

Technology – Flexible Printed Circuits – Rev. 1.1

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Options and Characteristics	Online calculation	On explicit enquiry
Quantity	1 pieces up to 1m ² total area	1 piece to mass production
Number of layers	1 to 2 layers	up to 6 layers
Material thickness	0,05mm to 0,25mm	0,06mm* to 0,30mm
Copper thickness (base)	18µm and 28~35µm* *2 layer standard starts with 18µm base copper plated to ca. 28µm.	5µm, 9µm, 12µm, 18µm, 28~35µm*, 70µm *2 layer standard starts with 18µm base copper plated to ca. 28µm.
Material colour	beige/fawn	beige/fawn
Base material type	Polyimide with epoxy adhesive	Adhesive-less polyimide (PI), polyethylen (PET)
Copper type	no selection	Elektrolytic deposit (ED) or rolled annealed (RA)
Maximum operating temperature	ca. 120° C	up to around 200° C (Tg 260), adhesive-less polyimide (PI)
Minimum operating temperature	ca. -40° C	down to -40° C
Silk print layer	none, Top	keiner, top, bottom, double side
Solder mask colour	yellow or green	yellow or green
Cover lay	yellow polyimide	yellow polyimide
Combination solder mask & cover lay	not possible	possible
Silk print colour	white	black, blue, yellow, red
Via-filling (no copper lid)	possible, using cover lay	possible, using cover lay
Stiffeners	0,20mm polyimide	FR4 or PI

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3M-adhesive	possible	possible
E-Test	possible	possible
Plugging (with copper lid, e.g. for „Via-in-Pad“ technology)	not possible	possible
Peelable mask	not possible	possible
Chamfering/beveling	not possible	possible
Surface finish	immersion gold (ENIG)	immersion tin, immersion gold (ENIG), immersion silver, OSP
Connector gold plating	not possible	possible
Long term tempering	not possible	possible
Maximum FPC size 1- and 2 layers	235x585mm ²	235x585mm ²
Maximum FPC size 4- and 6 layers	not possible	220x320mm ²
Minimale Leiterplattenfläche vereinzelt	0,25cm ² @ minimum 5mm width	<0,25cm ² / smaller 5mm possible
Minimale FPC width	5mm	<5mm
Lead time options 1- and 2 layers	10WD, 15WD, 20WD	from 10WD
Lead time options 4- and 6 layers	not possible	from 15WD
Routing	not possible	not possible
V-cut / scoring	not possible	possible, in rigid panel frame
Jump scoring	not possible	not possible
Punching (soft tooling)	possible	possible
Punching (hard tooling)	not possible	possible
Hand cut	not possible	possible
Counter sink drills / tapped holes	not possible	not possible

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Z-axis routing / milling	not possible	not possible
Multilayer special stack-ups	not possible	possible

Panel production	Online calculation	On explicit enquiry
V-cut / scoring panel	not possible	possible
V-cut – punching panel (combination)	not possible	possible
Multy panel (more than 1 layout per panel)	not possible	possible
Panel setup (chosen by LeitOn)	possible	possible
Panel setup (according to drawing)	possible	possible

PTH drills (plated)	Online calculation	On explicit enquiry
Smallest Drill 5µm to 18µm (final diameter)	not possible	0,15mm
Smallest Drill 28~35µm (final diameter)	0,25mm	0,15mm
Smallest Drill 70µm (final diameter)	not possible	0,20mm
Smallest annular ring 5µm to 18µm	not possible	0,10mm
Smallest annular ring 28~35µm	0,15mm	0,10mm
Smallest annular ring 70µm	not possible	0,15mm
Possible drill sizes	up to 5,5mm in 0,05mm steps	up to 5,5mm in 0,05mm steps
drills >5,5mm	punched	punched
Smallest hole-to-hole distance for 0,2mm to 2,0mm drill diameter (outer edge to outer edge)	0,50mm	0,40mm
Smallest hole-to-hole distance for 2,05mm to 5,5mm drill diameter (outer edge to outer edge)	0,60mm	0,50mm
Intersecting drills	not possible	replaced by punching

