

Axiom Electronics PCBA Design for Manufacturability Guidelines

Section: 4.0

Revision: A

Revision Date: 2/14/13

DFM Subject: Printed Circuit Board Assembly (PCBA) Manufacturing Overview

4.1 Manufacturing Flow

This section briefly explains the various processes used to manufacture PCBAs. The major assembly steps for a PCBA populated on both sides are listed below.

1. Solder paste printing
2. SMT Component placement
3. Reflow soldering
4. Cleaning (if required)
5. Solder paste printing
6. SMT Component placement
7. Reflow soldering
8. Cleaning (if required)
9. Through hole component insertion
10. Selective Soldering
11. Cleaning (if required)
12. Mechanical assembly (faceplates, heatsinks, etc)
13. Inspection
14. Electrical Test

4.2 Solder Paste Printing

Solder paste is a homogenous mixture of solder particles and flux. Solder paste application is accomplished by forcing the solder paste through apertures (openings) in a metal (usually stainless steel) stencil. Each side of the PCBA requires a custom stencil. The stencil is mounted inside an automated solder paste printing machine.

4.3 SMT Component Placement

Components are placed on the PCBA by overhead gantry placement machines. They are held in place after placement by the previously applied solder paste. Component packaging is a critical element of component placement. Components are feed into placement machines by tape and reel feeders, tube feeders or matrix tray handlers. Tape and reel is the preferred packaging method for most components.

4.4 Reflow Soldering

Reflow soldering heats the solder paste and the entire PCBA to a specific temperature, which melts the solder paste alloy and forms the surface mount solder joints. After soldering the oven cools the PCBA. An inline forced convection oven is used for reflow soldering. See Illustration 4.1 for a comparison of SnPb and Pb-free soldering temperatures.

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4.5 Cleaning

Cleaning, if required, is used to remove flux contamination after reflow and selective soldering. Aqueous (water) or solvent cleaning (Kyzen) is used when cleaning is required.

4.6 Through-Hole Insertion

Most through-hole components (connectors, sockets, etc.) are difficult to insert with automated machines so they are inserted into the PCBA by hand.

4.7 Selective Soldering

Selective soldering applies flux and solder to the secondary (bottom) side of a PCBA. This fills all of the plated through holes with solder.

4.8 Mechanical Assembly

Mechanical assembly attaches various pieces of mechanical hardware to the PCBA. This includes press fit connectors, faceplates, heatsinks, disk or CD drives and bottom cover plates. Mechanical assembly is usually labor intensive and time consuming.

4.9 Inspection

PCBAs are visually inspected using the globally accepted IPC-610 workmanship standard. Automated Optical Inspection (AOI) is used to detect manufacturing defects such as solder bridges and missing components.

4.10 Inspection and Test

PCBAs are tested using flying probe or in-circuit (ICT) testers and functional test methods. ICT and flying probe testing primarily detects manufacturing defects such as solder bridges and missing components. Functional test confirms the PCBA is working properly.

Illustration 4.1 – SnPb and Pb-free Reflow Soldering Temperature Comparison

