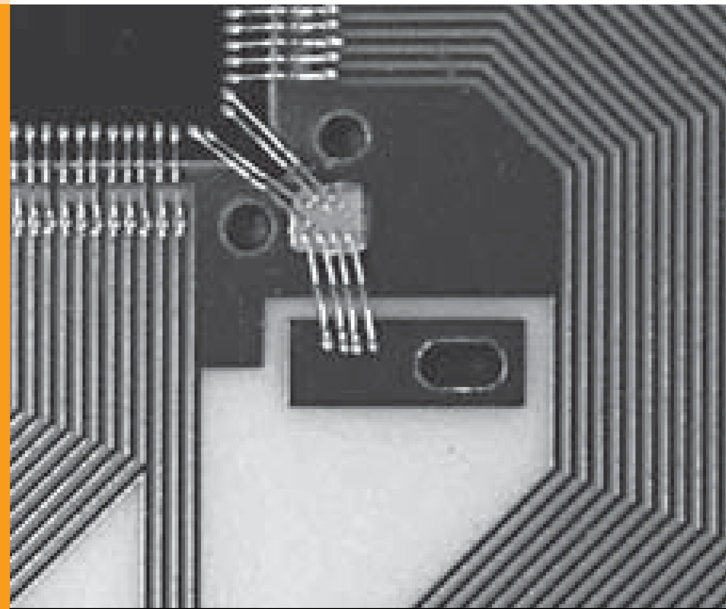
Thick Film
Thin Film
RF-PCB
Assembly/Packagng
Screening/Test

Design Manual



The following rules are effective for the draft of circuit boards and hybrid assemblies. The instructions are only valid for the layout design at RHe Microsystems GmbH. The rules are not intended to be exhaustive. All layouts should be designed in a close collaboration with RHe Microsystems GmbH.

Data file formats: GDS II, DXF, DWG, Extended GERBER (274-X) others on request

Compliance with mentioned values is depending on the properties of the used base material. A consultation is recommended.

Standard

These standard values can be used as a base for your layout and design process without request at RHe.

Special

These values are achievable by using special materials and/or special manufacturing equipment and methods. In any case a request for feasibility at RHe is recommended during early development/layout stage.

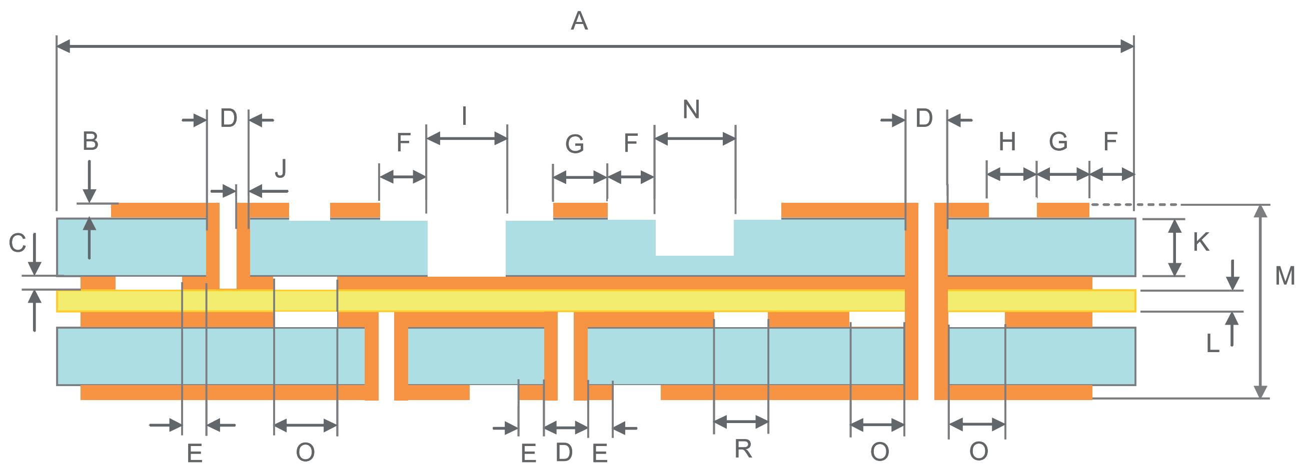
Special values should only be requested if a solution can't be found by using standard values.

Development

In this column named values are mostly custom made designs. As a developer/project leader please consider feasibility studies or separate sample manufacturing and use these parameters only in a tight collaboration with RHe in your products and constructions.

We look forward to be your partner for your special project. The manufacturing technologies will be especially designed to your requirements and series quantities.

