No	Items		Capabilities (for sample)	Capabilities (for small and medium volume)
1	Material	HDI PCB material	LDPP(IT-180A 1037 & 1086). Normal PP 106 & 1080	LDPP(IT-180A 1037 & 1086). Normal PP 106 & 1080
2		Normal FR4	Shengyi S1141 (not recommend it to lead free assembly processes)	Shengyi S1141 (not recommend it to No-Pb assembly processes)
3		Normal Tg FR4 (Halogen free)	Shengyi S1155	Shengyi S1155
4		High Tg FR4 (Halogen free)	Shengyi S1165	Shengyi S1165
5		High CTI	Shengyi S1600	Shengyi S1600
6		High Tg FR4	FR408, FR408HR, IS410, FR406, GETEK, PCL-370HR; IT-180A, IT-150DA; N4000-13, N4000-13EP, N4000-13SI, N4000-13EP SI; Megtron 4, Megtron 6 (Panasonic); EM-827 (Elite); GA-170 (Grace Electron); NP-180 (Nanya); TU-752; TU-662 (Taiwan Union); MCL-BE-67G(H); MCL-E-679(W); MCL-E-679F(J)(Hitachi); VT-47 (Ventec)	IT180A, GETEK, PCL-370HR, N4000-13, N4000-13EP, N4000-13SI, N4000-13EP SI
7		Ceramic Particle Filled Laminates	Rogers 4350, Rogers 4003, 25FR, 25N	Rogers 4350, Rogers 4003, 25FR, 25N
8		PTFE Laminates	Rogers series, Taconic series, Arlon series, Nelco series, Taizhou Wangling F4BK series, TP series	Taconic (TLX, TLF, TLY, RF, TLC, TLG series); Arlon (Diclad, AD series)
9		PTFE Bonding film	RO3001 (1.5mil), HT1.5 (1.5mil), Cuclad6700 (1.5mil)	/
10		PTFE PP	Taconic TP series, TPG series (TPG-30, 32, 35 (4.5mil, 5.0mil)), TPN series, Fastrise series	/
11		Hybrid laminating	Rogers/Taconic/Arlon/Nelco laminate with FR-4 material (including partial Ro4350B hybrid laminating with FR-4)	Rogers/Taconic/Arlon/Nelco laminate with FR-4 material (including partial Ro4350B hybrid laminating with FR-4)
12	PCB type	Rigid PCB	Backplane, HDI, High multi-layer blind & buried PCB. Embedded capacitance. Embedded resistance board. Heavy copper power PCB. Backdrill. Semiconductor Test products	Backplane. HDI. High multi-layer blind & buried PCB. Backdrill
13	Buildings	Blind & buried via type	Mechanical blind & buried vias with less than 3 times laminating	Mechanical blind & buried vias with less than 2 times laminating
14		HDI PCB	1+n+1, 1+1+n+1+1, 2+n+2,3+n+3, 4+n+4 (n buried vias ≤ 0.3mm), Laser blind via can be filling plating	1+n+1, 1+1+n+1+1, 2+n+2, (n buried vias ≤ 0.3mm), Laser blind via can be filling plating

No	Items		Capabilities (for sample)	Capabilities (for small and medium volume)
15	Finish treatment	Lead free	HASL Lead free, ENIG, Immersion Tin, Immersion silver, OSP, Hard gold, Soft gold, ENIG+OSP, ENIG+Gold finger, Hard gold+Gold finger, Immersion silver+Gold finger, Immersion Tin+Gold finger, ENEPIG	HASL Lead free, ENIG, Immersion Tin, Immersion silver, OSP, Hard gold, Soft gold, ENIG+OSP, ENIG+Gold finger, Hard gold+Gold finger, Immersion silver+Gold finger, Immersion Tin+Gold finger, ENEPIG
16		Leaded	Leaded HASL	Leaded HASL
17	Plating/coating thickness	Tin thickness	80 – 1600 u" (16 u" on large tin area of Leaded HASL, 6 u" on large tin area of HASL lead free)	80 – 1600 u" (16 u" on large tin area of Leaded HASL, 6 u" on large tin area of HASL lead free)
18		Flash gold (electroplated gold)	Ni: ≥ 120 u"; Au: 1-4 u"	Ni: ≥ 120 u"; Au: 1-4 u"
19		ENIG	Ni: 120-315 u"; Au: 2-4 u"	Ni: 120-315 u"; Au: 2-4 u"
20		Immersion Tin	≥ 40 u"	≥ 40 u"
