

Axiom Electronics PCBA Design for Manufacturability Guidelines

Section: 6.0	Revision: A	Revision Date: 2/14/13
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DFM Subject: Component Guidance, Through-Hole Mounted

6.1 Through-Hole Component Usage

Through-hole mounted components should only be used when an acceptable surface mount component is not available. For example, through-hole connectors are frequently used because they have more mechanical strength than surface mount connectors.

6.2 Lead Protrusion

Select through-hole components with a lead protrusion between 0.5mm (.020”) and 1.0mm (.040”). If lead protrusion is less than 0.5mm it is impossible to confirm the lead is properly seated in the hole. If lead protrusion is more than 1.0mm there will be an increase in solder bridging during the selective soldering process.

6.3 Resistors and Capacitors

Resistors and capacitors must conform to international standards for component recognition. For resistors, all axial leaded devices must use the standard color band guide. For capacitors, all radial and axial devices must have the voltage rating and farad value printed on the primary (viewable) side of the device.

6.4 Integrated Circuit (IC) Packages

Most, if not all, integrated circuits are available in a surface mounted package. Through-hole integrated circuits should only be used if no surface mount package is available. Through-hole mounted integrated circuits typically come in two package styles: dual-inline-packages (DIP) and pin grid arrays (PGA). 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).

6.5 Sockets

Sockets should not be used unless add-on capability requires their use. For reliability, only use machined barrel style sockets.

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6.6 Two Way Switches

Two Way Switches are generally used for power switching.

- These devices must be UL approved and contain no exposed material that may corrode.
- These devices must be completely assembled by the manufacturer; no additional assembly is required during or after installation.

6.7 Delay Buttons

Delay buttons are used primarily as reset buttons.

- These devices must contain no exposed material that may corrode.
- These devices must be completely assembled by the manufacturer; no additional assembly is required during or after installation.

6.8 Batteries

Only batteries installed in a socket may be used. Batteries shall not be soldered directly to the board for the following reasons:

- The terminals may short during selective soldering.
- If aqueous cleaning is used the bias created by the battery will polarize ions in the wash media creating a conductive path between the leads. This contamination results in higher current drain, leading to a short battery life.
- Field replacement of dead batteries is difficult or impossible.

6.9 LED Devices

LED devices shall meet the following criteria.

- The LED must be sealed and be able to withstand selective soldering and aqueous cleaning.
- The LED must be labeled or keyed to prevent improper installation.
- The LED must be completely assembled by the manufacturer; no additional assembly is required during or after installation.
- The LED should have a pin to prevent tipping during the selective soldering process.

6.10 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).
- Thermal pads should be designed into the PCB when heat dissipation is required.
- If the device is designed to lay flat on the PCB it must use a snap in retention clip.

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6.11 Connectors

Pin and socket connectors should be used instead of gold fingers, except where industry standards require them (e.g. EXM or ISA bus). Pin and socket connectors are preferred because they create a more reliable connection and they are less susceptible to damage during assembly.

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.

6.12 Common surface finish options

- Matte tin (Sn)
- Tin/copper (SnCu)
- Tin/bismuth (SnBi)
- Tin/silver (SnAg)
- Nickel/palladium (NiPd)
- Nickel/palladium/gold (NiPdAu)

See Table 6.1 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