

MHA Int-Elect

Printed Circuit Board
Design, Prototyping, Production

The Company

- MHA-Integrated Electronic Services Ltd is a total solutions company providing a time critical range of design, prototype, software and production solutions.
- One of these services is the supply of prototype and medium volume bare Printed Circuit Boards (PCBs). We specialise in single and double sided, multilayer, flexible, flexi-rigid, HDI and buried passive requirements. We utilise a range of UK based and offshore approved partners to offer a dynamic process for supplying you:
 - Time-critical prototype
 - Premium fast track and standard service medium volume and cost-sensitive higher volume PCBs
 - We can supply product to mainland Europe within 24 hours and world-wide within 48 hours.
 - We offer ourselves as a long-term partner to companies who view us as an extension of their own business who outsource engineering and manufacturing operations to us that enable them to concentrate on their own core skills.

Quality Approvals

- We only use certified producers of PCB's
 - Underwriters Laboratories
 - V0 rating for FR4
 - V0 rating for High Tg FR4
 - V0 rating for Flex
 - V0 rating for Flex-rigid using FR4
- BS EN ISO 9001:2000
- IECQ to BS 123000 (CECC) (Cert. no. 022/QCA)
 - Rigid S/S, D/S, M/L
 - Flex
 - Flexi-rigid
 - All above with through, blind and buried holes (mechanically and laser drilled)
- Future Quality Approvals
 - Underwriters Laboratories
 - V1 approval for reinforced polyimide

Capabilities & Design Guidelines (1)

- Current Technology

Maximum number of layers	36
Minimum track	75µm (3mil)
Minimum gap	75 µ m (3mil)
Smallest mechanically drilled holes	150 µ m (6mil)
Smallest mechanically drilled blind holes	150µm (6mil)
Smallest laser drilled holes	25 µ m (1mil)
Smallest laser drilled blind holes	50 µ m (2mil)
Smallest buried holes	25 µ m (1mil)
Aspect ratio max – through holes	16:1 (FHS)
Aspect ratio max – blind holes	1:1 (FHS)
Drilled hole edge to copper (M/L rigids)	175 µ m (7mil)
Drilled hole edge to copper (F/Rs)	225 µ m (9mil)

Controlled Impedance	+/- 10%
Vias in S/M pads	
Planar transformers	
Chip on-board and component in-board	
Edge plating	
Edge plated half holes	
Edge plated fingers	
Buried resistor	+/- 15%
Solder resist laser ablation	
Resin filled vias	
Copper filled blind vias	

Capabilities & Design Guidelines (2)

- Future Technology

Minimum track:	50 μ m (2mil)
Minimum gap:	50 μ m (2mil)
Drilled hole edge to copper	150 μ m (6mil)
Buried Capacitance	
Laser structuring (copper pattern and solder resist)	

- Maximum PCB Dimensions

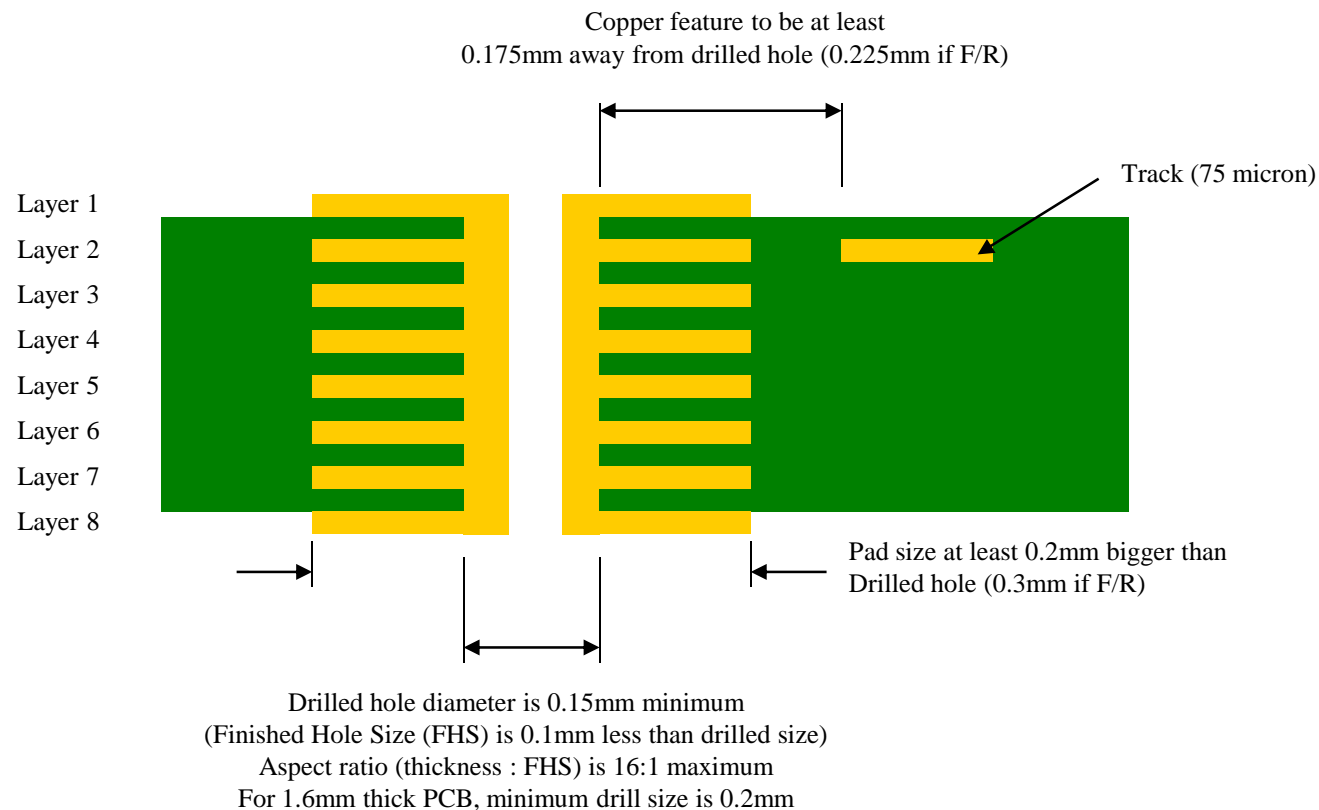
- More than 4 layers : 26.2" x 19.2"
- 4 or less layers: 27.2" x 19.2"
- Thickness 25 μ m to 4.8mm (6mm if sub-contracted process used)