21		Immersion Silver	8-16 u"	8-16 u"
22		OSP	4-12 u"	4-12 u"
23		Hard gold	4-160 u"	4-80 u"
24		Soft gold	4-160 u"	4-160 u"
25		ENEPIG	Ni: 120-315 u", Pd: 2-6 u", Au: 2-4 u"	Ni: 120-315 u", Pd: 2-6 u", Au: 2-4 u"
26		Carbon	4-14mil	4-14mil
27		Soldermask	0.4-0.7mil (on copper area), 0.2-0.31mil (on via pad), ≥ 0.2mil (on circuits around the corner, just for one-time print and copper thickness < 48um)	0.4-0.7mil (on copper area), 0.2-0.31mil (on via pad), ≥ 0.2mil (on circuits around the corner, just for one-time print and copper thickness < 48um)
28		Peelable solder mask	8-31.5mil	8-31.5mil
29	Hole	Finished mechanical hole size	4-244mil (corresponding drilling tool size 6-248mil	5-244mil (corresponding drilling tool size 8-248mil
30			A, Min finished hole size for PTFE material and hybrid PCB is 10mil (corresponding drilling tool size 14mil)	A, Min finished hole size for PTFE material and hybrid PCB is 12mil (corresponding drilling tool size 16mil)
31			B, Max finished hole size for blind & buried via is 12mil (corresponding drilling tool size 16mil)	B, Max finished hole size for blind & buried via is 12mil (corresponding drilling tool size 16mil)
32			C, Max finished hole size for via-in-pad plugged with solder mask is 18mil (corresponding drilling tool size 21.65mil)	C, Max finished hole size for via-in-pad plugged with solder mask is 12mil (corresponding drilling tool size 16mil)
33			D, Min connecting hole size is 14mil (corresponding drilling tool size is 18mil)	D, Min connecting hole size is 14mil (corresponding drilling tool size is 18mil)
34			E, Min half-hole (pth) size is 12mil (corresponding drilling tool size is 16mil	E, Min half-hole (pth) size is 12mil (corresponding drilling tool size is 16mil
35		Laser blind vias size for filling plating	4-6mil (priority 4mil)	4-6mil (priority 4mil)

No	Items		Capabilities (for sample)	Capabilities (for small and medium volume)
36		Max aspect ratio for laser via filling plating	1:1 (depth included copper thickness)	1:1 (depth included copper thickness)
37		Min width/space in laser via filling plating layers	3/4mil (line to line); 3/3mil (line to pad, pad to pad)	3/4mil (line to line); 3/3mil (line to pad, pad to pad)
38		Laminate times for laser via filling plating pcb	≤ 4 times	≤ 3 times
39		Max aspect ratio for mechanical through-hole	8:1 (only for 4mil drill size, it means the PCB thickness ≤ 31.5mil)	/
40			10:6:1 (only for 6mil drill size, it means the PCB thickness ≤ 63mil)	/
41			12.5:1 (only for 6mil drill size, it means the PCB thickness ≤ 98.4mil)	/
42			12.5:1 (only for 8mil drill size); 20:1 (> 8mil drilling size)	8:1 (only for 8mil drill size); 10:1 (> 8mil drilling size)
43	Hole	Hole location tolerance	± 3mil	± 3mil
44		PTH tolerance	± 3mil	± 3mil
45		Pressfit holes tolerance	± 2mil	± 2mil
46		NPTH tolerance	± 2mil (limited +0/-2mil or +2/-0mil)	± 2mil (limited +0/-2mil or +2/-0mil)
47		Finish hole size for via filled with resin	4-35.4mil (corresponding drilling tool size 6-39.4mil and PCB thickness must be ≥ 20mil when drilling tool size > 20mil)	11.8-21.65mil (corresponding drilling tool size 15.75-25.6mil and PCB thickness must be between 40mil and 80mil)
