Thick Film

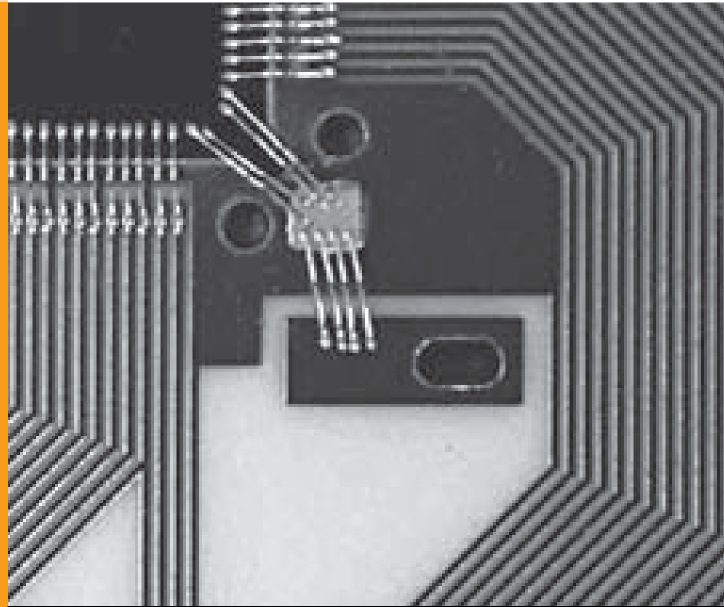
Thin Film

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.

Assembly/Packaging Design rules

Pos.	Reference	Standard	Special	Development
SMD Assembly				
	Pass. SMT components dimension min. for automatic assembly	0402	0201	01005
	Pass. SMT components dimension min. for manual assembly	0402	< 0 201	
	Board dimension max.	250 x 250 mm^2		
	Placement accuracy	+/- 50 µm	+/- 30 µm	< +/- 30 µm
	Technological frame on tile for pick and place automat	10 mm	3 mm	
Lead-out, leaded or leadless				
	Contact pitch min.	0.8 mm	0.6 mm	
Die Attach wire bonded dies				
	Die dimension, edge length min.	0.5 mm	0.25 mm	0.1 mm
	Die dimension, edge length max.	30 mm	40 mm	80 mm
	Die thickness min.	0.3 mm	0.08 mm	< 0.08 mm
	Distance die to other glued components	≥ 0.2 mm	≥ 0.1 mm	≥ 0.05 mm
	Distance die to other soldered components (SMT)	≥ 1 mm	≥ 0.5 mm	
	Board dimension max.	150 x 150 mm^2	250 x 250 mm^2	
	Placement accuracy	+/- 30 µm	+/- 20 µm	<+/- 20 µm
Die Attach flip chip				
	Die dimension, edge length min.	0.5 mm	0.25 mm	0.15 mm
	Die dimension, edge length max.	5 mm	10 mm	> 10 mm
	Bump pitch min.	250 µm	150 µm	100 µm
	Bump quantity	≤ 100	≤ 400	> 400
Wire Bonding, ultrasonic, thermosonic, wedge-wedge, ball-wedge				
	Wire diameter Au min.	25 µm	17 µm	
	Wire diameter Au max.	38 µm	75 µm	
	Wire diameter Al min.	25 µm		
	Wire diameter Al max.	300 µm	500 µm	
	Wire diameter Pt		12.5 µm	
	Die bond pad min.	80 x 80 μm^2	50 x 50 μm^2	< 50 x 50 μm^2
	Wire pitch	100 µm	50 µm	< 40 µm
	Bonding bridge length min. (in one height level)	500 µm	300 µm	< 300 µm
	Bonding bridge length max. in one height level, depending on wire diameter)	5 mm	10 mm	> 10 mm
Ribbon Bonding, thermosonic				
	Ribbon Au diameter	60 x 20 μm^2 120 x 20 μm^2 300 x 12.5 μm^2		
Parallel Seam Sealing				
	Package dimension min.	3 x 3 x 3 mm^3		
	Package dimension max.	135 x 50 x 30 mm^3		
	Fine leak test volume max.	16 cm^3		
Beam Lead Bonding		available		
Gap Welding		available		

Assembly/Packaging materials

Adhesives/coating materials					
Manufacturer	Reference	Properties	Thermal Cond.	CTE	Operating Temp.
			W/mK	ppm/K	°C
Epo-Tek/Polytec	H2OE	electrical conductive	2.9	31	- 55 / + 200
Epo-Tek/Polytec	H2OE-PFC	electrical conductive	3.2	21	- 55 / + 200
Epo-Tek/Polytec	H31D	electrical conductive	3.5	42	- 55 / + 200
Epo-Tek/Polytec	H37MP	electrical conductive	1.6	40	- 55 / + 200
Epo-Tek/Polytec	H72	thermal conductive	0.6	29	- 55 / + 250
Epo-Tek/Polytec	353ND	optic	N. A.	54	- 55 / + 250
Tracon	Ablebond 8-2	thermal conductive	1.5	40	- 55 / + 150
Panacol-Elosol	Elecolit 601	thermal conductive	1.1	35	- 60 / + 175
Ablestik	Ablefilm 5020 K	thermal conductive	0.7	45	
Emerson & Cuming	AMICON 50300	Glob top PCB	0.6	18	- 55 / + 125
Emerson & Cuming	AMICON 50302	Glob top ceramics	0.5	30	- 55 / + 125
Loctite	Hysol FP4460	Glob top ceramics		20	- 65 / + 125
Loctite	Hysol FP4650	Glob top ceramics		15	- 65 / + 125

