



Designation: F584 – 06^{ε1}

Standard Practice for Visual Inspection of Semiconductor Lead-Bonding Wire¹

This standard is issued under the fixed designation F584; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

^{ε1} NOTE—Adjunct references were corrected editorially in April 2006.

1. Scope

1.1 This practice covers conditions for nondestructive visual inspection of the surface finish of spooled aluminum and gold wire used for making internal semiconductor device connections and hybrid microelectronic connections.

1.2 This practice specifies the recommended lighting, magnification, and specimen positioning for inspecting spooled wire under an optical microscope.

1.3 Photographs (Figs. X1.1-X1.5) are included in Appendix X1 as guides to aid the inspector in identifying particular surface conditions. These photographs are not intended as standards for specifying wire surface quality.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards*:²

F72 Specification for Gold Wire for Semiconductor Lead Bonding

F487 Specification for Fine Aluminum–1 % Silicon Wire for Semiconductor Lead-Bonding

2.2 *Federal Standard*:³

Fed. Std. No. 209B Clean Room and Work Station Requirements, Controlled Environment

¹ This practice is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.07 on Wire Bonding, Flip Chip, and Tape Automated Bonding.

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² 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.

³ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

2.3 *ASTM Adjunct*:⁴

ADJF0584 Spool inspection jig (4 drawings and description)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *chatter marks*—for the purposes of this practice—repetitive closely spaced wire surface blemishes.

3.1.2 *dark area*—for the purposes of this practice—wire surface shadowed from direct light-source illumination.

3.1.3 *fingerprint*—for the purposes of this practice—residual surface contamination deposited during handling.

4. Summary of Practice

4.1 The wire spool to be inspected is first mounted on a holding fixture that permits rotation of the spool about its axis. The spool fixture is then placed on the stage of a binocular microscope. The wire surface is illuminated with light incident at a grazing angle; the microscope and fixture are positioned so that the microscope field shows the partially shadowed wire wrap just adjacent to the brilliantly lit surface at the top of the spool.

4.2 Inspection is accomplished by slowly rotating the spool about its axis and moving the fixture over the microscope stage until the operator has viewed the entire exposed wire surface area under partially shadowed illumination.

4.3 The defects to be identified, the manner in which their presence is reported, and the manner in which the wire surface quality is to be characterized should be agreed upon by the parties to the inspection.

NOTE 1—Viewing a wire spool in the partial shadow of glancing illumination is particularly revealing of surface flaws and soil. The viewing arrangement amounts to dark-field illumination with imperfections appearing as bright glints on the wire surface.

5. Significance and Use

5.1 Spooled wire viewed under bright direct lighting or in deep shadow generally exhibits a flawless appearance. Proper arrangement of the viewing angle and illumination, however,

⁴ Detailed working drawings of the apparatus are available from: ASTM International Headquarters. Order Adjunct ADJF0584.

permits accurate observation of wire-surface condition. This practice specifies the conditions under which reliable and reproducible surface finish inspection may be achieved. Such inspection is appropriate for evaluating surface quality with respect to the requirements in Specifications F72 and F487.

5.2 Surface smoothness and degree of cleanliness may affect the performance of wire. This practice may be used to determine whether or not spooled wire meets performance-based surface finish criteria agreed upon between a manufacturer or supplier and a wire purchaser.

5.3 The magnification recommended may not be sufficient to permit detection of all defects on the wire surface affecting wire performance; however, it is sufficient to permit an inspector to determine the overall state of the wire finish and the manner in which the wire lies on the spool.

6. Apparatus

6.1 *Binocular Microscope*—A microscope equipped with zoom objective lens with basic magnification ranges up to 30 or 40×.

6.2 *Eyepieces*, wide-field, with 10× magnification for a binocular microscope.

6.3 *Light Source*—Use a fluorescent light similar to that in Fig. 1.

