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# Process Capability & Tolerance For PCB Manufacturing


<b>Process Capability &amp; Tolerance For PCB Manufacturing</b>	

## 1.0 Process Capability

Seq	Process	Item	Unit	Process Capability
1	Surface	Surface Treatment		Tin lead /Leadfree HASL、Flash Gold、ENIG、OSP、Immersion Tin / Silver、Hard Gold
2		Selective Surface Treatment		ENIG+OSP, ENIG+Gold Finger, Flash Gold+HASL, Flash Gold+Gold Finger, Immersion Silver+Gold Finger, Immersion Tin+Gold Finger
3		Layer Count	Layer	1-42( $\geq 10$ Layers needs Review)
4		Bow and Twist	%	0.7( $\leq 0.5$ needs Process Review)
5		Min finished size	mm	5*5
6		Max finished Size (4L)	inch	22.5*40(Needs Review If length exceeds 30 Inch)



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7	Basic Information	Products Capability	Max finished Size ( $\geq 6L$ )	inch	22.5*40(Needs Review If length exceeds 30 Inch)
8			Multi-press for Blind/Buried Vias	/	Multi-press Cycle $\leq 3$ times(Needs review for 2 cycles pressing)
9			Max finished Size (Double Sides)	inch	23*35(Needs Review If length exceeds 30 Inch)
10			Finished Board Thickness	mm	0.20-7.0( $\leq 0.2$ mm Needs Review), $\leq 0.4$ mm for HASL
11			Finished Board Thickness Tolerance( $\leq 1.0$ mm)	mm	$\pm 0.1$
12			Finished Board Thickness Tolerance( $>1.0$ mm)	mm	Material Thickness $\pm 10\%$
13			Unspecified Finished Board Thickness Tolerance (No stack up requirements)	mm	Multilayer: $\leq 2.0$ mm can $\pm 0.1$ ; 2.0-3.0mm can $\pm 0.15$ ; $\geq 3.0$ mm can $\pm 0.2$ ; Double Sides $\pm 10\%$
14			Reliable Test	Peel Strength	N/cm
15		Flammability			94V-0
16		Ionic Contamination		ug/cm <sup>2</sup>	$\leq 1$
17		Min Dielectric Thickness		mm	0.075(only for HOZ Base Copper) / 1OZ if copper ground area $>80\%$
18		Impedance Tolerance		%	$\pm 5\Omega (<50\Omega)$ , $\pm 10\% (\geq 50\Omega)$ ; $\geq 50\Omega \pm 5\%$ (Needs Review)

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24	Innerlayer & Outerlayer Image Transfer	Machine	Scrubbing Machine		0.11-3.2mm, min 9*9inch
25		Innerlayer Process Capability	Laminator, Exposer		0.11-6.0mm, min 8*8in, max 24*24in
27			Etching Line		0.11-6.0mm, min 7*7inch
28			Min Inner Line Width(18um copper foil, Before Compensation)	mil	4 (3.5mil needs review)
29			Min Inner Line Spacing(18um base copper, after compensation)	mil	3
30			Min Inner Line Width(35um copper foil, Before Compensation)	mil	2.5
31			Min Inner Line Spacing(35um base copper, after compensation)	mil	3.5
32			Min Inner Line Width(70um copper foil, Before Compensation)	mil	5



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33	Innerlayer Process Capability	Min Inner Line Spacing(70um base copper,after compensation)	mil	4
34		Min Inner Line Width(105um copper foil,Before Compensation)	mil	6
35		Min Inner Line Spacing(105um base copper,after compensation)	mil	5
36		Min Inner Line Width(140um copper foil,Before Compensation)	mil	7
37		Min Inner Line Spacing(140um base copper,after compensation)	mil	7
38		Min Spacing from hole edge to conductive	mil	≤6L 8mil (Partial 7mil) 、 ≤18L 10mil (Partial 9mil)、 ≥20L 12mil(Partial 11mil)

