More than a manufacturer

Standard Technology

2020

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05 Routing/ Scoring

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Rigid PCB

Capabilities

Layer count	• 1 - 24 layers (higher layer counts on request)	
PCB thickness	• 0.4 - 3.2 mm (> 3.2 mm on request) • Tolerance: +/- 10% • Core thickness min 0.075 mm for inner layer (0.05 mm on request)	
PCB size	• Maximum 500mm x 580mm	
Bow & Twist	• ≤ 0.7%	
Base copper thickness	• Up to 6 OZ (210µm) with UL approval	
Laminate types	• FR-4 • Aluminum substrate • Copper substrate • High frequency materials (low loss materials) • CEM-1 / CEM-3	Available FR-4 properties: • High TG (175°C) • CAF resistant • Halogen free • CTI ≥ 600V
Laminate brands (FR-4)	• Shengyi • Kingboard • Ventec • Panasonic	• ITEQ • Nanya • Dekai • Isola
Solder mask	• Green • White • Black	• Blue • Red glossy / semi-matte / matte
Solder mask brands	• Taiyo • Tamura • Huntsman	• Rongda • Yeyo • Gingwa
Outline	• Routing • Punching/ Push back punching • V-scoring / Jump V-scoring	
Special features	• Resin or solder mask plugging of via holes • Depth routing (e.g. for bendable PCB) • Press-fit hole • Back drilling	

Base Material

Type	Description	Application
CEM 1	• Hard paper core and epoxy resin / glass fiber	• Single -layer PCB
CEM 3	• Epoxy resin / non woven glass • epoxy resin / glass fiber	• Single-layer and double layer PCB • Plated through holes
FR4 FR5	• Epoxy resin / glass fiber • FR5 = FR4 with high Tg	• Double-layer and Multilayer PCB
Aluminum Substrate	• PCB with Aluminum Substrate	• Single layer PCB with improved heat dissipation
Copper Substrate	• PCB with Copper Substrate	• Single -, Double and Multilayer PCB with improved heat dissipation

Possible FR4 characteristics

Tg (°C):
130 / 150 / 170
Low CTE
Halogen free
CAF Resistent
CTI:
>100 … >600

Tg: Glass Transition Temperature
CTE: Coefficient of thermal expansion
CAF: Conductive Anodic Filament
CTI: Comparative Tracking Index

Copper Thickness

Copper Thickness in accordance IPC-A600
Double Side (DS) and Multilayer (ML) outer layer

Weight (Oz)	µm	nominal Cu min. IPC 4562 (raw material) "base copper"	Absolut copper min. (less 10% reduction)	Plus minimum plating +20µm (equivalent to IPC class 1 and 2)	Plus minimum plating +25µm (equivalent IPC class 3)	Maximum variable processing allowance reduction	Minimum surface conductor thickness after processing (DS and ML outer layer) "final thickness"	
							equivalent to IPC class 1 und 2	equivalent to IPC class 3
1/8	6	5,10 µm	4,59 µm	24,59 µm	29,59 µm	1,50 µm	23,1 µm	28,1 µm
1/4	9	8,50 µm	7,65 µm	27,65 µm	32,65 µm	1,50 µm	26,2 µm	31,2 µm
3/8	12	12,00 µm	10,80 µm	30,80 µm	35,80 µm	1,50 µm	29,3 µm	34,3 µm
1/2	18	17,10 µm	15,39 µm	35,39 µm	40,39 µm	2,00 µm	33,4 µm	38,4 µm
1	35	34,30 µm	30,87 µm	50,87 µm	55,87 µm	3,00 µm	47,9 µm	52,9 µm
2	70	68,60 µm	61,74 µm	81,74 µm	86,74 µm	3,00 µm	78,7 µm	83,7 µm
3	105	102,90 µm	92,61 µm	112,61 µm	117,61 µm	4,00 µm	108,6 µm	113,6 µm
4	140	137,20 µm	123,48 µm	143,48 µm	148,48 µm	4,00 µm	139,5 µm	144,5 µm

