Cheatography

Reflow Soldering Cheat Sheet

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Introduction: Reflow Soldering

Reflow soldering permanently glues components that are first temporarily stuck to their pads on circuit boards using solder paste that will be melted through hot air or other thermal radiation conduction. Reflow soldering is implemented in a machine called a reflow soldering oven (Figure 3). As its definition implies, electrical components are temporarily attached to contact pads prior to soldering using solder paste.

This process primarily contains two steps. First, solder paste is accurately placed on each pad through a solder paste stencil. Then, components are placed on pads by a pick-and-place machine. Real reflow soldering won't start until those preparations have been made.

Source:https://www.techbriefs.com/component/content/article/tb/features/articles/28337

1. Pre-Heating

This step serves two purposes during reflow soldering. First, it allows boards to be assembled to consistently reach the required temperature to fully comply with thermal profiling. Second, it is responsible for expelling volatile solvents contained in solder paste. Otherwise, soldering quality will be compromised.

2. Thermal Soak

Similar to wave soldering, reflow soldering also depends on flux that has been contained in solder paste. Accordingly, temperature has to reach a level at which flux can be activated, or the flux fails to play its role in the soldering process.

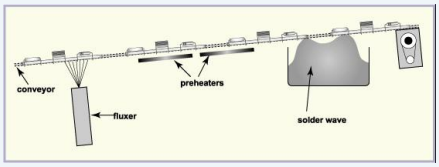
3. Reflow Soldering

This phase occurs when the peak temperature is achieved, enabling the solder paste to be melted and reflowed. Temperature control plays a crucial role in the reflow soldering process. Too low a temperature stops the solder paste from sufficiently reflowing; too high a temperature may cause damage on surface mount technology (SMT) components or boards. For example, a ball grid array (BGA) package contains multiple solder balls that will be melted during reflow soldering. If soldering temperature doesn't reach the optimal level, those balls may be melted unevenly, and BGA soldering may suffer due to rework..

4. Cooling

Temperature will go down soon after the top temperature is achieved. Cooling leads solder paste to solidify, permanently fixing parts on contact pads on boards.

Reflow Soldering



Applies to SMT and THT Assembly

Reflow soldering can be applied in both SMT and through-hole technology (THT) assembly, but is used primarily in the former. When it comes to application of reflow soldering on THT assembly, pin-in-paste (PIP) is usually relied upon. First, solder paste fills in holes on the boards. Then, component pins are plugged into the holes, with some solder paste coming out on the other side of the board. Finally, reflow soldering is implemented to complete soldering.

Wave Soldering vs. Reflow Soldering

Figure 2 illustrates the difference between soldering process steps. The essential difference between wave soldering and reflow soldering lies in flux spraying — wave soldering contains this step, while reflow soldering does not. Flux enables dioxide elimination and surface tension reduction in the material to be soldered. Flux works only when it's activated, which requires rigorous adherence to temperature and time control. Since flux is contained in solder paste in reflow soldering, flux content has to be appropriately arranged and achieved..

Wave Soldering vs. Reflow Soldering



General Preferences

Generally speaking, **reflow soldering works best for SMT assembly**, while **wave works best for THT or DIP assembly**. Nevertheless, a circuit board almost never contains pure SMDs (surface mount devices) or through-hole components. In terms of mixed assembly, SMT is normally first carried out and then THT or DIP is performed, since the temperature required for reflow soldering is much higher than that required for wave soldering. If the sequence of two assemblies is inverted, solid solder paste will possibly be melted again, with well-soldered components suffering from defects or even falling from the board..

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