Technology - Rigid Printed Circuits - Rev 240322

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Options and Characteristics - Rigid Printed Circuits - PCBs	Online calculation/Standard	on explicit enquiry
Quantity	1 piece up to 2,5m² total area	from 1 piece up to mass production with on-call orders
Layer quantity	1 to 14 layers	up to 24 layers
Material thickness (1 and 2 layers)	0,5mm; 0,8mm; 1,0mm; 1,2mm; 1,55mm; 2,0mm and 2,4mm	0,10mm* to 3,0mm *see flexible printed circuits (FPC)
Material thickness (up to 14 layers multilayer)	several, up to 2,4mm	0,2mm* to 4,2mm *see flexible printed circuits (FPC)
Copper thickness (1 and 2 layers)	35µm, 70µm and 105µm	35µm, 70µm, 105µm, 140µm, 210µm, 280µm, 400µm
Copper thickness (up to 14-layer multilayers)	35µm, partially 70µm and 105µm	12µm to 210µm
Material colour	beige / fawn	black, blue, white
Base material type	FR4 Tg 130° C; FR4 Tg 170° C	several Rogers HF, Isola high-Tg etc. (please enquire our stock)
Maximum operating temperature	ca. 110° C / ca. 150° C	up to ca. 230° C (Tg 260)
Minimum operating temperature	ca. -40° C	down to ca. -40° C
Silk print layer	none, top, bottom, double sided	none, top, bottom, double sided
Solder mask colour	green, white, black, blue, red	green, white, black, blue, red and transparent (individual colours on exact colour value - RAL scale)
Silk print colour	white	black, blue, yellow, red
Via-Filling (no copper lid)	possible	possible
Electric test	possible (flying probe)	possible, also adapter
Plugging (with copper lid, e.g. for "via-in-pad technology"	possible	possible
Peelable mask	top, bottom or double sided	top, bottom or double sided
Bevelling	possible	possible

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Surface finish	HAL lead free, immersion tin, immersion gold (ENIG and ENEPIG), RoHS compliant (means one of the three surface finishs, chosen by LeitOn)	HAL lead free, immersion tin, immersion gold (ENIG and ENEPIG), OSP (ENTEK), immersion silver, HAL lead, RoHS compliant (means one of the three surface finishs, chosen by LeitOn)
Connector gold	possible	possible
Long term tempering	not possible	possible
Maximum printed circuit board size 1 and 2 layers PCB	570 x 500 mm² (prototypes), 537x437mm² (M-series)	1200 x 500 mm²
Maximum printed circuit board size for multilayer PCBs	570 x 500 mm² (prototypes), 537x437mm² (M-series)	500 x 600 mm²
Minimum singulated circuit board size	3cm², smaller can be calculated but will be paneliyed	>1cm² <3cm² on enquiry
Minimum circuit board size in v-cut panels	5 x 5 mm²	
Minimum circuit boar size in routing panels	10 x 10 mm², bzw. 1cm²	
Minimum printed circuit board width	5mm	
Lead time options 1 and 2 layers printed circuits	2WD, 3WD, 5WD, 7WD, 8WD, 9WD, 12WD, 15WD, 18WD, 25WD	In-day-service and over-night-service
Lead time options 4 to 8 layers multilayer printed circuits	3WD, 4WD, 6WD, 7WD, 9WD, 10WD, 12WD, 15WD, 18WD, 25WD	Over-night-service
Lead time options 10 to 14 layers multilayer printed circuits	4WD, 5WD, 8WD, 12WD	from 2WD
Lead time options 16 to 24 layers multilayer printed circuits	not possible	from 3WD
Routing	always	always, except punching
V-cut	possible	possible
Jump-v-cut	possible	possible
Punching	not possible	possible
Counter-sink-holes	not possible	possible
Z-axis milling	not possible	possible
Multilayer special stack-up	not possible	possible

