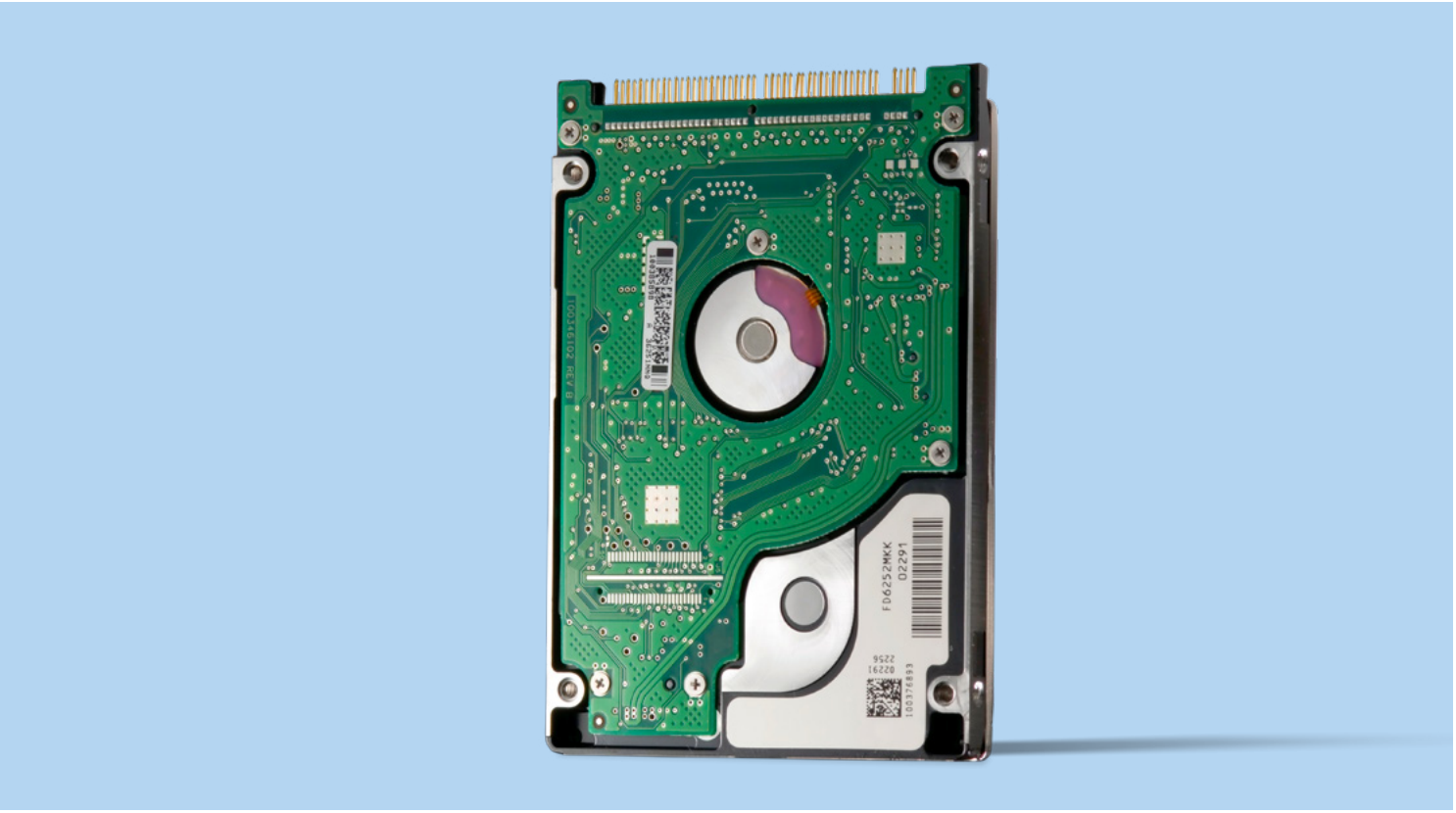
Labels on Printed Circuit Boards

Factsheet

Facts about the PCB manufacturing process



What is a printed circuit board?

The base board is made by laminating together sheets of a non-conductive material (typically fibreglass) and sheets of copper. Holes are then drilled through the board and made conductive. During the assembly process components are applied on top of the board and soldered in place.

Why are labels used?

Electronic equipment manufacturers benefit from automated assembly, processing, test and packaging systems which include automatic identification.
A bar code label is normally attached to a printed circuit board before the assembly process to enable automatic identification and traceability.

What conditions must labels withstand?

Labels must cope with high temperatures during the soldering process and the harsh chemicals used during the cleaning process.

There are two main processes for soldering: wave and reflow.

