Vitronics Soltec

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Why a second soldering treatment will usually not help to improve hole-fill

Introduction

To get a good hole-fill on through hole solderjoints with protruding leads, it is necessary that both the surface solderability and the thermal solderability together with the specific soldering distance be within the specifications for the process to be used. For wave soldering with tin-lead solder all these solderability demands are specified in the book Soldering in Electronics from R.J. Klein Wassink. Only when these demands are met, one has a good basis for a reliable soldering process.

Often the board design has a main effect on the thermal solderability of certain joints. If not the correct design rules regarding this thermal aspect are used, solder-fill to the top of the board surface will often be impossible with the allowed solder process settings. A second soldering operation will in general not improve this result as will be explained.

Insufficient hole-fill or solder wick-up

The reasons for insufficient hole-fill are in most cases design related and is as such in general related to a limited amount of specific joints. Some times lack of solderability can also be held responsible, but in that case often more joints suffer poor hole filling.
Looking to the solderprocess insufficient fluxing or flux activity is the most common source for poor hole filling. Also in that case most joints on a board will show this effect.
Finally insufficient contact with the solderwave may be a cause.

Once a soldered board contains insufficient filled holes it is difficult to correct these holes with a re-soldering operation for the following reasons:

- If there was a flux insufficiency than re-soldering will not improve that condition unless extra flux is applied on the topside of the joint. This is necessary to reduce the oxides that hampered a good solderflow during the first soldering operation.
- If the incomplete hole-fill was due to lack of thermal solderability, re-soldering will not help unless a higher process temperature is used. The reason is that the major portion of heat that is required to melt a small soldervolume is not to raise its temperature to the solder meltingpoint but to apply its latent heat of fusion to get that solder fully molten again. Since the solder, that did already fill the joint during the first soldering operation will transfer the applied heat directly to the connecting metal parts, it will take more local energy to re-melt the joint than during the original joint formation.

Only if the solder in the joint is completely re-melted and new flux and solder is added the solder can perhaps further wick-up to the top of the board.
This operation is in general not recommended since it gives often a higher thermal load than is allowed for the materials involved such as component and board.

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Remedy

Check the solderprocess settings and correct these if necessary.

If a higher thermal load is allowed for the board during soldering one should change the process settings, so that such joints will possibly fulfil the solder rise quality requirements within this new process boundaries.

The best solution when dealing with a poor thermal design lies in the optimisation of the board design and the correct mounting of components.

Remark

With the use of lead-free solders with a relative high melting point, new rules for the determination of the solderability aspects and specific soldering distance should be defined.