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Panel Production - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
V-cut panel	possible	possible
V-Cut - Routing panel (combination)	possible	possible
Multi panels (more than one layout per panel)	possible	possible
Panel setup (chosen by LeitOn)	possible	possible
Panel setup (according to drawing)	possible	possible

PTH-drills (plated drills) - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Smallest drill 35µm (final diameter)	0,10mm, standard is 0,30mm	0,10mm
Smallest drill 70µm (final diameter)	0,10mm	0,10mm
Smallest drill 105µm (final diameter)	0,10mm	0,10mm
Smallest drill 140µm (final diameter)	not possible	0,30mm
Smallest drill 210µm (final diameter)	not possible	not possible
Smallest drill 280µm (final diameter)	not possible	0,40mm
Smallest drill 400µm (final diameter)	not possible	0,50mm
Smallest annular ring 35µm	0,15mm	0,10mm
Smallest annular ring 70µm	0,15mm	0,12mm
Smallest annular ring 105µm	0,20mm	0,15mm
Smallest annular ring 140µm	not possible	0,25mm
Smallest annular ring 210µm	not possible	0,30mm
Smallest annular ring 280µm	not possible	0,40mm
Smallest annular ring 400µm	not possible	0,50mm
Possibel drill diameters	0,20mm to 5,5mm in 0,05mm steps	0,15mm to 5,5mm in 0,05mm steps
Drills >5,5mm	are routed	are routed
Smallest drill distance 0,20mm to 2,00mm hole size (drill edge to drill edge)	0,40mm	0,40mm

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Smallest drill distance 2,05mm to 5,50mm hole size (drill edge to drill edge)	0,50mm	0,20mm
Intersecting drills	not possible, will be routed	1,0mm to 2,0mm
Half-open PTH on PCB edge	possible	possible

NPTH-drills (non-plated drills) - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Smallest drill size (final diameter)	0,60mm	0,30mm
Possible drill sizes	0,60mm to 5,5mm in 0,05mm steps	0,15mm to 5,5mm in 0,05mm steps
Copper clearance / distance to copper	0,20mm	0,20mm
Drills >5,5mm	are routed	are routed
Minimum drill-to-edge distance	0,50mm	0,50mm
Smallest drill distance 0,20mm to 2,00mm hole size (drill edge to drill edge)	0,40mm	0,20mm
Intersecting drills	not possible, will be routed	1,0mm to 2,0mm
NPTH drills in copper area (without clearance)	not possible (will be cleared from copper by min. 0,2mm)	on explicit requirement only

Blind Vias - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Smallest blind via (final diameter)	0,30mm to 0,50mm, depending on stack-up and required layer connection	0,30mm
Smallest Aspect-Ratio	1	1
Smallest annular ring	0,15mm	0,125mm

Buried Vias - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Smallest buried via (final diameter)	0,30mm	0,10mm

Routing (non-plated) - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry

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Inner routing NPTH	possible	possible
Smallest inner routing NPTH	0,70mm	0,60mm (depends on PCB thickness)
Available routing diameters NPTH	up to 2,0mm in 0,10mm steps	up to 2,2mm in 0,10mm steps
Smallest radius (inner corners) NPTH	0,35mm	0,35mm

Routing (plated) - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Inner routing PTH	partly possible	possible
Smallest inner routing PTH (final diameter)	0,60mm	0,50mm (depends on PCB thickness)
Edge plating (outer edge)	not possible	possible
Special routing paths with plating (inner)	partly possible	possible
Available routing diameters PTH (final diameter)	up to 1,9mm in 0,10mm steps	up to 1,9mm in 0,10mm steps
Smallest radius (inner corner, final) PTH	0,30mm	0,30mm
Smallest annular ring	0,20mm	0,20mm

Copper Layers (outer) - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Smallest trace 18µm	not possible	0,07mm
Smallest trace 35µm	0,10mm; 0,125mm or 0,15mm	0,08mm
Smallest trace 70µm	0,20mm	0,15mm
Smallest trace 105µm	0,25mm	0,20mm
Smallest trace 140µm	not possible	0,30mm
Smallest trace 210µm	not possible	0,60mm
Smallest trace 280µm	not possible	0,80mm
Smallest trace 400µm	not possible	1,20mm
Smallest trace-to-trace distance 18µm	not possible	0,09mm
Smallest trace-to-trace distance 35µm	0,10mm; 0,125mm or 0,15mm	0,10mm

