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GB/T 2423.28-2005 / IEC 60068-2-20:1979

Replacing GB/T 2423.28-1982

Environmental testing for electric and electronic products - Part 2: Tests methods - Test T: Soldering

电工电子产品环境试验 第 2 部分：试验方法 试验 T：锡焊

(IEC 60068-2-20:1979, Basic environmental testing procedures - Part 2: Test - Test T: Soldering, IDT)

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Standardization Administration of PRC.

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Foreword

This part of GB/T 2423 is equivalent to the International Electrotechnical Commission's IEC 60068-2-20:1979 "Basic environmental testing procedures - Part 2: Test - Test T: Soldering" and its revision 2:1987.

This part is a revision of GB/T 2423.28-1982 "Environmental testing for electric and electronic products - Part 2: Tests methods - Test T: Soldering". GB/T 2423.28-1982 identically adopts IEC 60068-2-20:1979. Compared with GB/T 2423.28-1982, this Part mainly identically adopts the revision 2:1987 of the IEC 60068-2-20:1979, to revise the 4.7.3, 4.11, 5.6.3, 5.9, to make the standards more scientific and stricter.

Other national standards cited in this Part include:

- GB/T 2423.2-2001 Environmental testing for electric and electronic products - Part 2: Test methods - Tests B: Dry heat (idt IEC 60068-2-2:1974)

- GB/T 2423.3-1993 Basic environmental testing procedures for electric and electronic products - Test Ca: Damp heat, steady state (egv IEC 60068-2-3:1969 and revision 1:1984)

- GB/T 2421-1999 Environmental testing for electric and electronic products - Part 1: General and guidance (idt IEC 60068-1:1988)

The editorial amendments to IEC 6006 8-2-20:1979 in this Part are as follows: The "2-propanol (isopropanol)" in the original text is uniformly called "isopropanol". The Figures in the Appendix are consecutively numbered together with the Figures in the text in the original text, which are now numbered according to the Appendix where they are located. Figure D.3 and Figure E.1 originally used the third angle projection method, BUT now use the first angle projection method.

Appendix A, Appendix B, Appendix C, Appendix D, Appendix E of this Part are all normative appendixes.

This part will replace GB/T 2423.28-1982, from the date of implementation.

This part was proposed by China Electrical Equipment Industry Association.

This part shall be under the jurisdiction of the National Technical Committee for Standardization of Environmental Technology for Electrical and Electronic Products.

Responsible drafting organization of this Part: The Fifth Institute of Electronics of the Ministry of Information Industry.

Environmental testing for electric and electronic products - Part 2: Tests methods - Test T: Soldering

1 Scope

This Part of GB/T 2423 applies to all electrical and electronic components, that may be subject to the following test conditions.

2 Purpose

Determine the ability of component terminations and printed circuits to be easily wetted; check the ability of components themselves not to be damaged during assembly and soldering.

3 Terms

3.1

Colophony

Natural rosin is the residue, after turpentine is extracted from the oil-containing pine tree. It is mainly composed of rosin acid and similar resin acids. It also includes a small amount of resin acid esters.

3.2

Contact angle

Usually refers to the angle, between the tangent plane of the liquid surface and the two planes of the liquid-solid interface, at the intersection of the liquid and the solid (see Figure 1). This specifically refers to the contact angle, when the liquid solder is in contact with a solid metal surface.

When inactive flux is not suitable for use, according to the requirements of relevant standards, ammonium chloride (analytical pure) can be added to the above flux, to increase the chloride ion content to 0.5% by mass (referring to the amount, which is expressed by free chloride ions, based on the benchmark of rosin content).

4.8.3 Procedure

The test wire shall be basically straight. If necessary or convenient, they can be removed from a sample to be tested.

Before the solderability test, the wire shall not be cleaned. If required by the relevant standards, the wire can be immersed in a neutral organic solvent, at room temperature, to remove oil stains.

Before the new solder ball, which is selected in accordance with 4.8.2.1, is placed on the heating head in the soldering device, the solder, which is left on the heating head from the previous test, shall be wiped clean.

The flux is used, by dipping the wire in the flux OR brushing the flux on the wire, that has been placed in a suitable position in the test device. A small amount of flux can also be applied to the molten solder ball, to ensure that it is clean AND not oxidized; meanwhile it can completely wet the heating head.

Then put the wire to be tested into the ball, so that the wire touches the surface of the heating head.

4.8.4 Requirements

Measure the elapsed time, FROM when the wire cuts the solder and touches the heating head TO when the solder flows around the wire and covers the wire. This is the soldering time. The maximum soldering time shall be specified, in the relevant standards.