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39	Innerlayer & Outerlayer Image Transfer	Innerlayer Process Capability	Min Innerlayer Annular Ring	mil	3(18,35um,Partial3.5),4(70um),6(105um)
40			Min Innerlayer Isolation Clearance	mil	Conductive to Conductive 8mil
41			Min Spacing from board edge to conductive	mil	8 (except for blind vias) 、 10 (Blind Vias)
42			Min Gap width between copper ground		5(35um base copper) ≥2pcs ( ≥70um needs review)
43			Different copper thickness for inner core		18/35,35/70(needs review)
44			Max Finished Copper Thickness		6OZ
45		Outerlayer Process Capability	Min Outer Line Width(12/18um base copper, before compensation)	mil	3
46			Min Outer Line Spacing(12/18um base copper, after compensation)	mil	2.5
47			Min Outer Line Width(35um base copper, before compensation)	mil	4.0
48			Min Outer Line Spacing(35um base copper, after compensation)	mil	3.5
49			Min Outer Line Width(70um base copper, before compensation)	mil	5.0
50			Min Outer Line Spacing(70um base copper, after compensation)	mil	4.0
51			Spacing from Line to pad, pad to pad (After compensation)	mil	3.5(12um), 4.0(18um、 35um),5.5(70um),6.5(105、 140um)



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52	Outerlayer Process Capability	Min Outer Line Width(105um base copper, before compensation)	mil	7.0
53		Min Outer Line Spacing(105um base copper, after compensation)	mil	5.0
54		Min Outer Line Width(140um base copper, before compensation)	mil	8.0
55		Min Outer Line Spacing(140um base copper, after compensation)	mil	6.0
56		Min Grid Line Width	mil	5 (12、18、35 um) , 10 (70 um)
57		Min Grid Spacing	mil	5 (12、18、35 um) , 8 (70 um)
58		Min Hole Pad Diameter	mil	12(0.10mm mechanical or Laser Drill)

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59	Innerlayer & Outerlayer Image Transfer	Process Capability	Max size for slot tenting		5mm*4.0mm; the tent land should >10mil
60			Max diameter for tenting hole	mm	4.5
61			Min tent land width	mil	8
62			Min annular ring (after compensation, except for blind vias)	mil	4(12、18um) Partial 3.5、4.5(35um)、 6(70um)、8(105um)、10 (140um)
63			Min BGA diameter	mil	10(Flash gold 8mil)
64	AOI	Machine Capability	Orbotech SK-75 AOI	/	0.05-6.0mm,max 23.5*23.5inch
			Orbotech Vex Machine	/	0.05-6.0mm,max 23.5*23.5inch
66	Drilling	Machine Capability	MT-CNC2600 Drill machine	can process 2nd drill	0.11-6.0mm, max 18.5*26inch $\phi$ 0.20MM钻头
67			Process Capability	Min Multi-hit drill bit size	mm
68		Max aspect ratio for board thickness vs drill bit size	/	12:1(except for $\leq$ 0.2mm drill bit,exceed 10:1 needs review)	
69		Hole location tolerance (Compare with CAD data)	mil	$\pm$ 2	
70		Counterbore hole		PTH & NPTH, Top angle 130 Degree, Top diameter <6.3mm	



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71	Drilling	Process Capability	Min spacing from hole edge to conductive(Except for blind vias)	mil	6( $\leq 8$ L),8( $\leq 14$ L),12( $\leq 26$ L)
72			Max drill bit size	mm	6.5
73			Max board thickness for 0.20mm drill bit size	mm	2.5
74			Min multi-hit slot width	mm	0.45
75			Hole size tolerance for press fit	mil	$\pm 2$
76			Min PTH Slot dimension tolerance	mm	$\pm 0.15$
77			Min NPTH slot dimension tolerance	mm	$\pm 2$ (min +0, -0.05 or +0.05, -0)

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78	Drilling	Process Capability	Min spacing from hole edge to conductive(Blind vias)	mil	9(1 cycle pressing) 10(2 cycles pressing) 12(3 cycles pressing)
79			Max board thickness for 0.15mm mechanical drill	mm	1.20( $\leq 8$ L) needs review
81			Min hole size for laser drill	mm	0.10(Depth $\leq 55\mu\text{m}$ ),0.13(Depth $\leq 80\mu\text{m}$ ), 0.15(Depth $\leq 100\mu\text{m}$ )
82			Countersink hole angle & Diameter		Top 82, 90, 120 degree, diameter $\leq 10\text{mm}$ needs review
83	Wet Process	Machine Capability	Panel & Pattern plating line		0.20-7.0mm,max 24*30inch
84			Deburring Maching		0.20-7.0mm,min 8*8inch
85			Desmear Line	Can process 2nd desmea	0.20-7.0mm,max 24*32in
86			Tin Plating Line		0.20-3.2mm,max 24*30inch
87	Process Capability	Min hole wall copper thickness	um	average 25,min $\geq 20$	
88		Finished copper thickness(18um base copper)	um	$\geq 35$ (nominal thickness 52um、 or 1.5Oz)	
89		Finished copper thickness(35um base copper)	um	$\geq 55$ (nominal thickness 65um)	
90		Finished copper thickness(70um base copper)	um	$\geq 90$	



