Technology - Flexible Printed Circuits

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Options and Characteristics - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	Online calculation/Standard	on explicit enquiry
Quantity	1 piece to 1m² total area	from 1 piece to mass production
Number of layers	1 to 2 layers	up to 6 layers
Material thickness	65µm or 45µm respectively	25µm to 0,30mm
Copper thickness (base)	18µm or 28~35µm* *2layer standard starting from 18µm base copper, plated up to ~28µm	5µm, 9µm, 12µm, 18µm, 28~35µm* *2layer standard starting from 18µm base copper, plated up to ~28µm
Material colour	beige/fawn	beige/fawn
Base material	Polyimid with epoxy adhesive	adesive-less polyimide (PI), polyethylen (PET)
Operating temperature	around 120° C	up to around 200° C (Tg 260), adesive-less polyimide (PI)
Copper type	no selection	Elektrolytic deposit (ED) or rolled annealed (RA)
Silk print layer	none, Top	none, top, bottom, double sided
Solder mask colour	cover lay, yellow	green solder mask
Cover lay	yellow polyimide	yellow, black or white polyimide
Combination solder mask & cover lay	possible	possible
Silk print colour	white	black, blue, yellow, white, red
Via-Filling (no copper lid)	possible (with cover lay)	possible (with cover lay)
Stiffener	for standard ZIF/LIF connector 0,30mm +/-0,05mm	several thicknesses, FR4 or polyimide
3M-adhesive	possible	possible
E-Test	possible	possible
Plugging Plugging (with copper lid, e.g. for „via-in-pad“ technology)	not possible	not possible
Peelable mask	not possible	possible (stiffeners)
Chamfering/beveling	not possible	not 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	230x580mm²	230x7000mm²

Maximum FPC size 4 and 6 layers	not possible	220x600mm²
Lead time options 1- and 2 layers FPCs	5WD, 7WD, 9WD, 12WD, 17WD, 22WD	from 3WD
Lead time options 4- and 6 layers FPCs	not possible	from 10WD
Routing	not possible	not possible
V-Cut / scoring	not possible	possible, inside fixture/stiffener
Jump scoring	not possible	not possible
Punching (soft tooling)	standard	possible
Punching (hard tooling)	not possible	possible
Hand Cut	not possible	possible
Hand cut & soft tooling combination	not possible	possible
Counter sink drills / tapped holes	not possible	not possible
Special multilayer stack-ups	not possible	possible

Panel production - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
V-Cut / scoring panel	not possible	possible
V-Cut - punching panel (combination)	not possible	possible
Multi Panel (more than one 1 layout on a panel)	not possible	possible
Panel setup (chosen by Leiton)	possible	possible
Panel setup (according to drawing)	not possible	possible

PTH-drills (plated drills) - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
Smallest Drill 5µm to 18µm (final diameter)	not possible	0,10mm
Smallest Drill 28~35µm (final diameter)	0,25mm	0,10mm
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
Half open drills on PCB edge (Half open PTH)	not possible	possible

NPTH-drills (non-plated drills) - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**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
mallest 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 - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
Smallest blind via (final diameter)	not possible	0,10mm
Smallest Aspect-Ratio	not possible	1
Smallest annular ring	not possible	0,15mm

Buried Vias - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
Smallest buried via (final diameter)	not possible	0,20mm

Slots (non-plated) - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**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) - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
Inner slots PTH	not possible	possible
Smallest inner slot PTH	not possible	from 0,5mm 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) - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
Smallest trace 5µm	not possible	0,03mm
Smallest trace 9µm	not possible	0,06mm
Smallest trace 18µm	not possible	0,075mm
Smallest trace 28~35µm	0,10mm oder 0,15mm	0,085mm
Smallest trace 70µm	not possible	0,15mm
Smallest trace-to-trace distance 18µm	not possible	0,075mm
Smallest trace-to-trace distance 28~35µm	0,10mm oder 0,15mm	0,085mm
Smallest trace-to-trace distance 70µm	not possible	0,15mm
Smallest drill-pad diameter	0,55mm	0,35mm
Smallest copper clearance to inner edges (slots)	0,25mm	0,20mm oder 0,0mm (plated)
Smallest copper clearance to outer edges	0,25mm	0,20mm oder 0,0mm (metallisiert)
Smallest copper clearance to outer edges (V-Cut)	not possible	0,50mm