4.9 De-wetting

Note: The relevant standards shall specify whether this test is required.

4.9.1 Description of solder bath

The depth of the solder bath shall not be less than 40 mm; its volume shall not be less than 300 mL. The solder bath shall contain solder as specified in Appendix B. The temperature of solder, in the bath, shall be 260 °C ± 5 °C, before the test.

4.9.2 Procedure

At the temperature of the test room, before each test, the surface of the molten

solder shall be scratched clean and bright, by the use of a suitable material. The test shall be carried out immediately after the scratch.

First, immerse the tested termination into the flux, which is specified in 4.6.2. Excess flux can be drip-drying, by hanging for a suitable time OR removed by any other method, that can produce the same effect. In case of disputes, the drip-drying time shall be 60 s ± 5 s.

Then immediately immerse the termination into the solder bath, in the direction of the longitudinal axis. The distance, between the dipping point of the termination and the tank wall, shall not be less than 10 mm.

The immersion speed shall be 5 mm/s ± 2 mm/s. The time for the termination, to remain immersed in the bath shall be 5.0 s ± 0.5 s. At the same time, the body of the component shall be kept at the distance from the solder, which is specified by the relevant standards. Then take out the test sample at the same speed.

When taking it out of the solder bath, keep the test surface of the termination vertical, until the solder solidifies.

Any flux residue shall be removed, by the use of isopropanol or ethanol.

4.9.3 Requirements

Visual inspection shall be carried out, which can be inspected by the naked eye, under suitable light OR with the help of a 4X ~ 10X magnifying glass.

The impregnated surface must be covered with a smooth and bright solder layer. Only a few scattered defects, such as pinholes, non-wetting or de-wetting areas are allowed. These defects shall not be concentrated in one piece.

4.9.4 Repeated test

Because de-wetting may occur very slowly, a total of 10 s of immersion is required. This immersion can be divided into two cycles of 5 s, so that any rapid de-wetting will not be masked, by any successive rewetting.

4.10 Final inspection

The test sample shall be visually inspected. If required by the relevant standards, it shall carry out the electrical and mechanical performance inspections.

4.11 Requirements to be made by relevant standards

When relevant specifications include this test, specific provisions shall be made for the following details:

appearance, electrical and mechanical properties.

5.4 Test method 1A (solder bath with a temperature of 260 °C)

5.4.1 Solder bath

The depth of the solder bath shall not be less than 40 mm; its volume shall not be less than 300 mL. The solder bath shall contain the solder, which is specified in Appendix B. The temperature of the solder, in the solder bath, shall be 260 °C ± 5 °C, before the test.

5.4.2 Flux

5.4.2.1 The flux used shall be composed of 25% rosin and 75% isopropanol or ethanol, by mass. Meanwhile, diethyl ammonium chloride (analytical pure) is added, to increase the chloride ion content to 0.5% by mass (referring to the amount, which is expressed by free chloride ion, based on the rosin content).

5.4.2.2 When the test is part of the entire test series AND is performed before the damp heat test, it shall use an inactive flux, which contains 25% rosin and 75% isopropanol or ethanol, by mass. In this case, the test shall be carried out on the following test sample, which has passed the solderability test of the method 1 of the test Ta, within 72 hours before this.

5.4.3 Procedure

Before each test, a piece of suitable material shall be used, to scrape the surface of the molten solder clean and bright. The test shall be performed immediately after scraping.

The termination to be tested shall first be immersed in the flux, which is specified in 5.4.2, at the temperature of the test room; then immersed in the solder bath, along the longitudinal axis. The dipping point of the termination shall be at least 10 mm away from the tank wall.

Unless otherwise specified by the relevant standards, the termination shall be immersed in a place 2.0 mm ~ 2.5 mm away from the component or the mounting surface, in no more than 1 second. The termination shall be immersed at the specified depth, to maintain one of the following durations, which are specified in the relevant standards:

a) 5 s ± 1 s;

b) 10 s ± 1 s.

Note: The short immersion time of 5 s is mainly used for heat-sensitive components, which are mounted on printed circuit boards. It shall be noted that, such components

must be soldered to the printed circuit board, within 4 s.

Unless otherwise specified in the relevant specifications, a baffle, which is made of an insulating material AND has a thickness of 1.5 mm ± 0.5 mm, shall be used between the component body and the molten solder; meanwhile it shall open a hole, which is suitable for the size of the termination, on the baffle.

When the relevant standard stipulates that the radiator is used in the test process, it shall give the details of the size and type of the heat shunt; all these details shall be related to the method, which is used for soldering the product.