6.4 *Spool Inspection Jig*, either of two types as follows:

6.4.1 *Jig*—A fixture of the mandrel type shown in Fig. 2,⁴ capable of positioning the spool so that the spool axis is horizontal, and incorporating means for rotating the spool 360 deg about its axis during inspection, or

6.4.2 *Machinist's V-Block*, of suitable size to support the spool on its rims, with no contact between the V-block and the wire.

NOTE 2—Use of the jig fixture is recommended. The jig provides more convenient and sturdier support during inspection and minimizes the possibility of spool contamination from handling. The jig dimensions shown are intended for standard spools described in Specification F72. For occasional inspection, or for some particular spool designs, construction of a jig may not be warranted. The use of the V-block may then be a practical substitute for the jig, although much greater operator care not to damage the wire will be required.

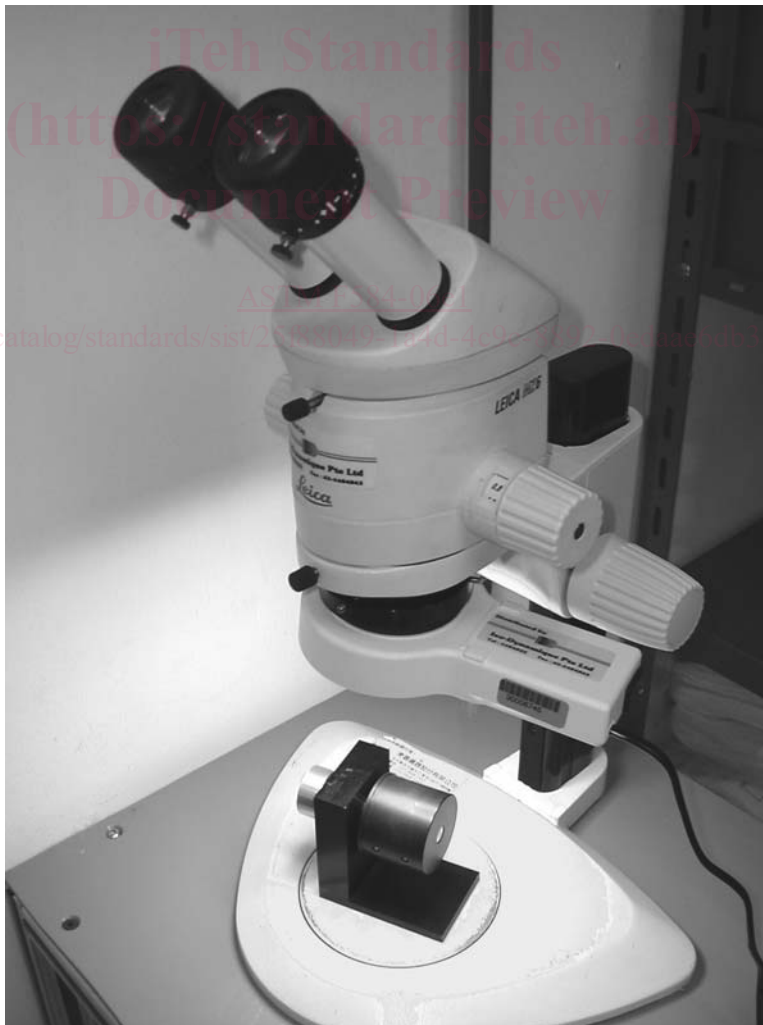


FIG. 1 General Arrangement of Apparatus

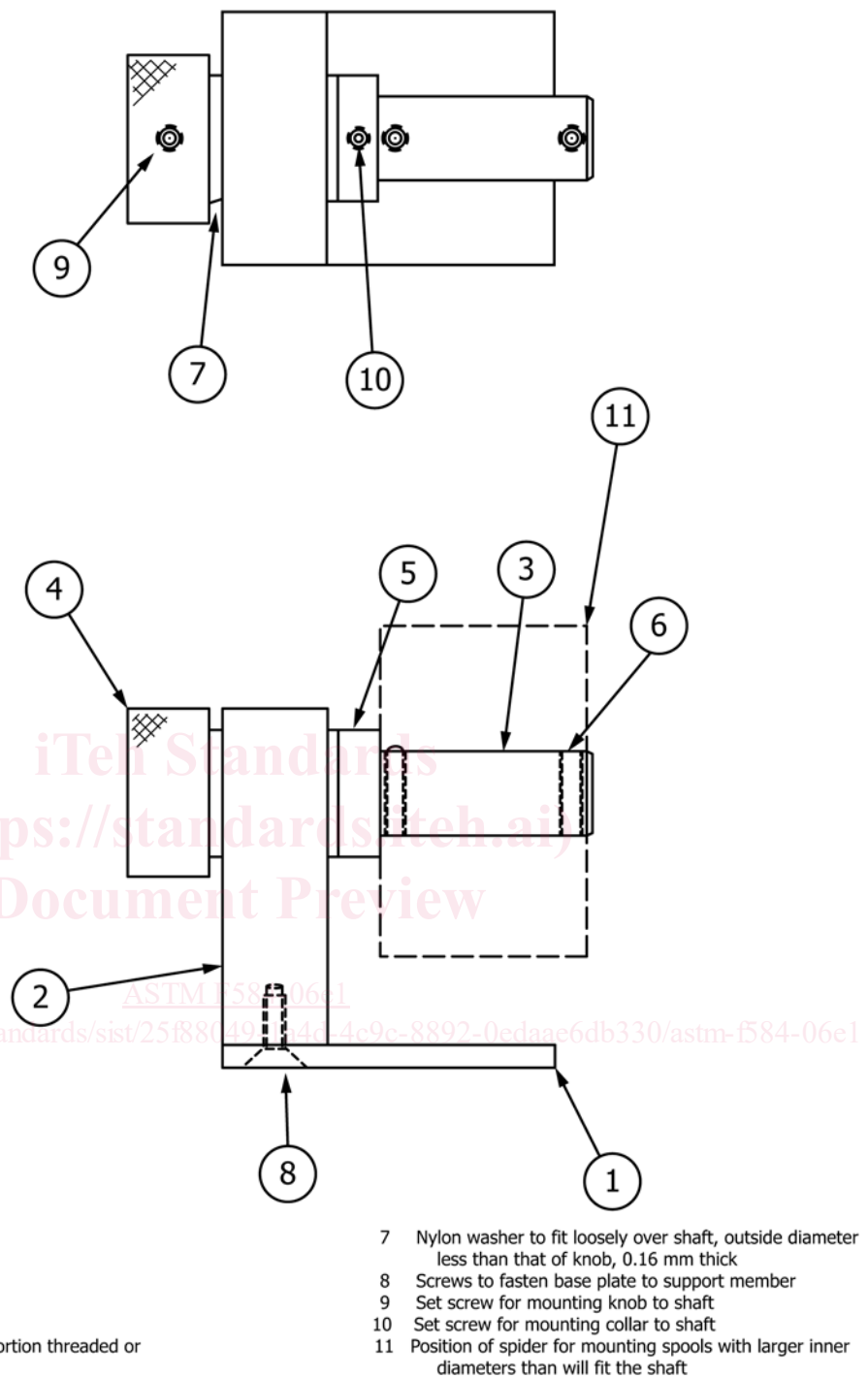


FIG. 2 One Form of Spool Inspection Jig

6.5 *Clean Room or Work Station*—Laminar-flow facility satisfying requirements for Class 1000 or higher, as defined in Fed. Std. No. 209B.

7. Sampling

7.1 This practice is not intended for use as a 100 % screen; therefore, sampling of spools is required.

7.2 The sample should be representative of spools for the intended use. The size of the sample and the method of selection should be agreed upon by the parties to the inspection.

7.2.1 If sampling by lot is used, the definition of what constitutes a lot should be agreed upon by the parties to the inspection.