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Smallest trace-to-trace distance 70µm	0,20mm	0,15mm
Smallest trace-to-trace distance 105µm	0,25mm	0,20mm
Smallest trace-to-trace distance 140µm	not possible	0,40mm
Smallest trace-to-trace distance 210µm	not possible	0,60mm
Smallest trace-to-trace distance 280µm	not possible	0,70mm
Smallest trace-to-trace distance 400µm	not possible	0,80mm
Smallest drill pad	0,50mm bei 0,20mm Bohrungen, Standard ist 0,60mm	0,38mm
Smallest copper clearance to inner routing	0,25mm	0,15mm or 0,0mm (plated)
Smallest copper clearance to board edge (routing)	0,25mm	0,15mm or 0,0mm (plated)
Smallest copper clearance to board edge (v-cut)	0,40mm	0,30mm

Copper Layers (inner) - Rigid Multilayer Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Smallest trace 18µm	not possible	0,08mm
Smallest trace 35µm	0,10mm; 0,125mm or 0,15mm	0,10mm
Smallest trace 70µm	0,20mm	0,15mm
Smallest trace 105µm	0,25mm	0,25mm
Smallest trace-to-trace distance 18µm	not possible	0,08mm
Smallest trace-to-trace distance 35µm	0,10mm; 0,125mm or 0,15mm	0,08mm
Smallest trace-to-trace distance 70µm	0,20mm	0,15mm
Smallest trace-to-trace distance 105µm	0,25mm	0,20mm
Smallest drill-pad diameter	0,60mm	0,40mm
Smallest copper clearance to outer edges (routed)	0,30mm	0,25mm
Smallest copper clearance to inner edges (routed)	0,30mm	0,25mm
Smallest copper clearance to drills	0,30mm	0,25mm

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Solder Mask - Rigid Multilayer Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Smallest solder mask web (green, straight) 	0,12mm	0,10mm
Smallest solder mask web (non-green, straight) 	0,15mm	0,15mm
Smallest solder mask web (round) 	0,075mm	0,05mm
smallest solder mask size around copper 	0,075mm	<0mm
Smallest text lines	0,25mm	0,20mm

Silk Print - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Smallest lines	0,20mm	0,15mm
Smallest distance between lines	0,20mm	0,15mm
Minimum clearance to copper pads	0,20mm	0,15mm

Carbon Print - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Smallest pad-to-pad distance	not possible	0,50mm

Tolerances, Values, Marks & Norms - Rigid Printed Circuit Boards - PCBs	Online calculation/Standard	on explicit enquiry
Max. offset drill centre to centre of reference	0,07mm	0,05mm
Max. offset solder mask / copper structures	0,12mm	0,075mm
Finished drill sizes PTH (up to 3mm)	+/-0,10mm	+/-0,05mm
Finished drill sizes PTH (>3mm <5,5mm)	+/-0,12mm	+/-0,10mm
Finished drill sizes NPTH (up to 5,5mm)	+/-0,12mm	+/-0,075mm
Finished drill sizes PTH & NPTH (>5,5mm - routed)	+/-0,20mm	+/-0,125mm
Outline	+/-0,20mm	+/-0,125mm

