Designation: ~~B678 – 86 (Reapproved 2017)~~ B678 – 23

Standard Test Method for Solderability of Metallic-Coated Products[1]

This standard is issued under the fixed designation B678; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method provides a procedure for evaluating the solderability of metallic-coated products and test specimens to assure satisfactory performance in manufacturing processes requiring soldering with soft (tin-lead) solder and rosin flux. This test method is applicable only for testing coatings that are normally readily solderable such as: tin, tin-lead alloy, silver, and gold.

1.2 This test method is qualitative and broadly applicable. It is easy to perform and requires only simple equipment. There are other solderability tests not covered by this test method that are more applicable to specific situations, yield quantitative results, or both. Several are described in the literature.[2] This is a "go-no-go" test and does not grade solderability as excellent, good, fair, and so forth.

1.3 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

~~B32 Specification for Solder Metal~~
D509 Test Methods of Sampling and Grading Rosin
D1193 Specification for Reagent Water

3. Summary of Test Method

3.1 The specimen to be tested is coated with rosin flux, dipped briefly into molten tin-lead solder, and examined for complete and uniform coverage by the solder. When specifically required, the specimens are artificially aged before testing by exposure to hot, humid air.

---

[1] This test method is under the jurisdiction of ASTM Committee B08 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.10 on Test Methods.

Current edition approved ~~Nov. 1, 2017~~Nov. 1, 2023. Published ~~December 2017~~January 2024. Originally approved in 1986. Last previous edition approved in ~~2011~~2017 as B678 – 86 ~~(2011).~~(2017). DOI: ~~10.1520/B0678-86R17.~~10.1520/B0678-23.

[2] Long, J. B., "A Critical Review of Solderability Testing," in *Properties of Electrodeposits, Their Measurement and Significance*, edited by Richard Sard, Henry Leidheiser, Jr., and Fielding Ogburn, The Electrochemical Society, 1975.

Harding, W. B., "Solderability Testing," *Plating*, Vol 52, No. 10, October 1965, pp. 971–981.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

4. Significance and Use

4.1 In order that a sound solder joint be formed simply and quickly in a production operation, the molten solder must readily wet and spread over the surfaces of the products being joined. For this to happen, the surfaces must be clean or be soiled only with contaminants that are easily removed by an appropriate flux. It often is necessary that the flux be only strong enough to remove the normally occurring soils. A more aggressive flux may corrode the product and have other harmful effects. Nonactivated rosin in alcohol is the standard flux used in this test method; however, provision is made for the use of other fluxes. Since rosin is a mild flux, it provides better discrimination between acceptable and unacceptable solderability in marginal cases than do more active fluxes.

4.2 Metallic coatings are frequently used to provide solderable surfaces. But, an improperly produced coating may not yield the required solderability. There are many coating defects that cause poor solderability including porosity, codeposited impurities, incorrect thickness, and surface contamination. It may be difficult or impractical to test a coating directly for each of the undesirable conditions. In these instances solderability is tested. Products that pass the solderability test can be expected to solder satisfactorily in production. In the case of failure to pass the test, the test results will not reveal the cause of the inadequate solderability, though, with experience, an operator may be able to identify the cause.

4.3 This test method measures the ability of a coated product to be soldered with ~~60/40 tin/lead~~ Sn60Pb40 or Sn63Pb37 solder using a nonactivated rosin flux. This solder and this flux, or an activated form of it, are generally used in the assembly of electronic products.

4.4 It is intended that the tested specimens be components of electronic products or articles with the same general shape and mass. Articles that are much more massive than this will heat up too slowly during the solder immersion. If more massive specimens are to be tested, a longer immersion time will have to be used, the time to be determined by experiment.

4.5 If the specimen tested is longer than 25 mm, its bottom end will be in the solder for significantly longer than the specified time. Therefore, if the specimen is longer than 25 mm, the results obtained at the bottom end of the specimen are invalid. This part of the specimen shall be discounted in the evaluation of the results. A second set of tests can be run on additional specimens in which the specimens are only partly immersed. These would be used to evaluate the bottom ends.

5. Flux

5.1 The flux shall be a ~~25 ± 5 mass %~~ 25 mass % ± 5 mass % solution of water-white rosin, as defined by Test Methods D509, Grade WW, dissolved in isopropyl alcohol of a minimum purity of ~~99 mass %~~ 99 mass % (Note 1). A different flux, such as mildly activated and activated rosin fluxes, may be used if the specifying authority requires it. Such deviation from the standard shall be stated in the test report.

NOTE 1—Suitable fluxes are commercially available. Care must be taken that the commercial flux used is nonactivated, rosin flux. Commercial fluxes of higher concentration may be thinned with isopropyl alcohol to give the required concentration.

5.2 *Solder:*

5.2.1 The solder shall be an alloy of either 60 mass % tin and 40 mass % lead, or 63 mass % tin and 37 mass % lead that conforms to ~~alloy Grade 60A of Specification~~either Grade Sn60 or Grade ~~B32.~~Sn63.

5.2.2 The composition of molten solder will gradually change because of oxidation. Also, the immersion of test specimens can introduce metallic impurities into the solder. For these reasons, the solder shall be replaced after being molten for 8 h unless chemical analysis shows it to meet the requirements of 5.2.1.

5.3 *Water*—The water used in the aging chamber shall be distilled or deionized water meeting the requirements for Type II or Type III reagent water as defined in Specification D1193.

6. Sampling

6.1 The nature and the number of specimens shall be given by the specification covering the coating or the coated product or other governing document.