The Institute for Interconnecting and Packaging Electronic Circuits
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# IPC-TM-650
# TEST METHODS MANUAL

| Number | |
|---|---|
| **2.4.43** | |
| Subject | |
| **Solder Paste—Solder Ball Test** | |
| Date | Revision |
| **1/95** | |
| Originating Task Group | |
| **Solder Paste Task Group (5-24b)** | |

**1.0 Scope** This test is carried out to determine the reflow properties of the solder paste. The ability of the prealloyed solder particles in the paste to reflow into a sphere on a non-wettable substrate is determined under defined test conditions.

**2.0 Applicable Documents** None

**3.0 Test Specimen** Frosted glass microscope slide, alumina substrate or glass/epoxy printed circuit board with a thickness of 0.60 to 0.80 mm and a minimum length and width dimension of 76 mm and 25 mm, respectively.

**4.0 Equipment/Apparatus**

**4.1** Metal Stencils

**4.1.1 Stencil for Type 1-4** Stencil 76 mm x 25 mm x 0.2 mm provided with at least 3 round holes of 6.5 mm diameter apertures with a minimum distance between centers of 10 mm.

**4.1.2 Stencil for Type 5-6** Stencil 76 mm x 25 mm x 0.1 mm provided with at least 3 round holes of 1.5 mm diameter apertures with a minimum distance between centers of 10 mm.

**4.2** Spatula

**4.3** Solder bath not less than 100 mm x 100 mm x 75 mm deep containing solder suitable to maintain a temperature of 25°C above the liquidus temperature of the solder paste being evaluated.

**4.4** Flat hot plate

**4.5** Surface temperature thermometer

**4.6** Magnifying glass with a 10 to 20 times magnification.

**5.0 Procedure**

**5.1 Preparation**

**5.1.1** Set the temperature of the solder bath or hot plate at a temperature of 25°C +/–3°C above the liquidus temperature of the solder alloy.

**5.1.2** Homogenize the solder paste by hand stirring with a spatula.

**5.1.3** Condition the paste to uniform temperature of 25° C +/–2°C.

**5.1.4** Prepare two test specimens with either/or both stencils listed above (4.1.1 and 4.1.2). The solder paste should be squeeged with the spatula to fill and level each hole.

**5.2 Test**

**5.2.1 Test Conditions**

**5.2.1.1** Test one specimen within 15 +/–5 minutes after placement of solder paste on test coupon.

**5.2.1.2** Test the second specimen 4 hours +/–15 minutes after placement of solder paste on test coupon. Storage for 4 hours shall be at 25°C +/–3°C and 50 +/–10% RH.

**5.2.2 Conditioning Heating Equipment**

**5.2.2.1** Clean the surface of the solder bath with the scraper.

**5.2.2.2** Remove all foreign material from the surface of the hot plate to ensure proper control.

**5.2.3 Solder Reflow** Reflow specimens by one of the following two methods.

**5.2.3.1** Lower the substrate, in a horizontal position with the paste deposit on top, into the solder bath at a speed of 25 +/–2 mm/second until the substrate is 50% submerged. It is important that good thermal contact is achieved between the molten solder and the substrate. As soon as the solder has melted, withdraw the substrate from the solder bath maintaining it in a horizontal position. The total time on the solder bath shall not exceed 20 seconds.

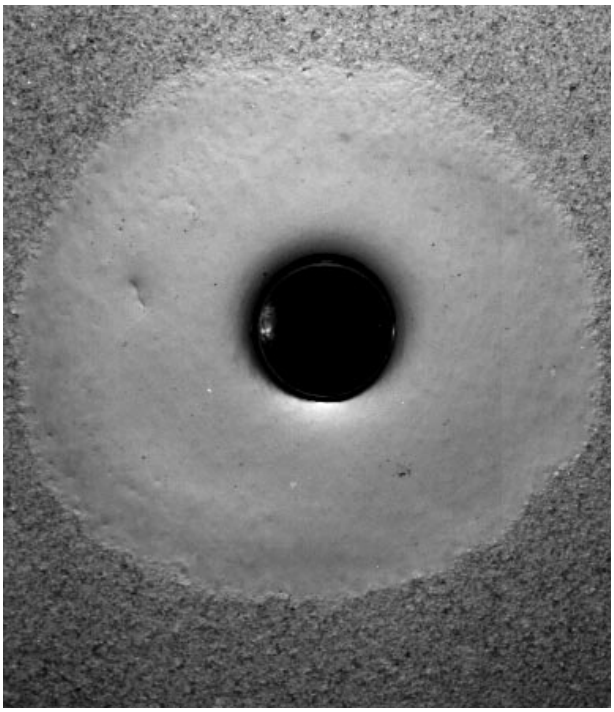
**5.2.3.2** Place the substrate on the hot plate. As soon as the solder has melted, withdraw the substrate from the hot plate maintaining a horizontal position. The reflow shall occur within 20 seconds after the specimen is placed in contact with the hot plate.