5.5 Test method 1B (solder bath with a temperature of 350 °C)

5.5.1 Solder bath

The solder bath is the same as specified in 5.4.1, BUT its temperature is 350 °C ± 10 °C.

5.5.2 Procedure

The procedure shall be the same as that specified in 5.4.3, BUT the immersion time is 3.5 s ± 0.5 s. The entire immersion process, including staying in the tank and taking out, shall be finished within no less than 3.5 s and not more than 5 s.

5.6 Test method 2 (soldering iron with a temperature of 350 °C)

5.6.1 Description of the soldering iron

It is as specified in Article 4.7.1.

Relevant standards shall specify whether to use No. A or No. B soldering iron.

5.6.2 Solder and flux

It is as stipulated in Article 4.7.2.

5.6.3 Procedure

According to the requirements for the soldering iron in method 2 of test Ta4.7. However, the time of using the soldering iron on the test surface of the termination is selected from the following two conditions, by the relevant standards.

a) 5 s ± 1 s

b) 10 s ± 1 s

If the relevant standard does not clearly stipulate, then select condition b): 10 s

timing device. The wetting or de-wetting characteristics of the test samples are evaluated, in accordance with the relevant professional standards.

6.3 Test sample

The test sample shall be a rectangle, which has a width of 30 mm ± 1 mm AND a length that meets the requirements of 6.4.3. It shall be cut from:

a) Single-sided or double-sided copper clad laminates: It shall use samples that have not been etched.

b) Single-sided or double-sided printed circuit boards with or without metallized holes: A suitable part of a typical test pattern is given in the relevant professional standards.

c) Multilayer printed circuit board: It is to be determined.

Test samples b and c shall be manufactured, at the same time and under the same conditions, as the batch products of printed circuit boards.

When the test samples b and c are not cut from any standard test pattern, it shall consider the width of the conductor, insulation gap, bonding pad, holes, thermal shunt effects. The test sample shall not include conductor structures, etc., that may affect the solderability evaluation. It does not intend to prove whether a specially designed board is easy to weld, BUT to select samples to test the weldability of copper or metal-clad layers.

6.4 Test equipment

6.4.1 Solder bath

It shall use a suitable solder bath, which has a depth of not less than 40 mm. If the solder bath is round, its diameter shall not be less than 120 mm; if the solder bath is rectangular, it shall not be less than 100 mm x 75 mm.

6.4.2 Transmission of test samples

A mechanical device conveys the test sample, at a constant speed, around the horizontal axis, in a circulating channel, to bring the test surface into contact with the molten solder. When there is no stop during the contact with the solder, the radius of rotation shall pass vertically through the center of the test sample surface. The distance between the test surface and the rotating shaft shall be 100 mm ± 5 mm (the outline in Appendix E shows the recommended arrangement of the test sample fixture and the timing needle).

The rotation speed range shall be adjustable, so that the time of contact between the test sample and the solder (as specified in 6.4.4) is within the range

of 1 s ~ 8 s.

When the printed board is in a horizontal position, the depth of immersion of the test surface, in the molten solder, shall not exceed the thickness of the board. It is important to ensure that, the solder does not flow on the upper surface of the test sample. Therefore, it is allowed to use a sample holder, which has a frame, to avoid this phenomenon (see 6.4.3).

6.4.3 Fixture of test sample

No matter what type of sample fixture is available, as long as it can fix the test sample as specified above (see also Appendix E) AND meet the following requirements:

a) The exposed length of the test surface of the test sample, in the direction of movement, is 25 mm ± 1 mm.

b) Those parts of the sample fixture, that are in contact with the test sample or solder (if the buckle spring is installed, it is also included), shall have low heat capacity and low thermal conductivity.

c) The sample holder shall not hinder the wetting of the exposed surface, in any way.

6.4.4 Timing device

The contact time, between the test surface of the test sample and the molten solder, will be determined by a timer, which is triggered by the electrical contact, between the timing needle and the molten solder. The needle tip shall be placed close to the test sample; the needle shall have the same rotation axis and radius of rotation, as the center of the test surface of the test sample; the needle tip shall be insulated from the test sample fixture, that carries it (see Appendix E), AND shall be kept clean, during the test.

Since the size of the needle can affect the recorded time, each device shall be arranged for use, after calibration.

6.4.5 Cleaning of solder

In order to remove oxides or flux residues, from the solder surface, before placing in the test sample, fix a narrow strip of suitable material, at 50 mm width, on the test device, in front of the test sample, during the test cycle. The distance of the strip in front of the test sample shall not exceed 10 mm at most.

6.5 Solder

The solder bath shall contain solder, whose chemical composition and melting

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