

Wetting balance test procedure

Introduction

A prerequisite for a sound solder process is that the components involved are solderable. An important aspect for solderability is the wetting ability or wettability of the components by the liquid solder.

The wetting balance test method is the most universal test for the measurement of the wettability of the component surfaces to be soldered, both, leaded and surface-mount.

The test can be performed under process conditions, using the same flux and solderbath temperature as used in the real process. This will give a direct indication for the solderability of the product in the solderprocess.

In most cases however the test is done at a 10 - 15°C lower solderbath temperature, with the use of a special low activated test flux.

If the solderability requirements during this test are met, one has a certain guarantee that also after a reasonable storage time the products can be used in production without solderability problems.

The wetting balance test can also be used to determine the thermal solderability or the specific soldering distance for leaded components.

The wetting balance test is not developed for testing PCB's. For testing the solderability of PCB's Rotary Dip test is still the most adequate test method.

Principle of the wetting balance test

A wetting balance makes use of a sensitive balance in which the product to be tested is fixed. During the test the connection part of the product will, after previously been fluxed and predried, be dipped into a bath (leaded components) or globule (SMD components) of liquid solder at a pre-set temperature to a pre-set dipping depth. After a given dwell time the product will be removed from the solderbath or globule. The dipping speed and removal speed can be pre-set and is usually set at 20 ± 5 mm/s.

During the test cycle the weighing forces are recorded on a high-speed chart recorder.

The changes in force measured by the wetting balance are related to the following equation:

$$\text{Force} = \gamma c \cos\theta - \rho v$$

Where γ is the surface tension of the solder in contact with the flux on the test specimen, θ is the wetting contact angle and ρ is the density of the solder, c is the circumference of the tested area and v is the volume of the part below the solder bath surface level.

The force time diagram from the test can be used to measure the solderability by comparing the plotted curve with the curve of an "ideal" solderable substitute. In most cases however some time/force points in the curve are marked, to see if they fit within the required test demands. These pass - fail monitor points are to be agreed upon between "supplier" and "customer", since the wetting balance test as described in the ANSI/J-STD-002 is a test without established accept / reject criteria.

Common test criteria for good solderability are the passage of the force curve across the buoyancy line must be within 2 seconds. After 3 seconds the force curve must have passed the level of 2/3 of the maximal obtainable force. This maximal obtainable force can be found by testing a perfectly wettable substitute.

The wettingbalance test method can also be used to compare the behaviour of different fluxes and also the behaviour of different solder-alloys.

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