**5.3 Evaluation**

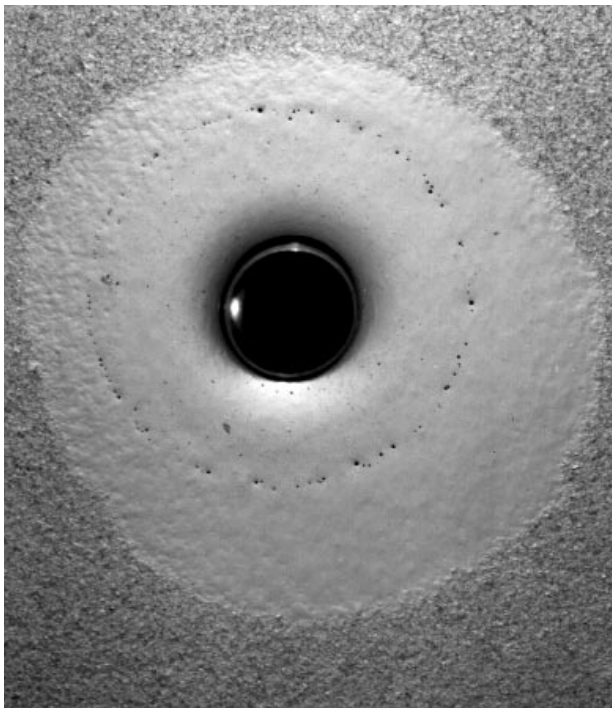
**5.3.1** Examine the reflowed specimens under 10X to 20X magnification.

**5.3.2** Solder ball size and number should be compared with Figure 1.

**5.3.3** Record the degree of reflow in comparison with Figure 1 for the 6.5 cm and 1.5 cm acceptance/reject conditions, respectively.

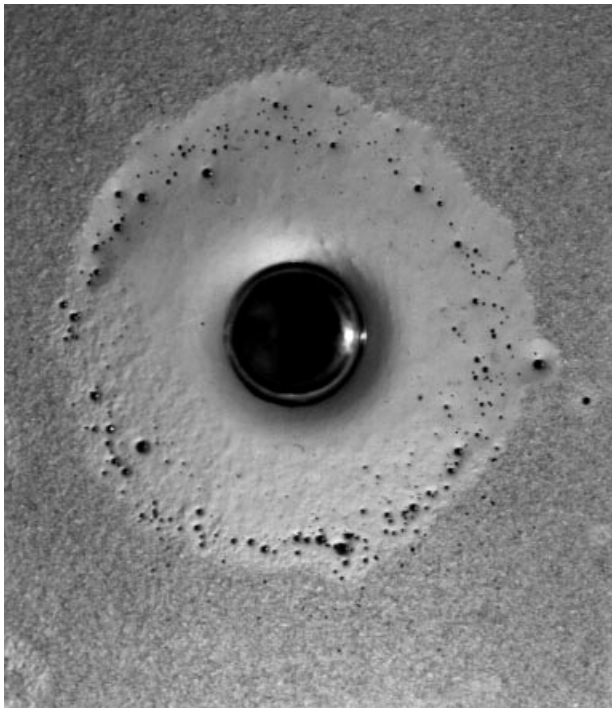


**Preferred**



**Acceptable**

**Unacceptable; Clusters**



**Unacceptable**

**Figure 1 Solder ball test standards**