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Max. offset outline/copper structures	+/-0,15mm	+/-0,10mm
V-cut depth	+/-0,30mm	+/-0,20mm
Z-axis milling	not possible	+/-0,05mm
V-Cut position to copper structures	+/-0,25mm	+/-0,15mm
Etch tolerance copper thickness 18µm	not possible	+0/-0,02mm
Etch tolerance copper thickness 35µm	+0/-0,03mm	+0/-0,03mm
Etch tolerance copper thickness 70µm	+0/-0,05mm	+0/-0,05mm
Etch tolerance copper thickness 105µm	+0/-0,07mm	+0/-0,07mm
Etch tolerance copper thickness 140µm	not possible	+0/-0,10mm
Etch tolerance copper thickness 210µm	not possible	+0/-0,12mm
Etch tolerance copper thickness 280µm	not possible	+0/-0,12mm
Etch tolerance copper thickness 400µm	not possible	+0/-0,25mm
Material thickness tolerances	<=1,0mm: +/-15% >1,0mm: +/-10% 1,55mm: 1,6mm +/-10%	differs, please enquire
Copper thickness tolerances	+20% / -15%	+/-10%
Immersion tin thickness	>=0,7µm	>=1,0µm
HAL lead free thickness	>= 8- bis 10µm, Kanten >0,5µm	>= 8- bis 10µm, Kanten >0,5µm
HAL lead thickness	not possible	>= 8- bis 10µm, edges >0,5µm
ENIG - Immersion gold for soldering (nickel thickness)	2,5µm to 5µm	3µm to 6µm
ENIG - Immersion gold for soldering (gold thickness)	0,05µm to 0,075 µm	0,07µm to 0,12 µm
ENEPIG - Immersion nickel-palladium-gold for gold-wire bonding (nickel thickness)	4µm to 8µm	4µm to 8µm
ENEPIG - immersion nickel-palladium-gold for for gold-wire bonding (palladium thickness)	0,1µm to 0,3µm	0,1µm to 0,3µm
ENEPIG - imersion nickel-palladium-gold for gold-wire bonding (gold thickness)	0,02µm to 0,08µm	0,02µm to 0,08µm
Immersion gold for gold-wire bonding (nickel thickness)	not possible	3µm to 6µm
Immersion gold for gold-wire bonding (gold thickness)	not possible	0,4µm to 6µm

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Immersion gold for aluminum-wire bonding (nickel thickness)	2,5µm to 5µm	3µm to 6µm
Immersion gold for aluminum-wire bonding (gold thickness)	0,05µm bis 0,075 µm	0,07µm bis 0,12 µm
Electrolytic connector gold - soft, bonding possible (nickel thickness)	not possible	4µm to 8µm
Electrolytic connector gold - soft, bonding possible (gold thickness)	not possible	0,3µm to 5µm
Electrolytic connector gold - hard, bonding NOT possible (nickel thickness)	4µm to 8µm	4µm to 8µm
Electrolytic connector gold - hard, bonding NOT possible (gold thickness)	1,0µm	0,8µm to 5µm
Wet solder laquer thickness	>15µm	>15µm
Copper thickness in plated hole, traces 35µm	minimum 20µm	minimum 20µm
Copper thickness in plated hole, traces 70µm or 105µm	minimum 20µm	minimum 20µm
Copper thickness in plated hole, traces 140 to 210µm	not possible	mindestens 25µm
Copper thickness in plated hole, traces 280 to 400µm	not possible	minimum 30µm
Winding	max. 1%	max. 0,5%
Warping	max. 1%	max. 0,5%
Bevelling angle	30°, 45°, 60°	30°, 45°, 60°
Base materials RoHS-compliance	yes, always	yes, always
Surface finish RoHS-compiance	yes, always	always, unless "HAL lead" is explicitly required
IPC-norm	IPC-A-600 - Class 2	IPC-A-600 - Class 1, 2 or 3
UL-approval of printed circuits (UL number, logo, date code)	UL94-V0 possible	UL94-V0 possible
UL-approved base material	yes, always	possible
Insertion of date code	possible, please mention in enquiry	possible, please mention in enquiry
Insertion of supplier logo (LeitOn)	possible, please mention in enquiry	possible, please mention in enquiry
DIN EN ISO 9001 certification of printed circuit board production	yes	yes
DIN EN ISO 14001 certification of printed circuit board production	yes	yes
DIN EN ISO 16949 certification of printed circuit board production	no	possible

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