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Environmental testing -- Part 2: Tests - Test Te: Solderability testing of electronic components for surface mounting devices (SMD) by the wetting balance method

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Titre :

Title : Environmental Testing - Part 2-69: Tests - Test Te: Solderability testing of electronic components for surface mounting devices (SMD) by the wetting balance method

Note d'introduction

La version française sera diffusée ultérieurement.

Introductory note

This CDV was prepared based on the discussion result of TC 91/WG 3 meeting in USA, 2004-10.

ATTENTION	ATTENTION
CDV soumis en parallèle au vote (CEI) et à l'enquête (CENELEC)	**Parallel IEC CDV/CENELEC Enquiry**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ENVIRONMENTAL TESTING –

Part 2: Tests – Test Te: Solderability testing of electronic components for surface mounting devices (SMD) by the wetting balance method

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International Standard IEC 60068-2-69 has been prepared by IEC technical committee 91: Electronics Assembly Technology

The text of this standard is based on the following documents:

FDIS	Report on voting
91/xxx/FDIS	91/xxx/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

Annexes A and B form an integral part of this standard.

ENVIRONMENTAL TESTING –

Part 2: Tests – Test Te: Solderability testing of electronic components for surface mounting devices(SMD) by the wetting balance method

1 Scope

This part of IEC 60068 outlines test Ta, solder bath wetting balance method and solder globule wetting balance method, applicable for surface mounting devices. These methods determine quantitatively the solderability of terminations on surface mounting devices. IEC 60068-2-54 is also available for surface mounting devices, check if it is applicable.

The procedures describe the solder bath wetting balance method and the solder globule wetting balance method and are both applicable to components with metallic terminations and metallized solder pads.

This standard provides the standard procedures for solder alloys containing lead (Pb) and for lead-free solder alloys.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60068. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60068 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60068-2-20: 1979, Basic environmental testing procedures – Part 2: Tests – Test T: Soldering
(incorporating Amendment 2:1987)

IEC 60068-2-54: 200x, Environmental testing – Part 2: Tests Test Ta: Solderability testing of electronic components by the wetting balance method

IEC 61190-1-3:2002, Attachment materials for electronic assemblies: Part 1-3: Requirements for electronic grade solder alloys and fluxed/non-fluxed solid solder for electronic soldering applications

ISO 683: Heat-treatable steels, alloy steels and free-cutting steels

ISO 6362: Wrought aluminium and aluminium alloy extruded rods/bars, tubes and profiles

ISO 9454-1: 1990, Soft soldering fluxes – Classification and requirements – Part 1: Classification, labelling and packaging

3 Terms and definitions

For the purpose of this part of IEC 60068, the terms and definitions as defined in IEC 60068-1 and IEC 60068-2-20 apply.

4 General description of the method

After applying the liquid flux to the component termination and mounting the component in a suitable holder, the specimen is suspended from a sensitive balance. The component termination is brought into contact with the cleaned surface of a solder bath or the apex of a solder globule, and immersed to the prescribed depth.

The resultant forces of buoyancy and surface tension acting upon the immersed termination are detected by a transducer and converted to a signal which is continuously monitored as a function of time, and recorded on a high speed chart recorder or displayed on a computer screen.

The wetting speed and the extent of wetting are derived from the force against time curve.

5 Description of the test apparatus

A diagram showing a suitable arrangement for the test apparatus is shown in Figure 1. The specimen is suspended from a sensitive balance and a mechanism used to either raise the solder to meet the specimen or lower the specimen into the solder.

After conditioning, the transducer signal is passed to either a chart recorder or a computer, where the force against time curve may be displayed and analysed.

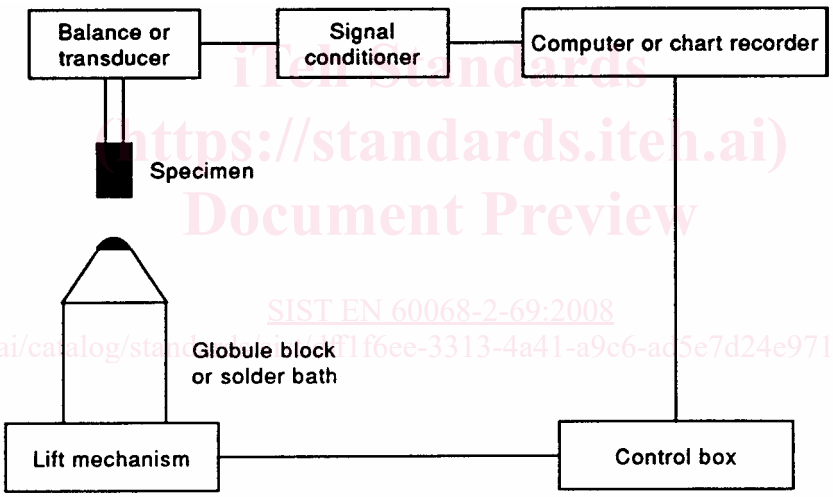

Figure 1 – Test apparatus

Any other system capable of measuring the vertical forces acting on a specimen is admissible, providing that the system has the characteristics given in Annex A.1, and the solder bath and globule support block meet the requirements of Annex A.2 and Annex A.3 respectively.

6 Preconditioning

6.1 Preparation of specimens

Unless otherwise specified the specimen shall be tested in the as-received condition and care should be taken to ensure that no part of the surface to be tested becomes contaminated, particularly by contact with the fingers, during the preparation and handling of the specimen.