48		Max aspect ratio for via filled with resin board	12:1	6:1
49		Mid width/space for via filled with resin board	3/4mil (line to line); 3/3.5mil (line to pad, pad to pad)	3/4mil (line to line); 3/3.5mil (line to pad, pad to pad)
50		Min laser drilling size	4mil (aspect ratio ≤ 1:1	4mil (aspect ratio ≤ 1:1
51		Max aspect ratio for mechanical depth-control drilling board (blind hole drilling depth/blind hole size)	1.3:1 (drilling tool size ≤ 8mil, 1.15:1 (drilling tool size ≥ 10mil)	1.3:1 (drilling tool size ≤ 8mil, 1.15:1 (drilling tool size ≥ 10mil)
52		Min depth of mechanical depth-control (backdrill)	8mil	8mil
53		Drill hole size for backdrill	20-248mil	20-248mil
54		Insulation thickness between backdrill layers (backdrill target layer & next layer)	≥ 8mil	≥ 8mil
55		Depth tolerance to backdrill	± 4mil	± 4mil
56		Countersink size and angle	PTH and NPTH, special tools: 82º, 90º,120º,135º (countersink drilling size 12-393.7mil)	PTH and NPTH, special tools: 82º, 90º,120º,135º (countersink drilling size 12-393.7mil)

No	Items		Capabilities (for sample)	Capabilities (for small and medium volume)
57			PTH and NPTH, standard angle 130º (drilling size ≤ 125mil), 165º (drilling size 125-248mil)	PTH and NPTH, standard angle 130º (drilling size ≤ 125mil), 165º (drilling size 125-248mil)
58		Countersink angle tolerance	± 10º	± 10º
59		Countersink hole size tolerance	± 6mil	± 6mil
60	Hole	Countersink depth tolerance	± 6mil	± 6mil
61		Irregular slot tolerance (routing holes)	± 4mil	± 5mil
62		Depth tolerance of depth-control groove milling	± 4mil	± 4mil
63		Min tolerance for drilling slot	NPTH Slot: length/width ≥ 2, width and length tolerance is ± 2mil; length/width < 2, width and length tolerance is ± 3mil	NPTH Slot: length/width ≥ 2, width and length tolerance is ± 2mil; length/width < 2, width and length tolerance is ± 3mil
64			PTH Slot: length/width ≥ 2, width and length tolerance is ± 3mil; length/width < 2, width and length tolerance is ± 4mil	PTH Slot: length/width ≥ 2, width and length tolerance is ± 3mil; length/width < 2, width and length tolerance is ± 4mil
65		Min tolerance for routing slot	NPTH: width/length ± 4mil; PTH: width/length ± 5mil	NPTH: width/length ± 4mil; PTH: width/length ± 5mil
66	Pad (ring)	Min pad size for laser drillings	10mil (for 4mil laser via), 11mil (for 5mil laser via)	10mil (for 4mil laser via), 11mil (for 5mil laser via)
67		Min pad size for mechanical drillings	16mil (8mil drillings)	16mil (8mil drillings)
68		Min BGA pad size	HASL: 10mil, LF HASL: 12mil, other surface techniques are 7mil	LF HASL: 12mil, other surface techniques are 10mil (7mil is ok for flash gold)
69		Pad size tolerance	+5%-10%	± 1.5mil (pad sizes ≤ 10mil); ± 10% (pad size > 10mil
70	Width/space	Internal layer	1/3 oz, ½ oz: 3/3mil	1/3 oz, ½ oz: 3/3mil
71			1 oz: 3/4mil	1 oz: 3/4mil
72			2 oz: 4/5mil	2 oz: 4/5.5mil
73			3 oz: 5/8mil	3 oz: 5/8mil
74			4 oz: 6.5/11mil	4 oz: 6.5/11mil
75			5 oz: 7/13.5mil	5 oz: 7/14mil
76			6 oz: 8/15.5mil	6 oz: 8/16mil
77	Width/space	Internal layer	7 oz: 9/18 mil	7 oz: 9/19 mil
78			8 oz: 10/21mil	8 oz: 10/22mil
79			9 oz: 11/24mil	9 oz: 11/25mil
80			10 oz: 12/27mil	10 oz: 12/28mil
