

Axiom Electronics PCBA Design for Manufacturability Guidelines

Section: 8.0	Revision: A	Revision Date: 2/14/13
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DFM Subject: Printed Circuit Board (PCB) Guidance

8.1 Pb-Free PCB Fabrication

The higher solder temperatures associated with Pb-free reflow soldering (DFM Section 4.0) has a major impact on PCB materials and fabrication. Table 8.1 contains material recommendations for Pb-free PCB's. Unfortunately, these materials are harder and more brittle than standard SnPb materials. Because they are more brittle, Pb-free PCB's are susceptible to a defect called "pad cratering". It may be necessary to increase PCB thickness and/or add mechanical stiffeners to prevent pad cratering from occurring; consult with Manufacturing Engineering. Table 8.2 compares the advantages and disadvantages of each PCB surface finish.

Table 8.1 – Pb-Free PCB Material Requirements

Topic	Range	Recommendation
Glass Transition Temperature or Tg (lower Tg material)	130 – 175°C	Tg >140°C if PCB is ≤8 layers; BGA size is <2.5mm; hole aspect ratio is <6:1
Glass Transition Temperature or Tg (higher Tg material)	130 – 175°C	Tg >165°C if PCB is >8 layers; BGA size is >2.5mm; hole aspect ratio is >6:1
Coefficient of Thermal Expansion or CTE	na	≤3.5% from 50 to 260°C
Material Decomposition Temperature or Td	290 – 370°C	>325°C
Time to Delamination T260 and T288	na	T260 >30 minutes T288 >5 minutes

Table 8.2 – PCB Surface Finish Comparison

Subject	HASL	OSP	ENIG	ImAg	ImSn
Predictable SMT solder joint reliability	P	P	P	P	P
Predictable BGA solder joint reliability	P	P	M	P	P
Solderability shelf life is ≥ 9 months	P	P	P	P	M
Compatible with a variety of soldermasks	P	P	M	P	M
Improves via strength and reliability	M	M	P	M	M
Consistent thickness and flat surface	M	P	P	P	P
Conductive surface (ICT compatibility)	P	M	P	P	P
Solderable over 2 reflow cycles (no-clean)	P	P	P	P	P
Good hole filling after reflow (no-clean)	P	M	P	P	M
Creep corrosion concerns	P	P	M	M	P
P = plus, M = minus	Total: 8 P	7 P	7 P	8 P	6 P

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8.2 – PCB's per Panel and PCB Size, see Table 8.3.

Table 8.3 – PCB's per Panel and PCB Size

	18" x 24" Panel (Preferred)	21" x 24" Panel (Special)
PCB's per Panel	PCB Size (inches)	PCB Size (inches)
1 up	16 x 22	19 x 22
2 up	10.95 x 16	10.95 x 19
2 up	7.95 x 22	9.45 x 22
3 up	7.265 x 16	7.265 x 19
3 up	5.265 x 22	6.265 x 22
4 up	7.95 x 10.95	9.45 x 10.95
4 up	3.925 x 22	4.675 x 22
4 up	5.425 x 16	5.425 x 19
5 up	4.32 x 16	4.32 x 19
5 up	3.12 x 22	3.72 x 22
6 up	5.265 x 10.95	6.265 x 10.95
6 up	7.265 x 7.95	7.95 x 9.45
6 up	2.58 x 22	3.08 x 22
6 up	3.58 x 16	3.58 x 19
7 up	2.2 x 22	2.625 x 22
7 up	3.055 x 16	3.055 x 19
8 up	5.425 x 10.95	5.425 x 9.45
8 up	3.925 x 10.95	4.675 x 10.95
8 up	1.91 x 22	2.285 x 22
8 up	2.66 x 16	2.66 x 19
9 up	5.265 x 7.265	6.265 x 7.265
9 up	1.685 x 22	2.02 x 22
9 up	2.355 x 16	2.355 x 19
10 up	4.32 x 7.95	4.32 x 9.45
10 up	3.12 x 10.95	3.72 x 10.95
10 up	1.51 x 22	1.81 x 22
10 up	2.11 x 16	2.11 x 19
11 up	1.35 x 22	1.635 x 22
11 up	1.91 x 16	1.91 x 19
12 up	5.265 x 5.425	5.425 x 6.265
12 up	3.925 x 7.265	4.675 x 7.265
12 up	3.58 x 7.95	3.58 x 9.45
12 up	2.58 x 10.95	3.08 x 10.95
12 up	1.24 x 22	1.49 x 22
12 up	1.74 x 16	1.74 x 19