If required by the component specification, the specimen may be cleaned by immersion in a neutral organic solvent at room temperature. The specimen should be allowed to dry in air before testing. No other cleaning is permitted.

6.2 Ageing

If required by the component specification, the component may be subjected to accelerated ageing before testing. Ageing shall be performed in accordance with one of the following conditions:

- ageing 1a of IEC 60068-2-20 (4.5.1);
- ageing 1b of IEC 60068-2-20 (4.5.1);
- ageing 3 of IEC 60068-2-20 (4.5.3);
- ageing according to method 1 of IEC 60068-2-20, but for 8 h;
- ageing for 10 days at 85 °C in air with 85 % relative humidity.

7 Materials

7.1 Solder

7.1.1 General

The solder to be used for both the solder bath and for the solder globule wetting balance test shall be as specified in 7.1.2 and 7.1.3.

7.1.2 Solder alloy containing lead

The solder shall be Sn60Pb40A, Sn63Pb37A or Sn62Pb36Ag02B (Refer to IEC 61190-1-3 alloy name).

Note The presence of silver in the solder reduces the dissolution effect on silver containing metallization on components and therefore should be used when required by the relevant component specification.

7.1.3 Lead-free solder alloy

The preferred alloy composition to be used should consist of either 3,0 wt%Ag, 0,5 wt%Cu, 96,5 wt%Sn (Sn96.5Ag3.0Cu0.5) or 0,7 wt% Cu, 99,3 wt% Sn (Sn99.3Cu0.7).(Refer to IEC 61190-1-3 for alloy name)).

Note: A solder alloy consisting of 3,0 wt% to 4,0 wt% Ag, 0,5 wt% to 1,0 wt% Cu and the remainder of Sn may also be used instead of Sn96.5Ag3.0Cu0.5. The solder alloys consist of 0,45 wt% to 0,9 wt% Cu and the remainder of Sn may be used instead of Sn99.3Cu0.7.

7.1.4 Solder mass for solder globule wetting balance method

For the solder globule wetting balance method, the solder shall be in the form of pellets or cut wire with a mass of 200 mg ± 10 mg for use on the 4 mm diameter pin globule support block,100 mg ± 10 mg for use on 3,2 mm diameter pin support block or 25 mg ± 2,5 mg for use on the 2 mm diameter pin globule support block.

Pin diameter (mm)	Pellet mass (mg)	Pellet mass tolerance (mg)
2	25	±2,5
3,2	100	±10
4	200	±10

7.2 Flux

7.2.1 General

The flux used for the test shall be either rosin based or carboxylic acid based. The rosin based flux is either non-activated or activated. The carboxylic acid based flux is either water solution or alcohol solution.

Information about the used flux type shall be specified in the relevant specification.

7.2.2 Rosin based flux

a) non-activated: consist of 25 wt % colophony in 75 wt % of 2-propanol (isopropanol) or of ethyl alcohol (as specified in Appendix C of IEC 60068-2-20).

b) activated flux: the activated flux which is above flux with the addition of diethylammonium chloride (analytical reagent grade), up to amount of 0,2 % or 0,5 % chloride (expressed as free chlorine based on the colophony content).

7.2.3 carboxylic acid based flux

a) water solution: consist of 90,1% De-ionised Water, 5,0% Glycol Ester (CAS No. 34590-94-8) 1,6% Adipic Acid, 1,6% Succinic Acid, 1,6% Glutaric Acid and 0,1% alcohol ethoxylate surfactant (CAS no 68131-39–5).

b) alcohol solution: consist of 94% Propan-2-ol, 1,5% Adipic Acid, 1,5% Succinic Acid, 1,5% Glutaric Acid and 1,5% Rosin.

Note These fluxes reflect modern flux formulations and have similar discriminating powers to the rosin test fluxes.

8 Procedures

8.1 Test temperature

8.1.1 Solder alloy containing lead

Solder temperature prior to test and during test shall be 235 °C ± 3 °C.

8.1.2 Lead-free solder alloy

Unless otherwise specified in the relevant specification, the temperature of the solder prior to the test shall be 245 °C ± 3 °C for Sn96.5Ag3.0Cu0.5 solder and 250 °C ± 3 °C for Sn99.3Cu0.7 solder.

8.2 Solder bath wetting balance procedure

The specimen is mounted in a suitable holder to give the desired dipping angle and the termination(s) is/are centred above the solder bath. Preferred dipping angles are given in Table 1.

The temperature of the solder prior to the test shall be as described in 8.1.

Prior to testing, a continuous layer of the appropriate flux is applied to the portion of the component termination to be tested, using a cocktail stick, cotton bud or similar applicator and excess flux droplets are removed by touching against absorbent paper. It is very important that excess flux is not allowed to enter the specimen holder or remain on the component. The presence of excess flux will cause explosive boiling as the flux solvent makes contact with the molten solder.

Immediately prior to testing, wipe the oxide from the solder surface with a non-wettable blade. If required, the apparatus suspension and chart recorder are adjusted to the zero position.

Hang the specimen on the apparatus so that the lower edge of the component is 20 mm ± 5 mm above the solder surface during the preheat period and allow the specimen to dry for 30 s ± 15 s prior to immersion in the solder. This period is required to remove the solvent from the flux prior to the test and to prevent explosive boiling when the solder, specimen and flux come into contact.