Capabilities & Design Guidelines (3)

- PCB types
 - Single sided
 - Double sided
 - Multilayer (including sequential build)
 - Stepped multilayer
 - High Density Interconnect (HDI)
 - Flexible
 - Flex-rigid
 - Controlled impedance
 - Surface mounted and buried heat sinks
 - Blind and buried vias
 - Buried resistors
 - Fibre Optics in board

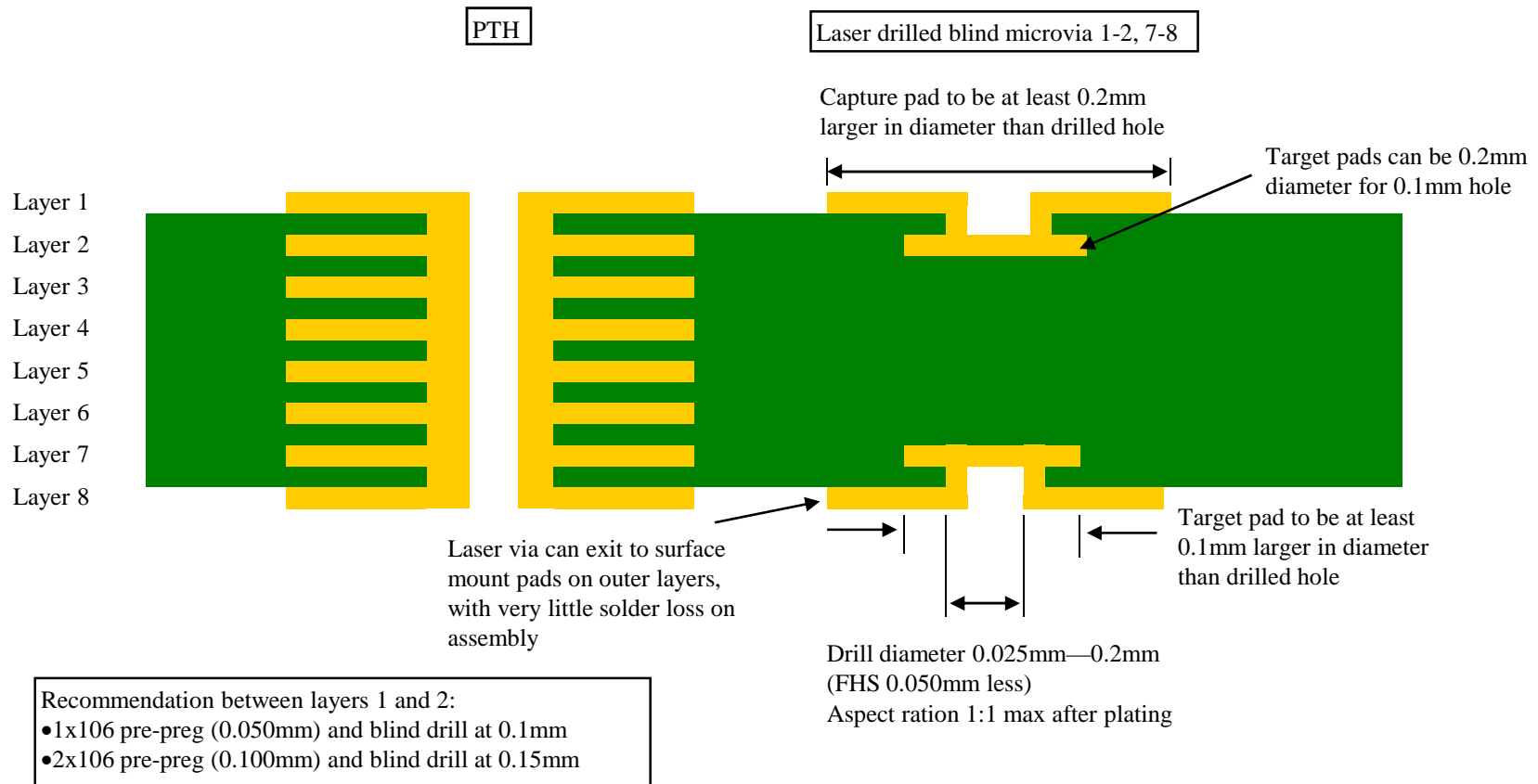
Popular Designs & Guidelines (8 layer)

