

Axiom Electronics PCBA Design for Manufacturability Guidelines

Section: 5.0	Revision: A	Revision Date: 2/14/13
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DFM Subject: Component Guidance, Surface Mounted

5.1 Component Packaging

- Machine presentable packaging is required for automated assembly
- Tape and reel is preferred for all components except fine pitch
- Matrix trays are acceptable for fine pitch and BGA devices
- Tubes are the least desirable format for automated assembly
- Bulk is not an acceptable format for automated assembly
- Reference EIA-481-1, 2, 3 Tape and Reel standards

5.2 Moisture Sensitive Devices

- Moisture sensitive devices require special handling
- Do not select components with a moisture sensitivity level greater than 3, if possible
- Reference J-STD-033 Standard for Handling, Packing, Shipping and Use of Moisture Reflow Sensitive Surface Mount Devices

5.3 Capacitors

All SMT capacitors must conform to the national standard of nomenclature. This standard allows each device to be verified for its value. To view the standard listings see Table 5.2. All devices, except for tantalums, are covered under this standard. All tantalums must have the voltage rating and farad value printed on the primary side of the device.

5.4 Resistors

All SMT resistors must conform to the national standard of nomenclature. This standard allows each device to be verified for its value. To view the standard listings see Table 5.3.

5.5 Connectors

All SMT connectors should be purchased in machine presentable packaging. This would be either tape and reel or tray loading. Each device must have a minimum pickup area of 0.1" x 0.1". This area needs to be in the center of the device's weight distribution. Machine placed connectors should not have guideposts. Hand placed connectors should have guideposts. All alignment must be done with zero insertion force guideposts.

SMT connectors over 1.5 inches long should be located on the PCB parallel to the direction of travel as it goes through the reflow oven. When design requirements make this impossible, then a support fixture may be required for reflow. This will require a keep out zone on the opposite side of the PCB under the center of the component leads. This area must be large enough to allow a support feature: a half-inch diameter area is recommended.

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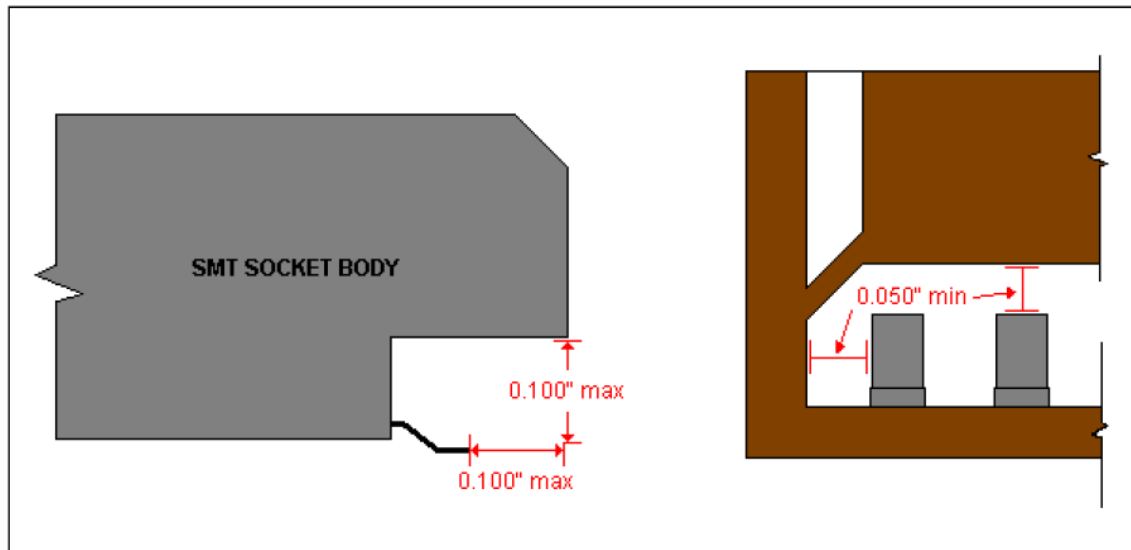
Connectors that require mounting hardware should use snap in tabs instead of threaded fasteners. This saves time during assembly and lowers assembly cost.

When connectors are used for PCB to PCB connection only one connector should be used, except where industry standards require them (e.g. PMC cards). Having multiple connectors on each PCB creates connector alignment issues; this will increase assembly cost and it may cause quality and reliability problems.

5.6 Sockets

SMT sockets are not desirable for assembly, but can be used if deemed necessary. For the addition of SMT sockets on PCB's, the following rules must be applied:

- Each device must have a minimum pickup area of 0.1" x 0.1". This area needs to be in the center of the device's weight distribution.
- The components must be available in machine presentable packaging. This would be either tape and reel or matrix trays.
- The leads must be accessible for rework and inspection.
- The leads cannot be recessed more than 0.100" from the body outline. The exception is if the leads are accessible from inside the socket seat.
- The leads should have as much clearance above them as they are recessed into the body, for example, if the leads are recessed 0.100" there must be 0.100" clearance above them.
- If the leads are in the socket seat there must be 0.050" clearance around the leads.