Single Side (SS) and Multilayer (ML) inner layer

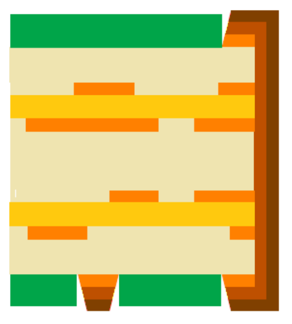
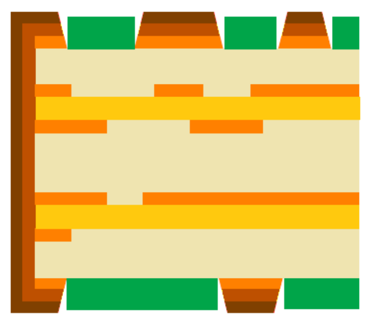
Weight (Oz)	µm	nominal Cu according IPC 4562 (raw material)	Absolut copper min. (less 10% reduction)	Maximum variable processing allowance reduction	Minimum final finish after processing (SS + ML inner layer)
1/8	6	5,10 µm	4,59 µm	1,50 µm	3,1 µm
1/4	9	8,50 µm	7,65 µm	1,50 µm	6,2 µm
3/8	12	12,00 µm	10,80 µm	1,50 µm	9,3 µm
1/2	18	17,10 µm	15,39 µm	4,00 µm	11,4 µm
1	35	34,30 µm	30,87 µm	6,00 µm	24,9 µm
2	70	68,60 µm	61,74 µm	6,00 µm	55,7 µm
3	105	102,90 µm	92,61 µm	6,00 µm	86,6 µm
4	140	137,20 µm	123,48 µm	6,00 µm	117,5 µm

Hole Copper Thickness

	Class 1	Class 2	Class 3
copper - average	20 µm average	20 µm average	25 µm average
Thin areas (minimum)	min. 18 µm	min. 18 µm	min. 20 µm

We suggest specifying the nominal copper thickness + min. plating. The final thickness will be the result optional to the plating thickness.

Copper Thickness

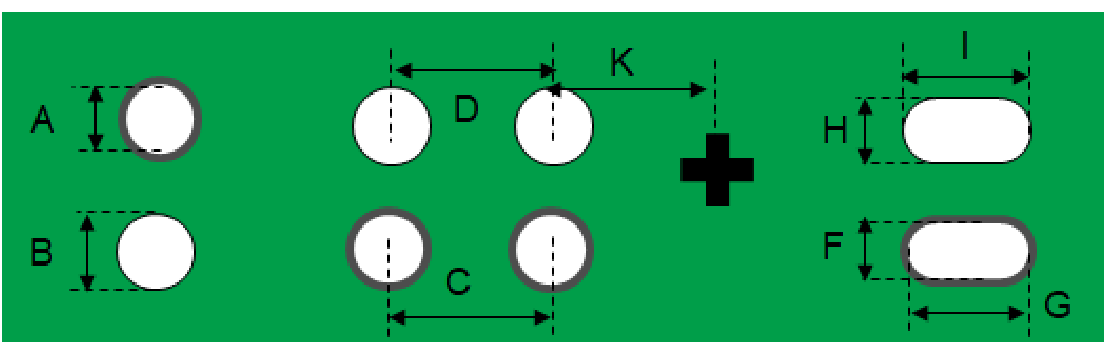



Copper thickness in PTH:
25µm (IPC-6012B Class 3)
20µm (IPC-6012B Class 2)

Inner layer			Outer layer			
Base Copper	Line width	Line space	Final copper Class 2	Final copper Class 3	Line width	Line space
½ oz (18µm)	80µm	80µm	33,4µm	38,4µm	100µm	100µm
1oz (35µm)	100µm	100µm	47,9µm	52,9µm	120µm	120µm
2oz (70µm)	150µm	150µm	78,7µm	83,7µm	180µm	180µm
3oz (105µm)	200µm	200µm	108,6µm	113,6µm	250µm	250µm

Inner layer: Base copper is nominal thickness, the min. thickness after processing is Base copper minus 10% minus 3µ
Outer layer: Final copper is the min. thickness after plating according to IPC – 6012 Class 2