- Standard plated through hole



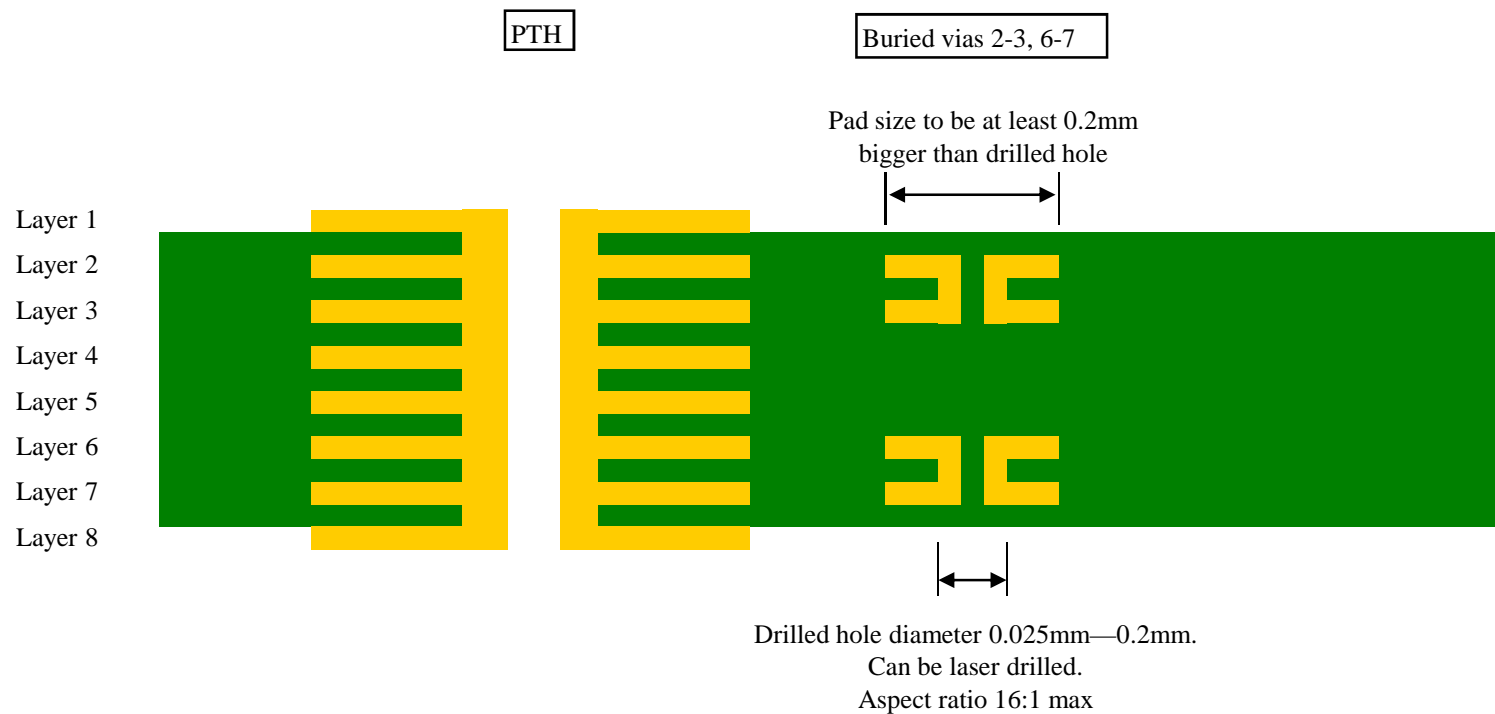
Popular Designs & Guidelines (8 layer)

- Laser drilled blind vias



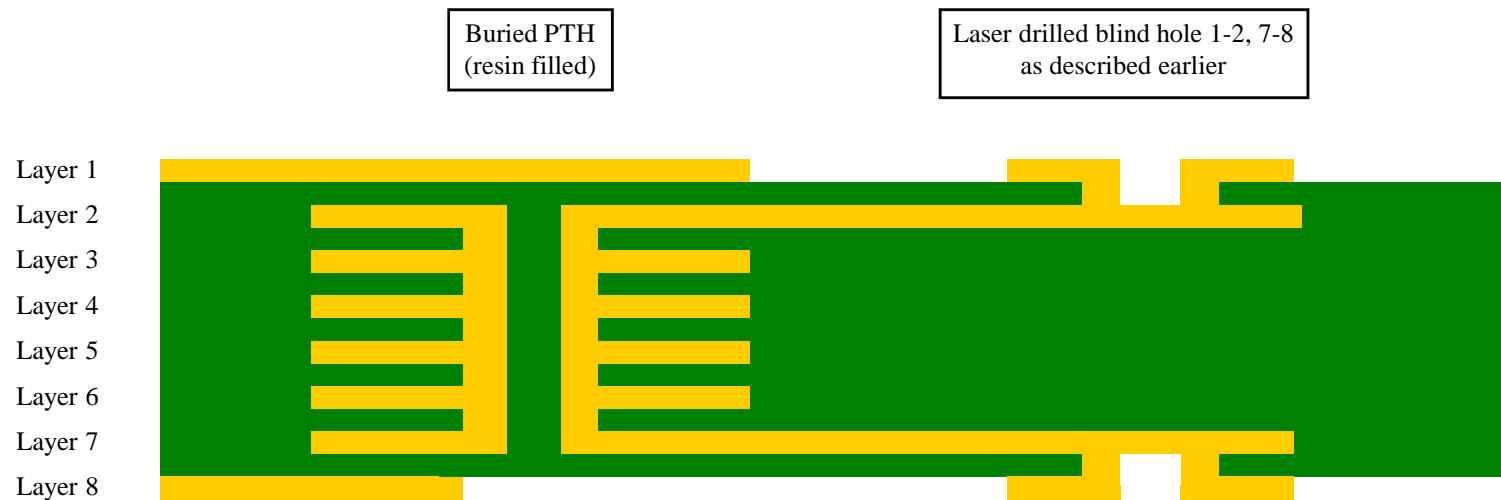
Popular Designs & Guidelines (8 layer)