5.7 Fuses

SMT fuses are preferred over through-hole fuses. These devices can either be in sockets or soldered directly to the PCB. In any scenario that may have the fuse trip (i.e. a drive interface) a socket style fuse should be used. This will allow the unit to be repaired in the field.

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5.8 Integrated Circuit (IC) Packages

These devices come in many package styles and sizes. In order to maintain a high level of quality and predictability during assembly there are certain restrictions on these devices.

- All devices should follow JEP95 Registered and Standard Outline drawings.
- All devices must have a clearly defined pin one marking.
- All devices must display the manufacturer's part number and a lot or date code on the viewable side of the device (viewable after assembly).
- Gold plated leads should be avoided due to solder joint reliability concerns. These devices shall not be wave soldered.

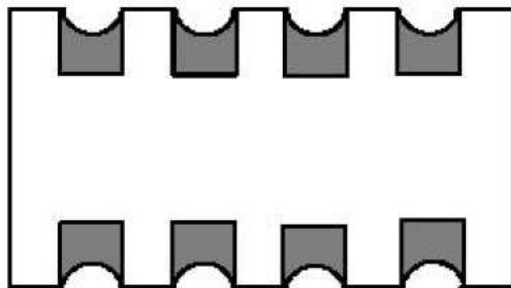
5.9 Transistors and Diodes

These devices come in many package styles and sizes. In order to maintain a high level of quality and predictability during assembly there are certain restrictions on these devices.

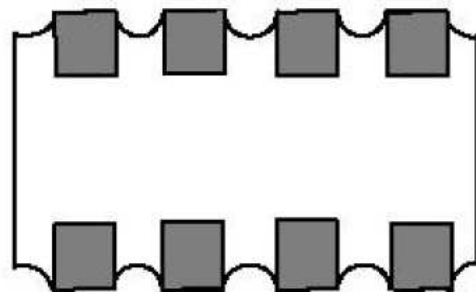
- All devices must have a clearly defined pin one marking.
- All devices must display the manufacturer's part number and a lot or date code on the viewable side of the device (viewable after assembly).
- Gold plated leads should be avoided due to solder joint reliability concerns. These devices shall not be wave soldered.
- Thermal pads should be designed into the PCB when heat dissipation is required.

5.10 Resistor Networks (R-packs)

- Devices with concave (castellated) leads should be avoided due to soldering problems.
- These devices shall not be wave soldered.



Concave Rpack (No)



Convex Rpack (Yes)

5.11 Common surface finish options

- Matte tin (Sn)
- Tin/copper (SnCu)
- Tin/bismuth (SnBi)
- Tin/silver (SnAg)

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- Nickel/palladium (NiPd)
- Nickel/palladium/gold (NiPdAu)

See Table 5.1 for a surface finish comparison.

Table 5.1 – Surface Finish Comparison

	Matte Sn	SnCu	SnBi	SnAg	NiPd	NiPdAu
SnPb & Pb-Free Solder Compatible	X	X		X	X	X
Low Cost with Good Availability	X	X				
Single Alloy Composition	X					
Pb-Free Solder Compatible Only			X			
Multiple Alloy Composition		X	X	X		
May Create Brittle Solder Joints			X			
Tendency to Cause Wetting Problems					X	X

Table 5.2 – SMT Capacitor Values

Letter on Component	First Two Numbers in Value	Number on Component	Multiply by (in pf)
A	1.0	0	1
B	1.1	1	10
C	1.2	2	100
D	1.3	3	1,000
E	1.5	4	10,000
F	1.6	5	100,000
G	1.8	6	1,000,000
H	2.0	7	10,000,000
J	2.2	9	0.1
K	2.4		
L	2.7		
M	3.0		
N	3.3		
P	3.6		
Q	3.9		
R	4.3		
S	4.7		
T	5.1		
U	5.6		
V	6.2		
W	6.8		
X	7.5		
Y	8.2		
Z	9.1		
a	2.5		

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b	3.5		
d	4.0		
e	4.5		
f	5.0		
m	6.0		
n	7.0		
l	8.0		
y	9.0		

Table 5.3 – SMT Resistor Values

1st & 2nd Numbers	3rd Number	1st, 2nd & 3rd Numbers	4th Number
Use as first two numbers in value	Number of zeros to add to end	Use as first three numbers in value	Number of zeros to add to end
	0 = no zeros		0 = no zeros
	1 = 0		1 = 0
	2 = 00		2 = 00
	3 = ,000		3 = ,000
	4 = 0,000		4 = 0,000
	5 = 00,000		5 = 00,000
	6 = 000,000		6 = 000,000
	7 = 0,000,000		7 = 0,000,000
	8 = 00,000,000		8 = 00,000,000
	9 = 000,000,000		9 = 000,000,000