Bonding wires					
Wire material	Diameter µm	Elongation %	Hardness	Breaking load cN	
Al	300	8 – 12		600 – 800	
AlSi1%	25	> 1		11 – 14	
AlSi1%	30	> 1		16 – 21	
Au	17.5	2 – 5	HD6	> 5	
Au	17.5	4 – 8	HD2	>1.5	
Au	25	4 – 7	HD1	> 7	
Au	25	2 – 6	HD5	> 9	
Au	30	2 – 6	HD2	12 – 16	

Solder material		
Material	Melding point °C	
	Liquidus	Solidus
SnIn52	125	118
SnBi58	138	138
InPb30	175	165
Sn62Pb36Ag2	179	179
SnPb40	191	183
SnAg3.5Cu0.7	220	217
SnAg3.5	221	221
AuSn20	280	280

Assembly/Packaging Heat sink materials

Material	Density	CTE	Thermal Cond.
	g/cm³	ppm/K	W/mK
W(20)Cu	14.3	6.4	180
Mo(30)Cu	9.7	7.5	183
Cu	8.9	17	400
Kovar	8.1	5.9	17.5
Stahl	7.8	12.5	50
AlSi7Mg	3	6 – 7	180 – 210
Hivol (AlSi)	3	6.8	226
AlSiC	3	6.7	180 – 210
Al_2O_3	3.9	7	25
AlN	3.2	4.5	180
Al	2.7	23.4	220
Si	2.3	4.7	148
GaAs	5.3	5.4	46
Al Graphite	2.3	8.2 – 8.4	140 – 205

MAC (Micro Assembly Center) Services

Assembly from different boards, substrates and PCB's

Due to the expansion of the micro assembly technology RHe can now offer a wide range of assembly services
in combination with the whole product portfolio:

- Thin film substrates (in-house manufacturing) for microwave applications, opto-electronic components and thermal management
- Thick film substrates (in-house manufacturing) microwave and power modules
- Special RF- and Microwave PCB's
- Standard FR4, rigid, rigid-flex and flex boards as well as multilayer
- Combination of different boards and materials in one module
- Assembly of board on base plates, on heatsinks and in housings

Board assembly

- Different parts and components: standard SMT (0201), THT, µBGA/BGA, QFP, CSP, components for microwave applications, RF connectors, LED's, photodiodes, laser diodes, crystals, active and passive optical components
- Automatic and manual Die-Attach: COB for Bare Dies/ASIC's, wire bonding, Flip-Chip, MIC/MMIC's processing from wafer or waffle pack
- Solder processes: with flux, with Pb, RoHS compliant, special solder; fluxless soldering in vacuum optional with positioning control and with formic acid, inert gas, hydrogen; rework services for soldered SMT components like BGA or QFP
- Gluing processes: high accuracy automatically dispense, stamp print; thermal/electrical glue or adhesive foil

Hybrid- and Module Assembly

- Automatic assembly of parts and components with a high precision microassembly system and with an integrated solderstation
- Plasma cleaning for parts, components and boards
- Fully automatic die bonding, flip chip bonding and assembly with components (e. g. MCM)
- Assembly of ceramic substrates, PCB's or power components on base plates, in housings with soldering or epoxy (conductive/non-conductive)
- Assembly of substrates and boards on heatsinks and sandwich heatsinks
- Automatic and manual wire bonding: Ball-Wedge, Wedge-Wedge; ultrasonic, thermosonic, Au-/Al-/AlSi-Pt-wire, thin wire, heavy wire; ribbon bonding
- Beam lead bonding
- Gap welding
- Connecting with standard leadframes (SIL/DIL) customized leadframes, special solutions
- Different types of RF connectors

Circuit module protection

RHe offers the following sealing processes for hybrids or electronic assemblies (hermetic/quasi-hermetic):

- Glob top
- Conformal coating
- Assembly of parts, modules and subassemblies in standard housings/customised housings
- Hermetic sealing or soldering (option: filled vias)
- Gluing or soldering of metal or ceramic frames on boards/substrates
- Gluing or soldering of lids on frames
- Frames with metal or glass lids (glued/soldered)

RHe Microsystems GmbH · Heidestraße 70 · 01454 Radeberg · Germany
Tel. +49 3528 4199-0 · Fax +49 3528 4199-99 · info@rhe.de · www.rhe.de

Ausgabe 1 / 2009