Drilling

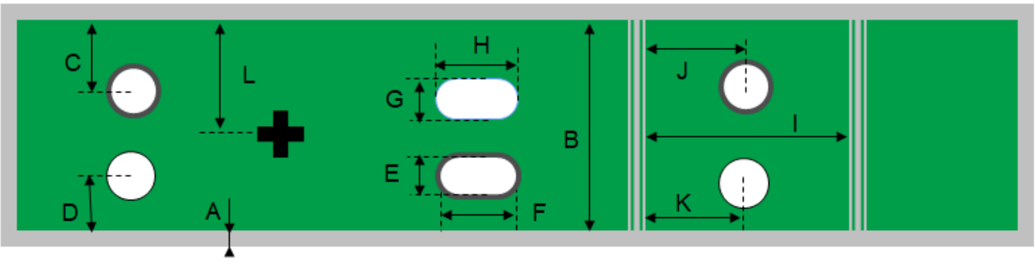


Aspect ratio (A:T) 1:8

with T=PCB thickness and A=hole diameter

No.	Description	Specification
A	Plated hole diameter	• Diameter: 0.2 – 6.5mm (larger on request) • Tolerance range: 0.15mm (adv.:0.10mm)
B	Non plated hole diameter	• Diameter: 0.2 – 6.5mm • Tolerance range: 0.10mm
CD	Distance hole to hole	• Tolerance: +/-0.08mm (adv.: +/-0.50mm) • Tolerance second drill: +/-0.125mm (adv.: +/-0.10mm)
FH	Drilled slot width	• Width: 0.6mm min.
FG	Plated slot size	• Tolerance F: +/-0.08mm • Tolerance G: +/-0.1mm
HI	Non plated slot size	• Tolerance H: +/-0.05mm • Tolerance I: +/-0.08
K	Hole to circuitry	• Tolerance: +/-0.1mm

Routing/ Scoring

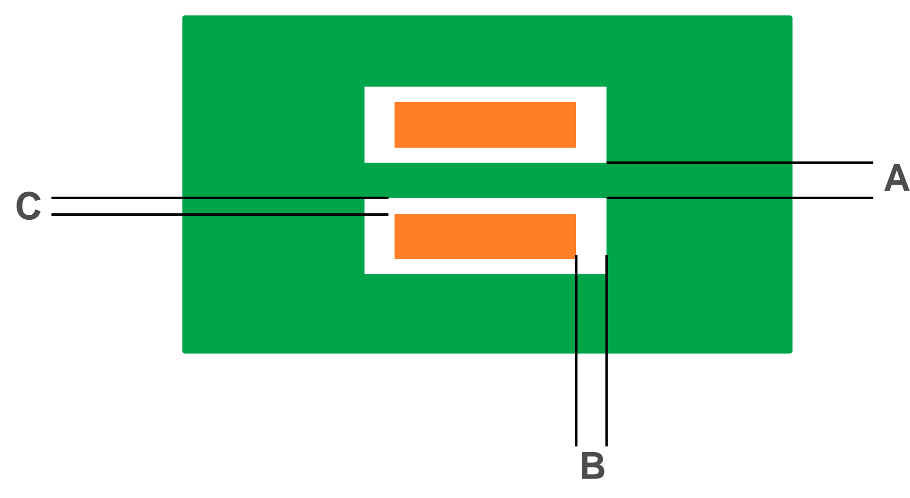


No.	Description	Specification
A	Routing bit diameter	• Standard ≥ 2mm (routing path) • Minimum 0.8mm
B	Distance edge to edge routing	• Tolerance: +/-0.10mm
I	Distance edge to edge scoring	• Tolerance: +/-0.1mm
CD	Distance hole to edge	• Tolerance: +/-0.10mm
JK	Distance hole to edge scoring	• Tolerance: +/-0.15mm
EG	Milled slot width	• Minimum 0.8mm
EF	Plated slot size	• Tolerance: +/-0.13mm
GH	Non plated slot size	• Tolerance: +/-0.10mm
L	Edge to circuitry	• Tolerance: +/-0.15mm

Impact of finishing on assembly

	OSP	HASL (lead free)	HASL (SnPb)	Immersion tin (Imm Sn)	Immersion silver (Imm Ag)	Electroless Nickel/Gold (ENIG)	Electrolytic (hard) Au
Thickness	0.25µm	1-40µm	1-40µm	min 1µm	0.15-0.5 µm	Ni: 3.5-6µm Au: min 0.05µm	Ni: >3µm Au: 0.05-2µm
Shelf life (solderability)	6 months	12 months	12 months	9 months	6 months	12 months	12 months
Co-planarity	Excellent	Poor	Poor	Excellent	Excellent	Excellent	Excellent
Solder joint Integrity	Good	Good	Excellent	Good	Excellent	Good	No soldering
Assembly cycles	Multiple	Multiple	Multiple	Multiple	Multiple	Multiple	No soldering
Final surface finishing	No	Yes	Yes	No	No	Yes	Yes
Rework	Yes	Yes	Yes	Yes	No	No	No
ROHS compliance	Yes	Yes	No	Yes	Yes	Yes	Yes
Fabrication costs	-	Standard	+	+	+	++	+++