Copper Layers (inner) - Multilayer Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**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	0,30mm

Solder Mask - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
Smallest solder mask web (straight) 	0,10mm	0,10mm
Smallest solder mask web (round) 	0,08mm	0,08mm
Smallest size around copper pad 	0,05mm	<0mm
Smallest text lines	0,25mm	0,25mm

Cover Lay (punched / drilled / lasered) - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
Smallest rectangular pad (clearance)	5x5mm	2x2mm
Smallest cover lay web (straight) 	5,0mm	2,0mm
Smallest cover lay web (round) 	3,0mm	1,0mm
Smallest size around copper pad 	0,2mm	<0mm
Smallest text lines	not possible	not possible

Silk Print - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**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 - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
Smallest pad-to-pad distance	not possible	0,50mm

Tolerances, Values, Marks & Norms - Flexible Printed Circuits - Prototypes to Mass Production - FPCs	**Online calculation/Standard**	**on explicit enquiry**
Max. offset drill centre to centre of reference	0,10mm	0,075mm
Max. offset solder stop (laquer or cover lay) / copper structures	0,20mm	0,10mm
Finished drill sizes PTH (up to 3mm)	-0,05/+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
Etch tolerance copper thickness 5µm	not possible	+0/-0,01mm
Etch tolerance copper thickness 9µm	not possible	+0/-0,01mm
Etch tolerance copper thickness 18µm	not possible	+0/-0,02mm
Etch tolerance copper thickness 28~35µm	+0/-0,03mm	+0/-0,03mm
Etch tolerance copper thickness 70µm	not possible	+0/-0,04mm
Material thickness tolerance	+/-15%	differs, please enquire
Copper thickness tolerance	+/-15%	+/-10%
Thickness immersion tin	>= 0,5µm	>= 1,0µm
Thickness tin (HAL-lead free)	not possible	nicht möglich
Immersion gold for soldering purpose (nickel thickness)	1,5µm to 3µm	2,5µm to 5µm
Immersion gold for soldering purpose (gold thickness)	0,025µm to 0,075µm	0,05µm to 0,075µm

Immersion gold for gold-wire bonding (nickel thickness)	not possible	not possible
Immersion gold for gold-wire bonding (gold thickness)	not possible	not possible
Immersion gold for aluminium-wire bonding (nickel thickness)	1,5µm to 3µm	2,5µm to 5µm
Immersion gold for aluminium-wire bonding (gold thichicht)	0,025µm to 0,075µm	0,05µm to 0,075µm
Elctrolytic soft gold for connectors, soft, bonding (nickel thickness)	not possible	4µm to 8µm
Elctrolytic soft gold for connectors, soft, bonding (gold thickness)	not possible	0,2µm to 0,3µm
Elctrolytic hard gold for connectors, hard, no bonding (nickel thickness)	not possible	4µm to 8µm
Elctrolytic 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	from 12,5µm
Adhesive thickness Polyimid base material to copper (epoxy)	25,4µm	from 12,5µm
Adhesive thickness Polyimid-cover lay to copper	25,4µm	from 12,5µm
Copper thickness inside plated holes (PTH) 5µm to18µm	at least 6µm	at least 6µm
Copper thickness inside plated holes (PTH) 28~35µm	at least 10µm	at least 10µm
Copper thickness inside plated holes (PTH) 70µm	at least 12µm	at least 12µm
Connector tolerance with siffener (total width)	+/-0,15mm	+/-0,075mm
Connector tolerance with siffener (outline to pad)	+/-0,15mm	+/-0,075mm
Chamfer angle	not possible	not possible
Base material RoHS-compliant	yes alway	yes alway
Surface finish RoHS-compliant	yes alway	yes alway
IPC-norm	some	IPC-6013 - Class 1, 2 or 3
UL-certification of FPC (UL-number, Logo, datecode)	not possible	possible
UL-certification of FPC base material	some	possible
Insert date code (WW/YY)	possible, please advise in case of order/enquiry	possible, please advise in case of order/enquiry
Insert supplier logo (Leiton)	possible, please advise in case of order/enquiry	possible, please advise in case of order/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