

METHOD 1022.7

RESISTANCE TO SOLVENTS

1. Purpose. The purpose of this test method is to verify that the markings will not become illegible on the semiconductor devices when subjected to solvents. The solvents will not cause deleterious, mechanical or electrical damage, or deterioration of the materials or finishes.

1.1 Formulation of solvents. The formulation of solvents herein is considered typical and representative of the desired stringency as far as the usual coatings and markings are concerned. Many available solvents which could be used are either not sufficiently active, too stringent, or even dangerous to humans when in direct contact or when the fumes are inhaled.

1.2 Check for conflicts. When this test method is referenced, care should be exercised to assure that conflicting requirements, as far as the properties of the specified finishes and markings are concerned, are not invoked.

2. Materials.

2.1 Solvent solutions. The solvent solutions used in this test shall consist of the following:

- a. A mixture consisting of the following:
 - (1) One part by volume of isopropyl alcohol, A.C.S. (American Chemical Society) Reagent Grade, or isopropyl alcohol in accordance with TT-I-735, grade A or B.
 - (2) Three parts by volume of mineral spirits in accordance with MIL-PRF-680, type II, grade A, or three parts by volume of a mixture of 80 percent by volume of kerosene and 20 percent by volume ethylbenzene.
- b. A semiaqueous based solvent (defluxer (e.g., a turpene)) consisting of a minimum of 60 percent Limonene and a surfactant heated to $+32^{\circ}\text{C} \pm 5^{\circ}\text{C}$ or any equivalent Environmental Protection Agency (EPA) approved Hydrochlorofluorocarbons (HCFC) or terpene solvent or demonstrated equivalent.
- c. At $+63^{\circ}\text{C}$ to $+70^{\circ}\text{C}$, a mixture consisting of the following: 2/
 - (1) 42 parts by volume of deionized water.
 - (2) 1 part by volume of propylene glycol monomethyl ether.
 - (3) 1 part by volume of monoethanolamine.

NOTE: Normal safety precaution for handling this solution (e.g., same as those for diluted ammonium hydroxide) based on Occupational Safety and Health Administration (O.S.H.A.) rules for monoethanolamine.

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2.1.1 Solvent solutions, safety aspects. Solvent solutions listed in 2.1 herein exhibit some potential for health and safety hazards. Safety precautions as listed in the appropriate manufacturers material safety data sheet shall be observed. The following safety precautions should be observed:

- a. Avoid contact with eyes.
- b. Avoid prolonged contact with skin.
- c. Provide adequate ventilation.
- d. Avoid open flame.
- e. Avoid contact with very hot surfaces.

2.1.2 Solvent solution reuse. In order to eliminate any potential decrease in solvent efficiency, all solvent solutions used for resistance to solvents testing shall be discarded at the end of each 8 hour shift. No test solutions shall be added back into the original solution container or reused beyond the original 8 hour shift.

2.2 Vessel. The vessel shall be a container made of inert material and of sufficient size to permit complete immersion of the specimens in the solvent solutions specified in 2.1.

2.3 Brush. The brush shall be a brush with a handle made of a nonreactive material. The brush shall have three long rows of hard bristles, the free ends of which shall lie substantially in the same plane. The brush shall be used exclusively with a single solvent and when there is any evidence of softening, bending, wear, or loss of bristles, it shall be discarded.

3. Procedure. The specimens subjected to this test shall be divided into three groups. Metal lidded leadless chip carrier (LCC) packages shall be preconditioned by immersing the specimens in room temperature ROL1 flux in accordance with J-STD-004 for 5 to 10 seconds. The specimens shall then be subjected to an ambient temperature of $+215^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for 60 seconds $+5$, -0 seconds. After the preconditioning, each device lid shall be cleaned with isopropyl alcohol. Each group shall be individually subjected to one of the following procedures:

- a. The first group shall be subjected to the solvent solution as specified in 2.1.a. maintained at a temperature of $+25^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
- b. The second group shall be subjected to the solvent solution as specified in 2.1.b maintained at a temperature of $+32^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
- c. The third group shall be subjected to the solvent solution as specified in 2.1.c maintained at a temperature of $+63^{\circ}\text{C}$ to $+70^{\circ}\text{C}$.

The specimens and the bristle portion of the brush shall be completely immersed for 1 minute minimum in the specified solution contained in the vessel specified in 2.2. Immediately following immersion, the specimen shall be brushed with normal hand pressure (approximately 2 to 3 ounces) for ten strokes on the portion of the specimen where marking has been applied, with the brush specified in 2.3. Immediately after brushing, the above procedure shall be repeated two additional times, for a total of three immersions followed by brushings. The brush stroke shall be directed in a forward direction, across the surface of the specimen being tested. After completion of the third immersion and brushing, specimens shall be rinsed and all surfaces air blown dry. After 5 minutes, the specimens shall be examined to determine the extent, if any, of deterioration that was incurred.

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3.1 Optional procedure for the third group. The specimens shall be located on a test surface of known area which is located 6 ± 1 inches (15.24 ± 2.54 centimeters) below a spray nozzle(s) which discharges 0.139 gpm (0.6 ± 0.02 liters/ minute) of solution (see 2.1.c) 1 square inches (6.5 square centimeters) of surface area at a pressure of 20 ± 5 psia (137.90 ± 34.47 kPal). The specimens shall be subjected to this spray for a period of 10 minutes minimum. Within five minutes after removal of the specimens, they shall be examined in accordance with 3.1.1. The specimens may be rinsed with clear water and air blown dried prior to examination.

3.1.1 Failure criteria. After subject to the test, evidence of damage to the specimen and any specified markings which are missing in whole or in part, faded, smeared, blurred, or shifted (dislodged) to the extent that they cannot be readily identified from a distance of at least 6 inches (15.24 cm) with normal room lighting, and without the aid of magnification, or with a viewer having a magnification no greater than 3X, shall constitute a failure.

4. Summary. The number of specimens to be tested shall be specified in the applicable performance specification sheet or acquisition document (see 3).

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