Solder mask

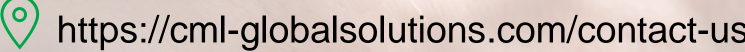


No.	Description	Standard	Special request
A	Solder mask bridge	• 100µm	• On request
B	Solder mask opening	• 100µm (annular)	• 50µm (annular)
C	Solder mask offset	• 100µm	• 50µm

Based on green solder mask and surface HAL LF. In case of other solder mask colors / surfaces , the values could be different.

Via Protection

Type according IPC-4761	CML process	Advantages	Disadvantages	IPC picture
Type III-a (plugged via)	Covered with UV cured solder mask after surface finishing	Surface finishing on copper hole wall No chemical residues in the vias	Higher risk of residue on surface (depends on distance via to pad)	
Type IV (plugged and covered via)	Plugged one side with solder mask wet in wet (filling rate min. 70%) and covered with solder mask both sides	Common process; no price impact	Restricted hole diameter (ideal 0.4mm)	
Type V (filled via)	Plugged with resin (filling rate 100%)	No restriction on hole diameter	Cost impact	
Type VI (filled and covered via)	Plugged with resin (filling rate 100%) and covered with solder mask	No restriction on hole diameter	Cost impact	
Type VII (filled and capped via)	Plugged with resin (filling rate 100%) and capped with copper	No restriction on hole diameter Via in pad application possible	Cost impact	



Let’s begin by understanding your requirements and expectations

More than a manufacturer

Advanced Technology

2020

Agenda

01
HDI

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Thermal Management

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Bendable Board

04
Flex and Rigid Flex

05
Topic

06
Topic

High Density Interconnect (HDI)

Capabilities

HDI Structure	• 1+N+1 / 2+N+2 / 3+N+3 / 4+N+4 (any layer on request)
μ-via drill diameter	• Min. 0.10mm
Max. Aspect Ratio	• Micro via 0.8:1 (advanced 1:1)
Surface Finish	• Electroless Nickel Gold • Immersion Tin • ENEPIG • OSP
Special Features	• Copper filled micro vias • Stacked and staggered micro vias • Sequential build-up • Copper paste plugging of burried micro vias
HDI	