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Half open drills on PCB edge (Half open PTH)	not possible	possible
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NPTH drills (non-plated)	Online calculation	On explicit enquiry
Smallest drill size (final diameter)	0,40mm	0,30mm
Possible drill sizes	0,40mm to 5,5mm in 0,05mm steps	0,30mm to 5,5mm in 0,05mm steps
Copper clearance / distance to copper	0,25mm	0,20mm
Drills >5,5mm	punched	punched
Smallest distance from drill to outer edge	0,60mm	0,50mm
Smallest hole-to-hole distance for 0,2mm to 2,0mm drill diameter (outer edge to outer edge)	0,50mm	0,40mm
Smallest hole-to-hole distance for 2,05mm to 5,5mm drill diameter (outer edge to outer edge)	0,60mm	0,50mm
Intersecting drills	not possible	replaced by punching
NPTH drills in copper area (without clearance)	not possible (copper will be cleared by min. 0,25mm)	on explicit notification

Blind vias	Online calculation	On explicit enquiry
Smallest blind via (final diameter)	not possible	0,20mm
Smallest Aspect-Ratio	not possible	1
Smallest annular ring	not possible	0,15mm

Buried vias	Online calculation	On explicit enquiry
Smallest buried via (final diameter)	not possible	0,20mm

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Slots (non-plated)	Online calculation	On explicit enquiry
Inner slots NPTH	by punching or hand cut	Hard tool punching
Smallest inner slot NPTH	from 1,0mm up, punching or by hand cut	from 0,5mm up, hard tool punching
Smallest radius (inner corners) NPTH	right angle	acute angle

Slots (plated)	Online calculation	On explicit enquiry
Inner slots PTH	not possible	possible
Smallest inner slot PTH	not possible	from 0,50mm up, hard tool punching
Edge plating (outer edge)	not possible	possible
Special outline paths with plating (inner)	not possible	possible
Smallest radius (inner corner, final) PTH	not possible	right angle
Smallest annular ring	not possible	0,15mm

Copper layers (outer)	Online calculation	On explicit enquiry
Smallest trace 5 μ m	not possible	0,03mm
Smallest trace 9 μ m	not possible	0,06mm
Smallest trace 18 μ m	not possible	0,09mm
Smallest trace 28~35 μ m	0,10mm oder 0,15mm	0,10mm
Smallest trace 70 μ m	not possible	0,20mm
Smallest trace-to-trace distance 5 μ m	not possible	0,03mm
Smallest trace-to-trace distance 9 μ m	not possible	0,06mm
Smallest trace-to-trace distance 18 μ m	not possible	0,09mm


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Smallest trace-to-trace distance 28~35µm	0,10mm or 0,15mm	0,10mm
Smallest trace-to-trace distance 70µm	not possible	0,20mm
Smallest drill-pad diameter	0,55mm	0,40mm
Smallest copper clearance to inner edges (slots)	0,25mm	0,20mm or 0,0mm (plated)
Smallest copper clearance to outer edges	0,25mm	0,20mm or 0,0mm (plated)
Smallest copper clearance to outer edges (V-Cut)	not possible	0,50mm



Copper Layers (inner) – Multilayer	Online calculation	On explicit enquiry
Smallest trace 5 to 9µm	not possible	0,04mm
Smallest trace 18µm	not possible	0,09mm
Smallest trace 28~35µm	not possible	0,10mm
Smallest trace 70µm	not possible	0,20mm
Smallest trace-to-trace distance 5 to 9µm	not possible	0,04mm
Smallest trace-to-trace distance 18µm	not possible	0,09mm
Smallest trace-to-trace distance 28~35µm	not possible	0,10mm
Smallest trace-to-trace distance 70µm	not possible	0,20mm
Smallest drill-pad diameter	not possible	0,40mm
Smallest copper clearance to outer edges	not possible	0,30mm
Smallest copper clearance to inner edges (slots)	not possible	0,35mm
Smallest copper clearance to drills	not possible	0,35mm




Solder mask	Online calculation	On explicit enquiry
 Smallest solder mask web (straight)	0,10mm	0,08mm

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 Smallest solder mask web (round)	0,05mm	0,05mm
 Smallest size around copper pad	0,05mm	<0mm
Smallest text lines	0,25mm	0,25mm

Cover lay (punched / drilled / lasered)	Online calculation	On explicit enquiry
Smallest rectangular pad (clearance)	5x5mm	2x2mm (gelasert)
 Smallest cover lay web (straight)	5,0mm	0,08mm
 Smallest cover lay web (round)	3,0mm	0,05mm
 Smallest size around copper pad	0,2mm	<0mm
Smallest text lines	not possible	not possible