- Buried vias



Popular Designs & Guidelines (8 layer)

- Laser blind sequential bond



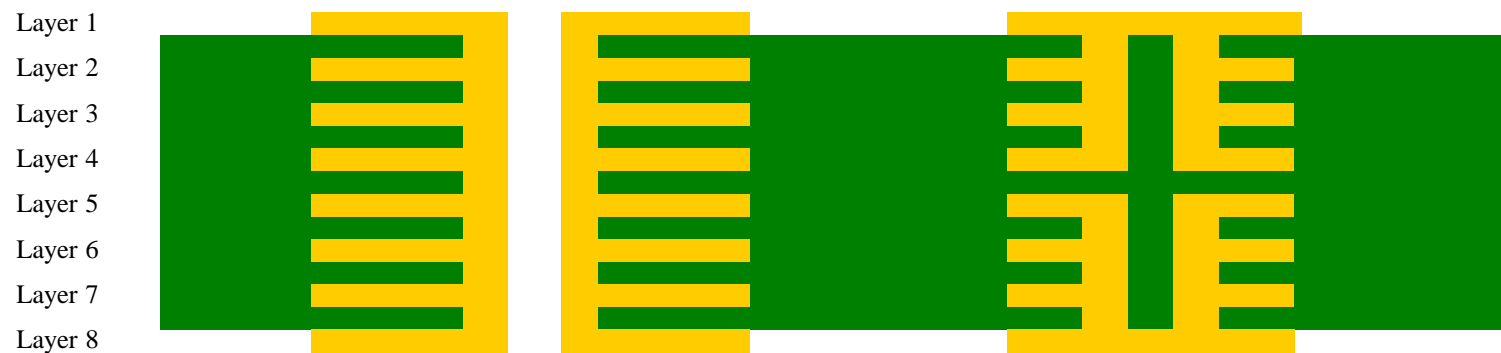
Buried PTH
(resin filled)

Laser drilled blind hole 1-2, 7-8
as described earlier

PTHs from 1-8 are optional.
If not required, outer layers can contain only surface mount pads.
All vias must exit to pads, so 2-7 holes must have pads on 2 and 7.

Popular Designs & Guidelines (8 layer)

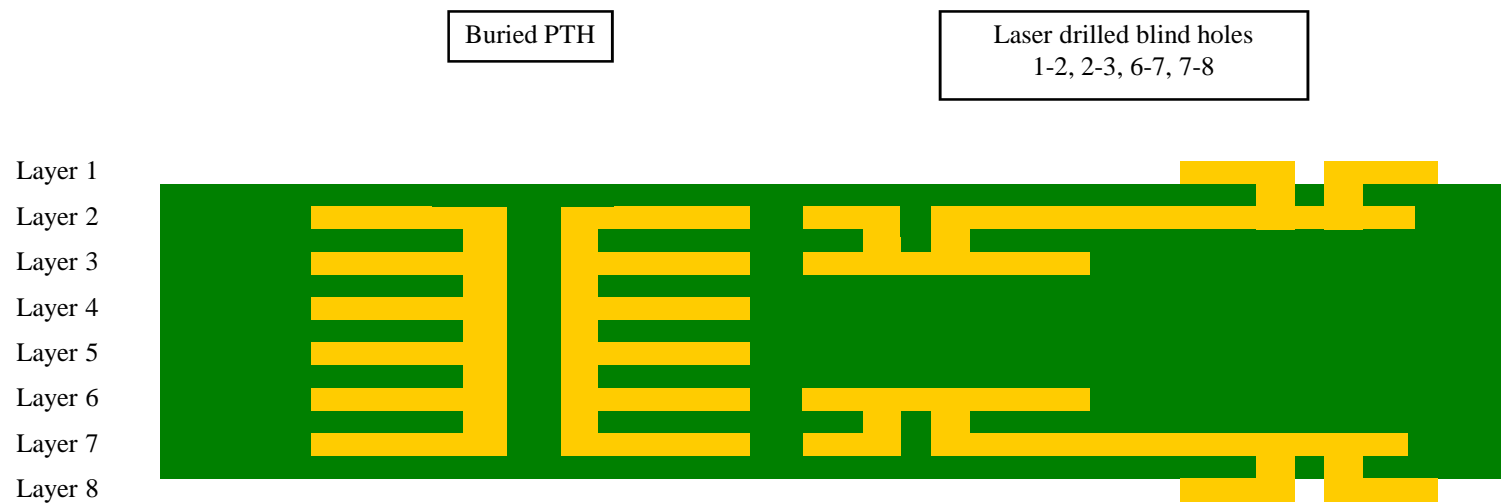
- Blind sequential bond



“Double multilayer” with blind holes filling and plating over.
All vias must exit to pads, so 1-4 and 5-8 holes must have pads on 4 & 5.