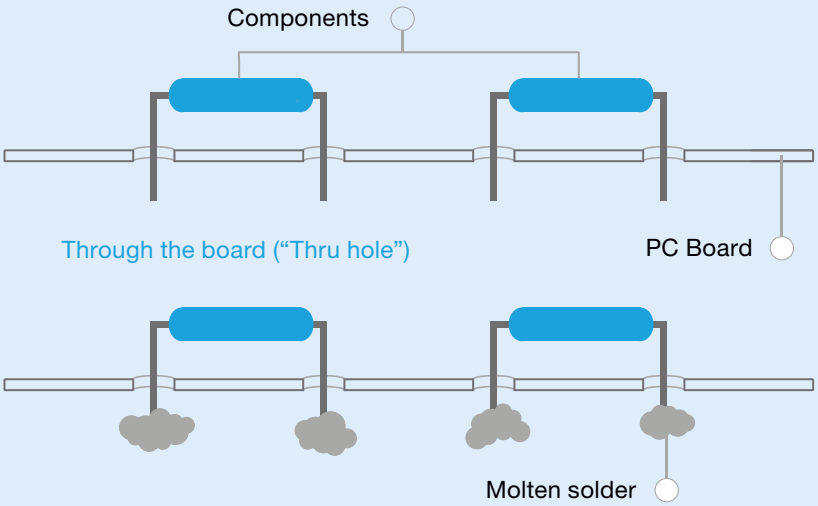
AVERY DENNISON

label.averydennison.com

Wave Solder Process

In the wave solder process components are fixed to the board using the drilled holes, and are fixed in place with molten metal solder. Labels on to the bottom surface of the board in the wave solder process experience temperatures up to 280°C. Labels on to the top surface of the board may experience considerably different temperatures. Depending on the material used, the thickness of the PCB and whether or not they are placed near drilled holes.

[1] Wave solder process - board is exposed to molten metal solder at up to 280°C.

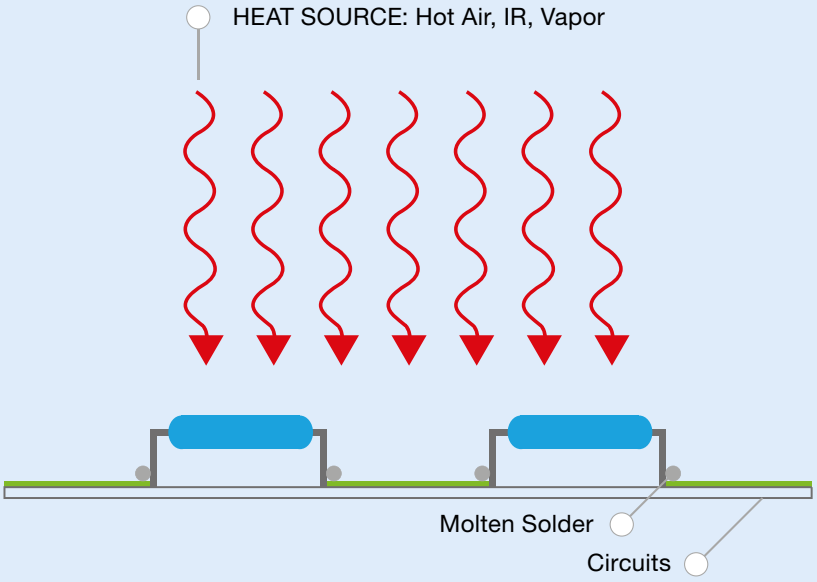


Reflow Process

Components are placed on the PCB with a solder paste. The solder is then melted in a reflow oven. Typically preheating takes 150 to 180 seconds at 150°C, followed by the re-flow for 60 seconds with a peak oven temperature of 220°C.

In the reflow process labels attached to the board may experience temperatures up to 220°C. The top side of the board gets hotter than the bottom side.

[2] Reflow process - board is exposed to temperatures up to 220°C to melt the solder paste in place.



The Cleaning Process

After soldering the boards are washed at elevated temperatures to clean away the remainder of the solder flux and to prepare the board for further coating and bonding processes. The cleaning processes vary greatly and use a combination of water, harsh solvents, pressurised spray and ultrasound to remove the residues. Our printed products have been confirmed as suitable after testing with the cleaning agents of a European market leader.

What products are used for labelling?

Polyimide is an orangey-brown translucent polymer film with a very high heat resistance. Polyimide is normally used at either 1mil (25 µm) or 2mil (50 µm) for labelling material.

In order to improve the contrast of barcodes, a thick heat and chemical resistant topcoat is applied onto the polyimide. The topcoat can be matt or glossy and is usually white. Matt topcoats are often preferred because of their good printability and low reflection during the bar code scanning. The topcoat is very thick and is typically 15-20 µm on top of the base film.

Finally the polyimide is coated with a special high temperature and chemical resistant adhesive.

Polyetherimide and other alternative lower cost polymer products have also been used for PCB labelling work at elevated temperatures, but they are of limited use in new higher temperature processes.

For labels applied after the soldering process, polyester or tamper evident labels are commonly used. Tamper evident labels help to administer warranties by ensuring that the serial number cannot be transferred to another board.

How are the labels printed?

Most labels are printed by thermal transfer. It is essential to choose a chemical and heat resistant ribbon to ensure the print is still readable at the end of the assembly process.

The chemical resistance of the print is improved by exposure to heat during the soldering process before the cleaning stage. Avery Dennison datasheets contain ribbon recommendations and performance results with popular PCB cleaning agents.

How are the labels applied?

Labels are applied onto printed circuits boards either automatically or manually. Care should be taken to select the correct dispenser setting for the thinner polyimide products.

2018_18775EN