RF-PCB Drawing



RF-PCB Design rules

		Standard	Special	Development
A	Panel dimension for PCBs with PTHs and multilayer	275 x 195 mm^2		
A	Panel dimension for PCBs without PTHs	370 x 220 mm^2		
B	Cu tickness - base Cu outer layer	18 µm – 70 µm	9 µm – 70 µm	
B	Final Cu thickness - conductor outer layer	18 µm – 70 µm	9 µm – 70 µm	5 µm – 70 µm
C	Cu thickness - base Cu inner layer	18 µm – 35 µm		
C	Final Cu thickness - conductor inner layer	18 µm – 35 µm	18 µm – 50 µm	
	Substrate hole (Via/PTH): Ø	≥ 0.500 mm	≥ 0.300 mm	≥ 0.200 mm
D	Tolerance drilled holes to patterning	± 0.100 mm	± 0.075 mm	
	Tolerance drilled hole to drilled hole (depending on base material)	± 0.100 mm	± 0.050 mm	
	Metallisation ring (rim) around via/PTH for top/bottom layer:			
E	Subtractiv, for standard solder, Al wire bonding: Ø	≥ 0.200 mm	≥ 0.150 mm	
	Semiadditiv, for AuSn solder, Au wire bonding: Ø	≥ 0.120 mm	≥ 0.050 mm	
F	Distance conductor to outer edges/cut-outs / cavities	≥ 0.200 mm	≥ 0.050 mm	
	Conductor Line & Space			
	for standard solder, Al wire bonding, final Cu thickness 18 µm	0.075 mm ± 0.020 mm		0.050 mm ± 0.010 mm
G/H	for standard solder, Al wire bonding, final Cu thickness 35 µm	0.100 mm ± 0.030 mm		
	for AuSn solder, Au wire bonding, final Cu thickness 9 – 18 µm	0.075 mm ± 0.020 mm	0.075 mm ± 0.010 mm	0.050 mm ± 0.010 mm
	for AuSn solder, Au wire bonding, final Cu thickness 35 µm	0.100 mm ± 0.030 mm		
	Cut-outs: Milling tool Ø	≥ 0.800 mm	≥ 0.200 mm	
I	Radii in the corner of cut-outs	≥ 0.400 mm	≥ 0.100 mm	
	Tolerance cut-out/tolerance cut-out to patterning and via/PTH	± 0.100 mm	± 0.050 mm	
J	Cu thickness inside via/PTH	≥ 20 µm		

		Standard	Special	Development
K	Base material thickness	≥ 0.200 mm	≥ 0.100 mm	
L	Bonding film thickness	~ 0.038 mm		
L	Prepreg thickness	~ 0.100 mm		
M	Total thickness of multilayer (without surface)	≤ 3.200 mm	≤ 3.200 mm	
N	Cavities: Milling tools Ø	≥ 0.800 mm	≥ 0.200 mm	
	Tolerance of cavity depth	± 0.150 mm	± 0.100 mm	
	Radii in the corner of cavities	≥ 0.400 mm	≥ 0.100 mm	
	Tolerance cavity/tolerance cavity to patterning and via/PTH	± 0.100 mm	± 0.050 mm	
O	Distance PTH metallisation to inner conductor layer	≥ 0.500 mm		
R	Distance conductor to conductor inner layer	≥ 0.300 mm		

RF-PCB materials

Manufacturer	Material	Composition	Permittivity/ DC εr @ 10 GHz	Loss Tanget tan δ @ 10 GHz	Temperature coefficient W/mK	CTE ppm/K		
						x	y	z
Rogers	RO3003	PTFE/Ceramic	3.0	0.0013	0.5	17	17	24
Rogers	RO3203	Woven Glass	3.2	0.0016	0.5	13	13	58
Rogers	RO3210	Woven Glass	10.2	0.0027	0.81	13	13	34
Rogers	RO4003C	Hydrocarbon Ceramic	3.38	0.0027	0.64	11	14	46
Rogers	RO4350B	Hydrocarbon Ceramic	3.48	0.0037	0.62	14	16	50
Rogers	RT/duroid 5880	PTFE Glass Fiber	2.2	0.0009	0.2	31	48	237
Rogers	RT/duroid 6010LM	PTFE Ceramic	10.2	0.0023	0.78	24	24	24
Rogers	TMM 4	Hydrocarbon Ceramic	4.5	0.0020	0.7	14	14	20
Rogers	TMM 6	Hydrocarbon Ceramic	6.0	0.0023	0.72	16	16	20
Rogers	TMM 10	Hydrocarbon Ceramic	9.2	0.0023	0.76	16	16	20
Rogers	ULTRALAM 2000	PTFE Woven Glass	2.4 – 2.6	0.0019	0.24	15	15	200
Taconic	CER-10	PTFE-Woven fiberglass	10.0	0.0035	0.63	14	14	46
Taconic	RF-35	PTFE Glass Fiber	3.5	0.0018	0.24	19	24	64
Taconic	RF-60	PTFE-Woven fiberglass	6.15	0.0028	0.43	12	12	75
Taconic	TLC-32	PTFE Glass Fiber	3.2	0.0029	0.24	10	10	70
Arlon	AR1000	PTFE/Woven Fiberglass Ceramic Filled	10.0	0.0030	0.645	14	16	37
Isola	IS620	Glass Reinforced/ Modified Epoxy	5.5 – 3.7	0.0080	n/a	16	14	47
Dupont/Pyralux	AP8525	Polyimid	3.4	0.0030	n/a	25	25	25

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