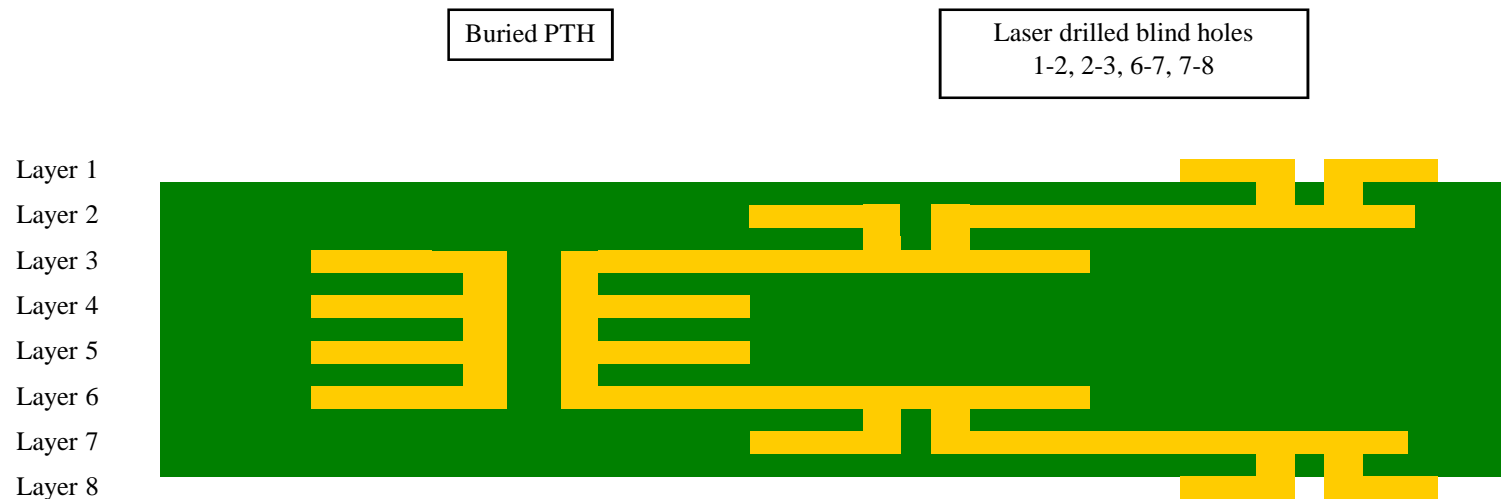
Popular Designs & Guidelines (8 layer)

- Double laser blind sequential (2 bonds)



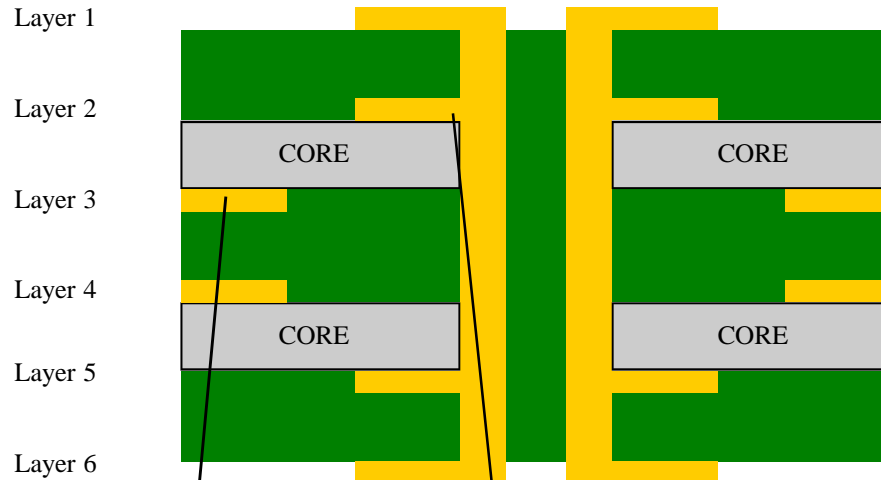
Popular Designs & Guidelines (8 layer)

- Double laser blind sequential (3 bonds)

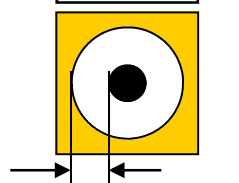


Annular Ring & Feature Clearance

Cross-section after plating

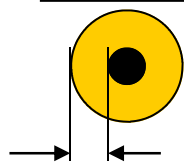


Clearance



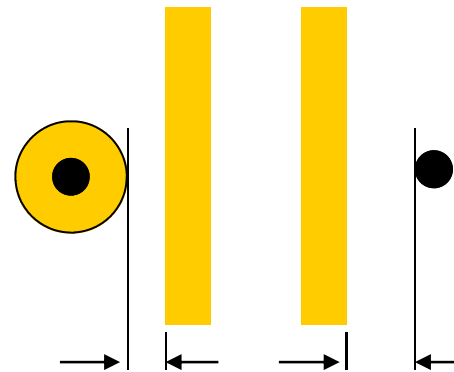
0.175mm (7mil)
clearance over
drilled hole