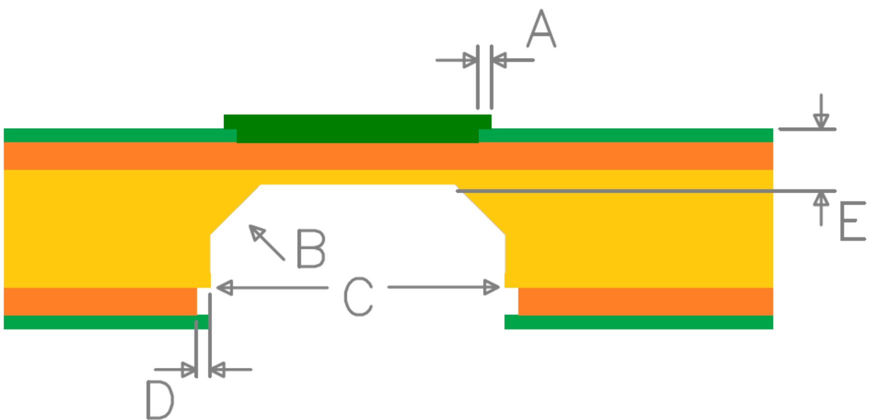
Thermal Management

Capabilities – Metal Substrate PCB

	Aluminum substrate	Copper substrate
PCB Structure	Aluminum substrate	Copper substrate
Layer Count	• 1 layer	1 or 2 layers
Substrates (thermal conductivity)	• Ventec VT4B5 (4.2 W/mK) • Ventec VT4B3 (3.0 W/mK) • Ventec VT4A2 (2.2 W/mK) • Boyu AL-01-B 30 (3.0 W/mK) • Boyu AL-01-B 50 (5.0 W/mK) • Boyu AL-01-B 80 (8.0 W/mK)	• Ventec VT4B5 (4.2 W/mK) • Ventec VT4B3 (3.0 W/mK) • Boyu Cu-01-B 30 (3.0 W/mK) • Boyu Cu-01-B 50 (5.0 W/mK) • Boyu Cu-01-B 80 (8.0 W/mK) • Copper foil + Shengyi S1000HB + copper plate C1100P
Thickness	• Copper: 18 to 70µm • Dielectric: min 50µm • Aluminum Plate: 0.5 to 3mm	• Copper: 18 to 70µm • Dielectric: min 50µm • Copper Plate: 0.5 to 3mm
Surface finishes	• Lead Free HAL • OSP, ENIG	• All finishes (no restrictions)
Specials	• Anodized aluminum surface • Panelization rules depending from outline (routing or punching)	• Copper filled micro vias • Panelization rules depending on outline (routing or punching)

Bendable PCB

A: Overlap flexible coating on solder mask	• 0.1mm
B: Angle inside the depth routed slot	• 45°
C: Depth-routed slot width	• Depends on bending angle
D: Spacing between depth routed slot and copper	• 0.7mm
E: Remaining thickness	• On request – minimum 1 Prepreg + Copper + Solder Mask
Bending cycles	• 1 x bend in shape
Bending angle	• Depends on depth routing slot width



Flex PCB

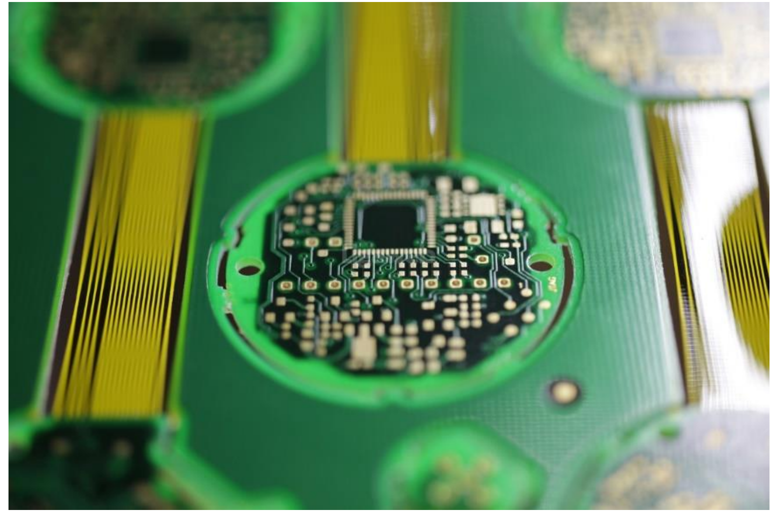
Capabilities

Layer Count	• 1-8 layers
PCB Thickness	• 0.15 to 1mm
Line and Space	• Minimum 50µm / 50µm with ¼ OZ base copper on inner layers
Flexible base material	Polyimide (PI) thickness: min 13µm Available as adhesive-less Brands: Doosan, Hanwha, Innox, Thinflex, Taiflex, Panasonic
Coverlay	• Colour: amber, black, white • For fine pattern: Flexible solder mask
Surface Finish	• OSP • Electroless Nickel / Gold • Immersion Tin • Electrolytic Nickel / Gold
Stiffeners	• FR-4, PI, Polyester (PET) • Stainless steel (SUS) on request • PSA (pressure sensitive adhesive) • TSA (thermal sensitive adhesive)
Outline	• Laser Cutting (Sample) • Routing (Sample) • Punching (Mass Production)
Specials	• Flex PCB attached to Aluminium substrate

Rigid-Flex PCB

Capabilities

Layer Count	• 2-10 layers
PCB Thickness	• Min. 0.4 mm
Structure	• Depends on customer design • To be reviewed case by case
Material	Combination of materials (base material, solder mask, cover layer, stiffeners) for rigid and flexible PCB
Specials	• Book structure • Unsymmetrical structure • Hybrid Rigid-Flex



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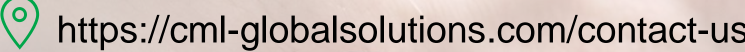
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