

Vitronics Soltec

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Wave soldering SMD's with double wave or smart wave

Introduction

For wave soldering of SMDs Soltec offers two systems which each have their specific benefits and drawbacks. This sheet will summarise the main points to give assistance in making the right choice.

General

To promote the wave soldering of SMDs the boards must contain no gaps, cut outs or adjusting holes, or these holes must be temporary closed. Only in that case the necessary solder wave pressure to promote SMD solder pad wetting can be applied without the risk of solder flooding the board. Normal mounting holes for the conventional wired components are allowed and need not to be covered in case no leads are in these holes.

The SMD solder pads must in general be greater than for conventional reflow soldering to promote solder wetting. Also the distances between SMDs must be greater to prevent solder bridging. For SOICs the use of solder thieves may be necessary to prevent solder bridging, although this might often work oposite for lead-free soldering. (See relevant suppliers documentation)

The height of the SMD components for wave soldering must in general be limited to 4 mm so that the solder wave will be not too much disturbed.

The boards must be kept as flat as possible during the soldering operation to ensure a reproducible soldering process and to prevent solder flooding.

The flux must be suitable to work with a double wave system when a chip wave in combination with a main wave is used.

The 'dynamic' gap between the chipwave and the main wave should be small enough to prevent complete solidification to full joint strength of the joints in-between the two waves. To prevent this complete full strength solidification in-between the waves, the distance between our chipwave and main wave is minimised.

The choice between Double wave versus Smart wave

The first wave soldering system for SMDs was the Double wave system. The first (chip) wave was necessary to promote the wetting on the small SMD pads. The second conventional wave removed the excess solder.

The pro's of this Double wave system are:

- Due to good outgassing properties for the flux vapours the chip wave enables wetting of relative densely packed circuits.
- This means also that boards with actually too small SMD solder pads sometimes can be soldered relatively well.

The con's of the Double wave system are:

- The first wave may wash of too much flux so that it is difficult to solder without solder bridges.
- Due to the deformation of the board on the chip wave, as a result of the thermal load, the board has a risk of solder flooding when it enters the second wave.
- The relative small chip wave orifice may be (partially) contaminated by dross or flux residues which disturbs the wave form. This can give skipped joints and/or solder flooding. To prevent this a regular maintenance and guarding is necessary.

To overcome these drawbacks the Smart wave was developed as a single wave SMD soldering system. But although it solves some drawbacks this solution has also some limitations which are listed in this paper.

The pro's of the Smart wave are:

- The single wave allows for less thermal load.
- Less risk of solder flooding since boards are exposed to only one solder wave.
- Less risk of random nozzle contamination makes cleaning only necessary after production and gives a reproducible wave.
- Very good controllable Front Nozzle Pump activation at a wave height range between 7 - 9 mm.
- The Smart wave is very well applicable for multi-layer boards to promote solder flow, since it generates its activity in the vertical direction.

The con's of the Smart wave are:

- Since the Smart wave is a massive wave, the outgassing properties on the solder side of the board are limited.
- In case of thick flux layers or flux concentrations this can lead to skipped joints especially when relatively small solder pads are used.

If for example the SOT 23 pad size is larger than $1.3 \times 1.3 \text{ mm}^2$ and the applied flux layer is not too thick (2 - 5 mm) and predried well, the solder result with the Smart wave will be good.

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