Annular Ring



0.10mm (4mil)
annular ring over
drilled hole size

Track to Feature Clearance



Minimum of 0.075mm (3mil)
clearance between pad and
track

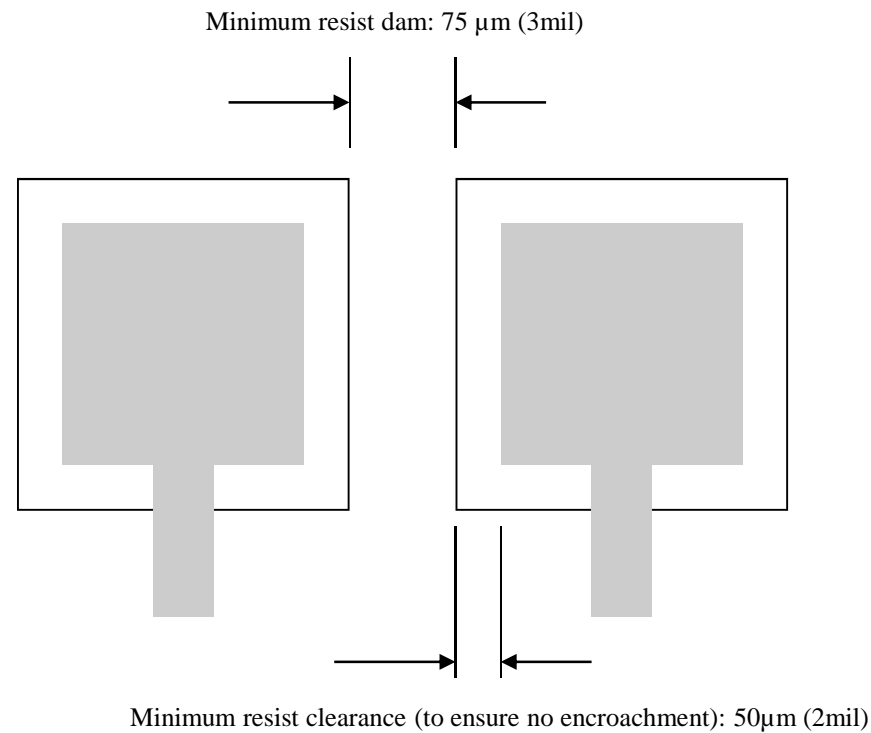
Minimum of 0.175mm (7mil)
clearance between hole and track

Solder Resist and Legend (1)

- Solder resist
 - Rigid circuits – Colour matt green. Other finishes and colours available including red, black and blue.
 - Flexible circuits Nippon Polytech NPR-80/ID 100T (screen printed). Colour brown.
 - Nominal Thickness 25 μ m (min 12.5 μ m)
 - We can plug through via holes using solder resist with a drill size of 0.3mm
- Legend
 - Photo-imagable or silkscreen
 - Minimum line width of 150 μ m (6mil)
 - Standard colour White or Yellow.
- Peel Mask
 - Nominal Thickness 250 μ m (10mil), min 200 μ m (8mil)

Solder Resist and Legend (2)

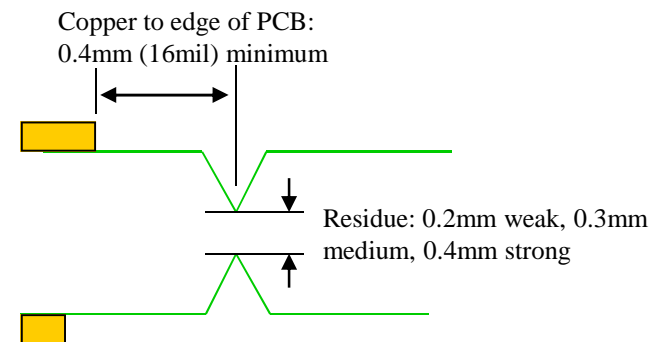
- Solder resist features:



Solder resist registration: $\pm 50\ \mu\text{m}$ (2mil)

Profiling

- Copper to Edge
 - 0.25mm (10mil)
- Rout Diameters
 - 0.6, 0.8, 1.6, 2.4mm standard. Others please enquire
- Route Tolerance
 - +/- 0.1mm
- Chamfer Angles
 - 20°, 45° standard



- Scoring cut angle 30°
- Scoring tolerance: +/- 0.1mm (4mil)
- Knife edge tooling for flexible circuit technology (+/-0.2mm edge to pattern). Laser profiling with 20µm "cut" (+/-25µm edge to pattern)

Maximum Panel Sizes

Process	Maximum (“)	Additional
Exposure	21 x 24	Outer layer
	21 x 26	Inner layer
Plating	24 wide	
Machining	21 x 30	Drilling
	18 x 24	Routing
Bonding	21 x 28	
Surface finish	18 x 24	Nickel/Gold
	24 x 24	HASL
	24 wide	Immersion Tin
	24 wide	Silver
Plasma desmear	18 x 24	
Test	25.6 x 26.4	Flying Probe and Bed of Nails tester
Silkscreen	21 x 26	
Conveyorised	24 wide	Desmear, Resist, Etch, Bond Trest Direct Metalisation