Silk print	Online calculation	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	Online calculation	On explicit enquiry
Smallest pad-to-pad distance	not possible	0,30mm

Tolerances, Values, Marks & Norms	Online calculation	On explicit enquiry
Max. offset drill centre to centre of reference	0,10mm	0,075mm

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Max. offset solder stop (laquer or cover lay) / copper structures	0,20mm	0,10mm
Finished drill sizes PTH (up to 3mm)	-0/+0,10mm	-0/+0,10mm
Finished drill sizes PTH (> 3mm)	-0,05/+0,10mm	-0/+0,10mm
Finished drill sizes NPTH (up to 6mm)	-0,05/+0,10mm	-0/+0,10mm
Finished drill sizes NPTH (>6mm)	-0,05/+0,10mm	-0/+0,10mm
Outline	+/-0,30mm	+/-0,10mm
Max. offset outline/copper structures	+/-0,30mm	+/-0,10mm
Scoring depth	not possible	+/-0,20mm
Max. offset scoring/copper structures	not possible	+/-0,20mm
Ritzlage /Leiterbild	not possible	+/-0,20mm
Etch tolerance copper thickness 5µm	not possible	+0/-0,02mm
Etch tolerance copper thickness 18µm	+0/-0,03mm	+0/-0,03mm
Etch tolerance copper thickness 28~35µm	+0/-0,05mm	+0/-0,05mm
Etch tolerance copper thickness 70µm	not possible	+0/-0,08mm
Material thickness tolerance	+/-10%	differs, please enquire
Copper thickness tolerance	+/-10%	+/-10%
Thickness immersion tin	>= 0,5µm	>= 1,0µm
Thickness HAL lead free	not possible	not possible
Thickness HAL lead	not possible	not possible
Immersion gold for soldering purpose (nickel thickness)	2,5µm to 5µm	2,5µm to 5µm
Immersion gold for soldering purpose (gold thickness)	0,025µm to 0,075 µm	0,05µm to 0,075 µm
Immersion gold for gold-wire bonding (nickel thickness)	not possible	not possible
Immersion gold for gold-wire bonding (gold thickness)	not possible	not possible

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Immersion gold for aluminium-wire bonding (nickel thickness)	2,5µm to 5µm	2,5µm to 5µm
Immersion gold for aluminium-wire bonding (gold thickness)	0,025µm to 0,075 µm	0,05µm to 0,075 µm
Electrolytic soft gold for connectors, soft, bonding (nickel thickness)	not possible	4µm to 8µm
Electrolytic soft gold for connectors, soft, bonding (gold thickness)	not possible	0,2µm to 0,3µm
Electrolytic hard gold for connectors, hard, no bonding (nickel thickness)	not possible	4µm to 8µm
Electrolytic hard gold for connectors, hard, no bonding (gold thickness)	not possible	0,8µm to 1µm
Solder mask thickness	ca. 10µm	>15µm
Cover lay thickness	25,4µm	ab 12,5µm
Adhesive thickness Polyimid base material to copper (epoxy)	25,4µm	ab 12,5µm
Adhesive thickness Polyimid-cover lay to copper (epoxy)	25,4µm	ab 12,5µm
Copper thickness inside plated holes (PTH) 5µm bis 18µm	minimum 6µm	minimum 6µm
Copper thickness inside plated holes (PTH) 28~35µm	minimum 10µm	minimum 10µm
Copper thickness inside plated holes (PTH) 70µm	minimum 12µm	minimum 12µm
Twist	max. 1%	max. 0,5%
Warping	max. 1%	max. 0,5%
Chamfer angle	not possible	not possible
Base material RoHS-compliant	yes, always	yes, always
Surface finish RoHS-compliant	yes, always	Immer, außer wenn explizit „HAL-verbleit“ gewählt wurde
IPC-norm	some	IPC-6013 - Klasse 1, 2 oder 3
UL-certification of PCB (UL-number, Logo, datecode)	not possible	possible

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UL-certification of FPC base material	some	possible
Insert date code (WW/YY)	possible, please note in enquiry	possible, please note in enquiry
Insert supplier Logo (LeitOn)	possible, please note in enquiry	possible, please note in enquiry
DIN EN ISO 9001 certification for order preparation, CAM and order processing from LeitOn	yes	yes
DIN EN ISO 9001 certification FPC supplier	yes	yes
DIN EN ISO 14001 certification FPC supplier	no	possible
DIN EN ISO 16949 certification FPC supplier	no	possible