81		External layer	1/3 oz: 3/3mil	1/3 oz: 3.5/4mil
82			½ oz: 3.5/3.5mil	½ oz: 3.9/4.5mil
83			1 oz: 4.5/5mil	1 oz: 4.8/5.5mil

No	Items		Capabilities (for sample)	Capabilities (for small and medium volume)
84			2 oz: 6/7mil	2 oz: 6/8mil
85			3 oz: 7/10mil	3 oz: 7/12mil
86			4 oz: 8/13mil	4 oz: 8/16mil
87			5 oz: 9/15.5mil	5 oz : 9/18mil
88			6 oz: 10/18.5mil	6 oz: 10/21mil
89			7 oz: 11/22mil	7 oz: 11/25mil
90			8 oz: 12/26mil	8 oz: 12/29mil
91			9 oz: 13/30mil	9 oz: 13/33mil
92			10 oz 14/35mil	10 oz: 14/38mil
93		Width tolerance	≤ 10mil: ± 1.0mil	≤ 10mil: ± 20%
94			> 10mil: ± 1.5mil	> 10mil: ± 20%
95	Space	Min gap between hole wall conductor (blind and buried via PCB)	7mil (1 times laminating), 8mil (2 times laminating), 9mil (3 times laminating)	8mil (1 times laminating), 9mil (2 or 3 times laminating)
96		Min gap between hole wall and conductor (none blind and buried via PCB)	5.5mil (≤ 8L), 6.5mil (10-14L), 7mil (> 14L)	7mil (≤ 8L), 8mil (> 8L)
97		Min space between laser holes and conductor	5mil	5mil
98	Space	Min gap between outline and out layer pattern for no copper exposure after routing	8mil	8mil
99		Min space of the V-CUT does not reveal the copper (central line of v-cut to internal/external circuits, H means board thickness)	H ≤ 40mil: 12mil (20° mean V-CUT angle), 13mil (30°), 14.6mil (45°)	H ≤ 40mil: 12mil (20° mean V-CUT angle), 13mil (30°), 14.6mil (45°)
100			40 < H ≤ 63mil: 14.2mil (20°), 16mil (30°), 20mil (45°)	40 < H ≤ 63mil: 14.2mil (20°), 16mil (30°), 20mil (45°)
101			63 < H ≤ 94.5mil: 16.5mil (20°), 20mil (30°), 25.2mil (45°)	63 < H ≤ 94.5mil: 16.5mil (20°), 20mil (30°), 25.2mil (45°)
102			94.5 < H ≤ 118.1mil: 18.5mil (20°), 23.2mil (30°), 30.3mil (45°)	94.5 < H ≤ 118.1mil: 18.5mil (20°), 23.2mil (30°), 30.3mil (45°)
103		Mid width of internal isolated strip	8mil	8mil
104		Min gap between outline and inner layer pattern for no copper exposure after routing	10mil	10mil
105		Min space of gold finger chamfering non-interference tab	236mil	275.6mil
106		Min space between hole walls in same net	6mil (thru-hole & laser hole PCB), 10mil (mechanical blind & buried PCB)	6mil (thru-hole & laser hole PCB), 10mil (mechanical blind & buried PCB)
107		Min pad space for ENIG finished	3.5mil (base copper) 1/3 oz, 0.5 oz	4mil (base copper) 1/3 oz, 0.5 oz

No	Items		Capabilities (for sample)	Capabilities (for small and medium volume)
108		Min space between gold fingers	Dry film pattern plating 7mil; lead process 5mil	Dry film pattern plating 7mil, lead process 5mil
109		Min gap between pads for HASL (no soldermask)	7mil (pad space 10mil in big copper area)	7mil (pad space 10mil in big copper area)
110		Min gap between peelable soldermask and pad	14mil	16mil
111		Min gap between legend and pad	6mil (traditional silkscreen technology), 4mil (silkscreen print technical)	6mil (traditional silkscreen technology)
112		Min gap between carbon pads	13mil	15mil
113	Space	Min gap between carbon and pads	8mil	10mil
114	Metal-substrate PCB	Layer counts	1-8L (Al-substrate, Cu-substrate); 2-24L (Heatsink, Sweat bonding, Buried metal)	1-8L (Al-substrate, Cu-substrate); 2-24L (Heatsink, Sweat bonding, Buried metal)