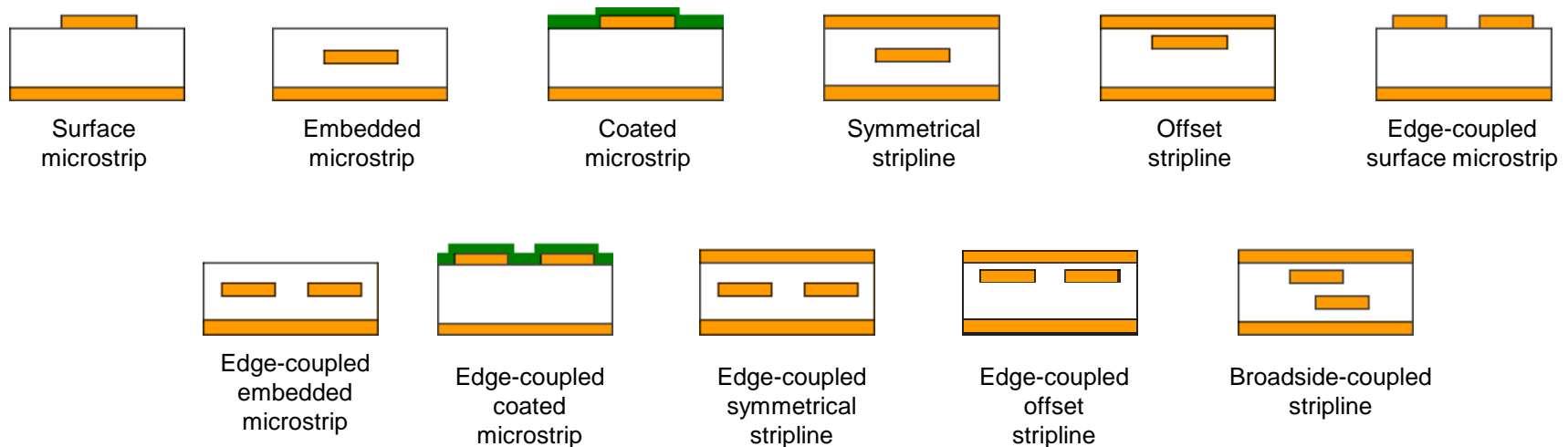
•Usable circuit area is 1.8” less in each axis

•Our standard panel sizes are

- 12x18
- 12x21
- 16x18
- 16x21
- 18x21
- 18x24
- 21x26 (limited processes)
- 21x28 (limited processes)

Controlled Impedance

- Test Equipment
 - Polar CITS500 Differential Impedance
- Dielectric Constant
 - Tester 3.85 or 4.3 after bonding standard
- Tolerance
 - 10% standard
 - 5% special



Electrical Test

Machine type:	Flying probe and dedicated (bed of nails) test
Test type:	Double sided, simultaneous test to supplied data
Pitch:	100 μ m (4mil) minimum
Pad size:	80 μ m (3mil) minimum
Active test area:	23.6"x24.4" maximum
Panel size:	25.6"x26.4" maximum
Board thickness:	0.025mm – 10mm (0.001" – 0.4")
Insulation test:	Pass > 10M Ω standard (can test > 0.5M Ω to 150M Ω)
Continuity test:	Pass < 10 Ω standard (can test < 0.05 Ω to 8k Ω)
Test voltage:	10V (can test up to 250V)

Rigid materials (1)

Material	Tg (°C)	Dk	Df	TCE (z)(%) 50-260°C	Application/Comments
Multifunctional FR4	135	3.8 – 4.6	0.025	4.5	Popular PCB material used in computer and telecommunication applications etc. Can also have specific CTI. Higer Tg than Di-functional
Laser drillable pre-preg	135	4.6	0.025	4.5	Easier to laser drill giving smoother hole walls
Getek	180	3.9	0.012	3.9	Improved thermal and electrical properties
High Tg FR4	180	4.6	0.025	4.1	Withstands higher temperatures
BT/Epoxy	185	4.1	0.015	3.5	Withstands higher temperatures. Better electrical properties - lower Dk and Df
Cyanate Ester	250	3.7	0.009	2.5	Withstands extremely high temperatures and has excellent electrical properties.
Polyimide	260	4.5	0.013	1.8	Withstands extremely high temperatures due to high Tg and low TCE (z) . Low Df.
PTFE Alternatives	280	3.4 3.5	0.002 0.004		Properties approaching PTFE but can be processed like FR4. Optimum frequency range 100MHz to 15GHz
PTFE	260	2.3	0.001		Optimum frequency range 1-90GHz.
Metal backed PTFE	280				Can be thick Aluminium, Brass or Copper backed
SI glass			0.026		Better signal integrity
Resin Coated Copper (RCC)	160	3.4			Ideal for outer layers with laser micro-drilling down to penultimate layers, bonded to rigid core. No reinforcement.
Halogen Free					Environmentally friendly

Rigid materials (2)

- Higher Glass Transition Temperature (T_g) gives lower Z axis TCE, giving better reliability at extreme temperatures, better in-service repair capability and the ability to produce thicker boards with higher aspect ratio holes enduring higher temperatures
- Lower Dielectric Constant (D_k) gives increased signal speeds
- Lower Dissipation Factor (D_f) minimises signal attenuation
- Copper from $5\mu\text{m}$ to $140\mu\text{m}$

Flexible materials (1)

