Blog

DFN and wave soldering

Automated soldering plays an essential role in how electronic components work on a PCB. Generally speaking there are two main techniques: reflow soldering for surface mount packages, and wave soldering for thru-hole or dual in-line packages. Nexperia created the DFN Wave soldering evaluation project to determine whether a wave soldering process would be feasible for certain Discrete Flat No lead (DFN) packages.

Reflow or wave, that is the question

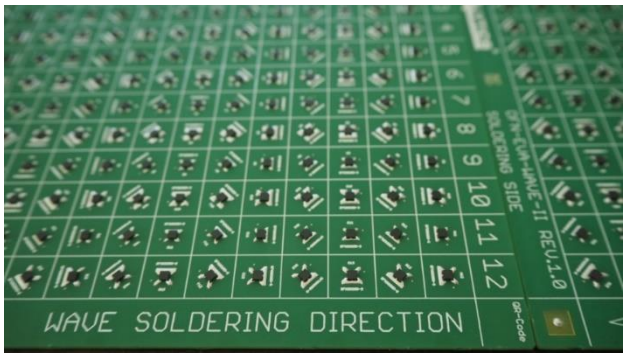
When surface mount technology (SMT) was first introduced, it was quite normal to solder surface mount devices (SMDs) and thru-hole components in a single wave soldering process. Of course, this came with increasingly sophisticated Design for Manufacturing (DFM) requirements. They included pad dimensions matched to each SMD package, glue dots to fix the component packages into place on the PCB, the need for components to be placed on the solder side, and that the solder must touch and flow around them. In addition, pad lengths needed to protrude relatively far beyond the end of the leads to ensure contact and wetting with the liquid solder.

Over the years as SMD packages became more common, the simpler reflow soldering process has become the most prevalent soldering method in the PCB industry. It offers less thermal shock and is a less wasteful process. However, there are still a few key benefits that wave soldering offers in terms of cost-effective manufacturing especially on boards on which through hole and SMD packages are used in parallel

A fresh look at wave soldering

Addressing the needs of automotive and industrial applications, Nexperia has already introduced side-wettable flanks for DFN packages. This enhances the quality of reflow solder joints and allows for Automated Optical Inspection (AOI). It also guarantees the complete side pad surface will be wetted with solder during reflow soldering.

Nexperia wanted to determine whether it was feasible to solder a DFN housing together with thru-hole components using the same wave soldering process. The first step was a feasibility study. This was followed by the determination and improvement of critical parameters for minimizing solder defects. DoE (Design of Experiment) was used to systematically vary SMD adhesive bonding, positioning, pad layout and transport direction, while soldering in two different inert atmosphere wave solder systems.



Systematic approach to DFN wave soldering project

Surprisingly good results

The DFN Wave soldering evaluation project clearly shows that Nexperia's DFN2020MD-6 and DFN2020D-3 components can be safely wave soldered. Results from the project were quantified using AOI (Automated Optical Inspection) and AXI (Automated X-ray Inspection). Among them were surprisingly good gap filling in the adhesive-defined solder gap thickness of 15 to 30 µm. In fact, a solder gap of 20 µm was easily filled, showing only low voiding.

Of course, while the results of the evaluation project were remarkably good, it is clearly only an initial investigation and should not be interpreted as a recommendation to attach BTC (Bottom Termination Component) types by wave soldering to reduce solder joint voiding.

However if you are interested and want to read more about the testing we undertook and the results from those tests, including issues like component orientation and wave soldering techniques, please download our white paper, "Can DFNs be successfully wave soldered?".

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Date of release:
Sept, 2020