115		PCB size (finished)	Max: 24” x 24”, min: 0.2” x 0.2” (Al-substrate, Cu-substrate, Heatsink, Sweat bonding, Buried metal	Max: 24” x 24”, min: 0.2” x 0.2” (Al-substrate, Cu-substrate, Heatsink, Sweat bonding, Buried metal
116		PCB thickness (finished)	0.02”-0.2”	0.02”-0.2”
117		Copper thickness (finished)	0.5-10 oz	0.5-10 oz
118		Metal thickness	0.02”-0.2”	0.02”-0.2”
119		Metal material type	AL: 1100/1050/2124/5052/6061; Cu: c11000; Iron	AL: 1100/1050/2124/5052/6061; Cu: c11000; Iron
120		Min finished hole size & tolerance	NPTH: 20±2mil; PTH: 40±4mil (for Al-substrate, Cu-substrate), 8±4mil (for Heatsink, Sweat bonding, Buried metal	NPTH: 20±2mil; PTH: 40±4mil (for Al-substrate, Cu-substrate), 8±4mil (for Heatsink, Sweat bonding, Buried metal
121		Dimension tolerance	±1.2mil (CNC); ±4mil (punch)	±2mil (CNC); ±4mil (punch)
122		PCB partial surface treatment	Leaded HASL/Lead free HASL; OSP; ENIG; ENEPIG; Plating (Ni) soft/hard gold; Plating SN	Leaded HASL/Lead free HASL; OSP; ENIG; ENEPIG; Plating (Ni) soft/hard gold; Plating SN
123		Metal partial surface treatment	Cu: Plating Ni & Au; AI: Anodic oxidation, Hard anodic oxidation coating, Chemical passivation; Physical treatment: Sandblasting, Wire drawing	Cu: Plating Ni & Au; AI: Anodic oxidation, Hard anodic oxidation coating, Chemical passivation; Physical treatment: Sandblasting, Wire drawing
124		Material	Metal PCB: Totking (T-110, T-111), Ventec (VT-4A1, VT-4A2, VT-4A3), Laird (1KA04, 1KA06); Bergquis (MP06503, HT04503), TACONIC (TLY-5, TLY-5F)	Metal PCB: Totking (T-110, T-111), Ventec (VT-4A1, VT-4A2, VT-4A3), Laird (1KA04, 1KA06); Bergquis (MP06503, HT04503), TACONIC (TLY-5, TLY-5F)
125		Thermal conductivity	0.3-3w/m.k (Heatsink, AI-substrate, Cu-substrate); 8, 33w/m.k (Sweat bonding); 0.35-3w/m.k (Buried metal)	0.3-3w/m.k (Heatsink, AI-substrate, Cu-substrate); 8, 33w/m.k (Sweat bonding); 0.35-3w/m.k (Buried metal)
126		Thermal glue thickness (dielectric layer)	3-6mil	3-6mil
127		Buried copper block size	0.118” x 0.118” – 2.756” x 3.15”	0.118” x 0.118” – 2.756” x 3.15”
128	Metal-substrate PCB	Buried copper block drop tolerance	± 1.6mil	± 1.6mil
129		Min gap between buried copper block and hole wall	12mil	12mil

No	Items		Capabilities (for sample)	Capabilities (for small and medium volume)
130	Ceramic-substrate PCB	Layer counts	1-2L	1-2L
131		PCB size (finished)	Max: 4" x 4", min: 0.2" x 0.2"	Max: 4" x 4", min: 0.2" x 0.2"
132		Surface treatment	OSP; ENIG; Immersion Silver	OSP; ENIG; Immersion Silver
133		Dielectric thickness	10mil; 15mil; 25mil	10mil; 15mil; 25mil
134		Copper thickness (finished)	2.4mil; 5.9mil; 11.8mil	2.4mil; 5.9mil; 11.8mil
135		Material	Ceramic DBC material (ALN & AI2O3)	Ceramic DBC material (ALN & AI2O3)
136		Thermal conductivity	24-180 w/m.k	24-180 w/m.k
137	Others	Min thickness to internal layer	0.05 (thru-holes PCB), 0.13 (with blind & buried holes)	0.075 (thru-holes PCB), 0.13 (with blind & buried holes)
138		Layer count	1-40L	1-32L
139		PCB thickness	8-275.6mil	16-236.22mil
140		Min finished PCB size	0.4" x 0.4"	0.4" x 0.4"
141		Max finished PCB size	23 x 35 inch (≤ 2L); 22.5 x 30 inch (≥ 3L)	23 x 33 inch (≤ 2L); 22.5 x 30 inch (≥ 3L)
142		Registration	≤ 5mil	≤ 6mil