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91			Min Line width for etching marking	mil	6(12、18um), 8(35um), 10(70um)
92			Max finished copper thickness for inner & Outer layers	/	6OZ
93			Different copper thickness	/	18/35、35/70(needs review)
94	Solder Mask	Machine Capability	Scrubbing Machine	/	0.50-7.0mm,min: 9*9inch
95			Exposer	/	0.11-7.0mm,max 25*32inch
96			Developing Machine	/	0.11-7.0mm,min 4*5inch
97		Color	Solder Mask Color	/	Green, yellow, black, blue, red, white, matte green

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98	Solder Mask	Color	Component Mark Color	/	White、Yellow、Black、Blue、Red、White、Matte Green
99		Solder Mask Capability	Min Solder Mask Opening (Clearance) (After Compensation)	mil	2(Partial 1.5 for Flash Gold,others can partia 1)Only for18um & 35um
100			Max plugged vias size	mm	0.65mm for drill bit size
101			Min width for line coverage by S/M	mil	2mil per side,Only applies to 18um and 35um base copper
102			Min solder mask legends width	mil	6
103			Min solder mask thickness	um	10
104			Solder mask thickness for via tenting	um	10
105			Min Spacing from carbon pattern to pads	mil	10mil、70um base copper $\geq$ 12mil
106			Min width for peelable mask cover line/pads	mil	6
107			Min solder mask bridge width	mil	Base copper $\leq$ 1OZ, Black,white & matte ink are 6mils, other inks are 4mils. Base coper 2-4OZ, min bridge width is 6mils.
108			Solder Mask Hardness	H	6
109					Min spacing from peelable mask pattern to pads



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110	Solder Mask	Peelable Mask Capability	Max diameter for peelable mask tent hole (By screen printing)	mm	2
111			Max diameter for peelable mask tent hole (By Aluminum printing)	mm	4.5
112			Peelable mask thickness	mm	0.2-0.5
113		Component Mark Capability	Min Component mark line width and height(12、 18um base copper)	/	Line width 4.5mil; Height: 23mil
114			Min Component mark line width and height(35um Base copper)	/	Line width 5mil; Height: 27mil
115			Min Component mark line width and height( $\geq 70$ um Base copper)	/	Line width 6mil, Height:45mil (State double printing on Lot Card)
116			Min Spacing from legends to pads	mil	7

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128	E-Test	Machine Capability	Flying Probe Tester		0.4-6.0mm,max 19.6*23.5inch
129			Min Spacing From Test Pad to Board Edge	mm	0.5
130			Min Conductive Resistance	$\Omega$	10
131			Max Insulation Resistance	M $\Omega$	100
132			Max Test Voltage	V	500
133			Min Test Pad Diameter	mil	3.9
134			Min Test Pad to Pad Spacing	mil	3.9
135			Max Test Current	mA	200




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136	Profiling	Machine Capability	Profiling Type	/	NC Routing; V-CUT; Slot Tabs; Stamp Hole
137			NC Routing Machine	Can process 2nd Routing	0.05-7.0mm,max 25.5*21.5inch
138			V-CUT Machine	<0.8mm for one side only	0.6-3.0mm, Max board width for v-cut:18inch
139			Min Routing Bit Diameter	mm	0.6
140			Outline Tolerance(Line to Line)	mil	±4(Complicated outline、slot need review)
141			V-CUT Angle Type		20°, 30°, 45°,60°
142		Process Capability	V-CUT Angle Tolerance	o	±5°
143			V-CUT Registration Tolerance	mil	±4
144			V-CUT Web Thickness Tolerance	mil	±4
145			Min Gold Finger Spacing ( After Compensation )	mil	6
146			Min Spacing to avoid gold finger tab bevelled	mm	7(For Auto-Bevelling)
147			Bevelling Angle Tolerance	/	±5°
148			Bevelling Remain Thickness Tolerance	mil	±5
149			Min Inner Radius	mm	0.4
150			Min Spacing from Conductive to Outline	mil	8
151		Countersink or Counterbore Depth Tolerance	mm	±0.10	

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