Material	Manufacturer	Adhesive type	Thickness Base (mil)	Thickness Ad. (mil)	Thickness Cu. (µm)	Tg(°C)	Dk	Df	Flamability Rating
Copper clad extruded polyimide	Espanex SB series	Adhesiveless	1,2	-	12, 18, 35, 70		3.5	0.004	V0
	Du Pont AP series	Adhesiveless	1,2,3	-	12, 18, 35, 70		3.2	0.002	V0
	Toray	Adhesiveless	2	-	2, 4			0.025	V0
	Du Pont LF series	Acrylic	1, 2, 3, 4, 5*	1	18, 35, 70	40 Adh 360 base	3.7	0.03	None
	Du Pont FNC series	Epoxy	1,2*	0.8	18, 35, 70		3.7	0.01	V0
Coverlay	Espanex SPC series	Modified Polyimide	1	1.4	-	80	3.4		V0
	Du Pont LF0 series	Acrylic	1, 2, 3, 5	1,2,3	-	40 Adh 360 base	3.7		None
	Du Pont FNCC series	Epoxy	1	1.5	-				V0
Bond ply (ad. /base/ad.)	Du Pont LF0 series	Acrylic	1, 2, 3	1,2,3	-				None
Bond ply (pure adhesive)	Espanex SPB series	Modified Polyimide	-	1.4,2	-	170	3.3	0.01	V0
	Du Pont FNCA series	Epoxy	-	1.6	-				V0
Flex photo imageable solder resist	Nippon Polytech NPR-80/ID100T		1 approx	-	-				V0

* Thicknesses exclude adhesive on both sides

Flexible materials (2)

- Our preferred flex material is the Espanex range, which is manufactured by the Nippon Steel Chemical company (NSC). See www.holders.co.uk for details.
- We can also use and hold reasonable stocks of DuPont and Toray adhesiveless materials and DuPont LF-series.
- We hold UL rating (V0) for flex and flex-rigids that use Espanex flex and FR4 rigid materials.
- Other materials available on request.
- Polyester based materials can also be obtained for low temperature applications.

Copper Weight Conversions

Oz/sqft	μm	mil (0.001")
0.06	2	0.1
0.14	5	0.2
0.25	9	0.4
0.3	12	0.5
0.5	17.5	0.7
1	35	1.4
2	70	2.8
3	105	4.2
4	140	5.6

Mixed copper weights are available

Finishes

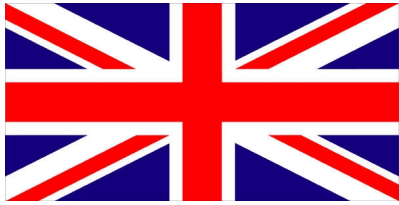
Finish	Thickness	Typical uses
Electroless Nickel/Immersion Gold	3-5 μm Ni 0.1 μm max Au	Soldering, Aluminium wire bond, Touch pads
Electroless Nickel/Electroless Palladium/ Immersion Gold ("Super" or "Universal" finish)	3-5 μm Ni, 0.6 – 0.8 μm Pb, 0.05-0.1 μm Au	Soldering, Aluminium wire bond, Gold wire bond, Touch pads, Pogo pin contacts
Electroplated Hard (Tab) Gold	2.5 μm pore free Au	Edge friction contacts, All over friction contacts
Electroplated Soft Gold	2.5 μm pore free Au	Soldering, Aluminium wire bond, Gold wire bond, Touch pads, Pogo pin contacts
HASL (63:37)	15 μm	Soldering
Electroplated Tin/Lead + Immersion Tin		Soldering
Organic Solderability Preservative	0.3 μm	Soldering
Electroless Nickel/Electroplated Hard Gold	3-5 μm Ni, 0.8 μm min Au	Edge friction contacts All over friction contacts
Electroless Nickel/Electroplated Soft Gold	3-5 μm Ni 1 μm min soft Au	Soldering, Aluminium wire bond, Gold wire bond, Touch pads, Pogo pin contacts
Immersion Sterling Silver	0.2-0.3 μm Ag	Soldering, Aluminium wire bond, Touch Pads.
Immersion Tin	>1 μm	Soldering
Carbon Key Pads		
Palladium (with or without Silver or Nickel undercoat)	4 μm pore free (1 μm if undercoated)	Soldering, Aluminium wire bond
Mixed Finishes (enquire)		

Turnaround time (working days)

	Standard	Fast
Double sided	10	2
Multilayer	15	3 (depending on layer count)
Flexible	15	5
Flexi-rigid	20	10

Faster turnaround times are available dependant on product type

CONTACT DETAILS



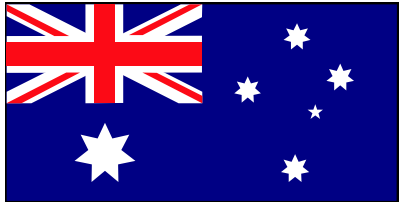
Head Office: **MHA** Int-Elect

Station House, Station Approach,
Atherton, M46 9LJ, England

Telephone: +44 (0)1942 887400 Facsimile: +44 (0)1942 887407

REG.: GB 3522631

sales@mhaintelect.com



Australia & New Zealand Office: **MHA** Int-Elect

31 Taylor Place, Queanbeyan,
NSW 2620,
Australia.

Telephone: +61 (0) 262842742

sales@mhaintelect.com.au