143		PCB thickness tolerance	Thickness ≤ 40mil; ± 4mil	Thickness ≤ 40mil; ± 4mil
144			Thickness > 40mil; ± 10%	Thickness > 40mil; ± 10%
145			Special tolerance (Unspecified requirement on between layers): ± 4mil (for ≤ 78.74mil thickness); ± 6mil (for 82.7-118.1mil thickness); ± 10mil (for 122-275.6mil thickness)	Special tolerance (Unspecified requirement on between layers): ± 5mil (for ≤ 78.74mil thickness); ± 6mil (for 82.7-118.1mil thickness); ± 12mil (for 122-236.22mil thickness)
146	Others	Impedance tolerance	Single-ended: ± 5 ohm (≤ 30 ohm), ± 10% (> 30 ohm) (Advanced: ± 5% (≥ 50 ohm)) Differential pair: ± 5 ohm (≤ 50 ohm), ± 10% (> 50 ohm) (Advanced: ± 5% (≥ 70 ohm))	± 5 ohm (<50 ohm), ± 10% (≥ 50 ohm)
147		Outline size tolerance	± 4mil	± 4mil
148		Outline location tolerance	± 4mil	± 4mil
149		Min bow & twist	0.10%	0.50%
150		Max finished copper thickness to internal & external layer	Internal layer: 10 oz; External layer: 11 oz	Internal layer: 5 oz; External layer: 5 oz
151		Min isolation thickness between layers	2mil (just for base copper 0.5 oz)	2mil (just for base copper 0.5 oz)
152		Min width/height of silkscreen	Width 4mil, Height 23mil (12um, 18um base copper); Width 5mil, Height 30mil (35um base copper); Width 6mil, Height 45mil (70um base copper)	Width 4mil, Height 23mil (12um, 18um base copper); Width 5mil, Height 30mil (35um base copper); Width 6mil, Height 45mil (70um base copper)
153		Min internal radius	12mil	12mil
154		V-CUT angle tolerance	± 5°	± 5°

No	Items		Capabilities (for sample)	Capabilities (for small and medium volume)
155		V-CUT symmetrical tolerance	± 4mil	± 4 mil
156		V-CUT web thickness tolerance	± 4mil	± 4mil
157		PCB thickness (X) range of V-CUT	Substrate thickness (excluding the outer layer of copper) 16mil ≤ X ≤ finished thickness 126mil; can only do single-sided V-cut if substrate thickness ≤ 23.62mil	Substrate thickness (excluding the outer layer of copper) 16mil ≤ X ≤ finished thickness 126mil; can only do single-sided V-cut if substrate thickness ≤ 23.62mil
158		Outline	Routing; V-CUT; Bridge; Stamp holes	Routing; V-CUT; Bridge; Stamp holes
159		Min width of soldermask bridge	Base coppers ≤ 1 oz: 4mil (Green); 5mil (other colour), 8mil (on copper area)	Base coppers ≤ 1 oz: 4mil (Green); 5mil (other colour), 8mil (on copper area)
160			Base copper 2 oz-4 oz: 6mil, 8mil (on copper area)	Base copper 2 oz-4 oz: 6mil, 8mil (on copper area)
161	Others	Min width of soldermask cover line (single side)	2.5mil (partial area can be allowed 1.5mil)	2.5mil (partial area can be allowed 1.5mil)
162		Soldermask colour	Green matte/glossy, Yellow, Black, Blue, Red, White, Purple	Green matte/glossy, Yellow, Black, Blue, Red, White, Purple
163		Silkscreen colour	White, Yellow, Black	White, Yellow, Black
164		Gold finger bevelling tolerance	± 5°	± 5°
165		Gold finger bevelling web thickness	± 5mil	± 5 mil
166		Min resistance test	10 ohm	10 ohm
167		Max insulation resistance test	100 M ohm	100 M ohm
168		Max test voltage	500V	500V
169		Max test currency	200mA	200mA
170		Silkscreen print (just for white colour)	Serial number, Barcode, Planar code	Serial number, Barcode, Planar code

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