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Test Method for Determining the Electrical Resistivity of a Printed Conductive Material[1]

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1. Scope

1.1 This test method covers the determination of the electrical resistivity of a conductive material as used in the manufacture of a membrane switch.

1.2 This test method is not suitable for measuring force sensitive conductive materials.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *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. Terminology

2.1 *Definitions:*

2.1.1 *membrane switch*—a momentary switching device in which at least one contact is on, or made of, a flexible substrate.

2.1.2 *circuit/test pattern resistance*—electrical resistance as measured between two terminations of a circuit trace.

2.1.3 *square*—A geometric unit of a printed conductive circuit trace/pattern obtained by dividing the length (*L*) of the printed conductive circuit trace/pattern by its width (*W*).

2.1.4 *resistivity*—ohms per square per mil of a conductive material.

3. Significance and Use

3.1 Resistivity is useful to suppliers and manufacturers as follows:

3.1.1 when designing membrane switch interface circuitry,

3.1.2 when selecting the appropriate conductive material,

3.1.3 for conductive material quality verification, and

3.1.4 for conductive material cure optimization and quality control.

4. Interferences

4.1 The accuracy of the resistivity determination will be improved as the number of squares of the resistance test strip is increased. The accuracy of the resistivity determination will be improved as the width (*W*) of the circuitry test pattern is increased. Some conductive materials' resistivity are sensitive to temperature.

5. Apparatus

5.1 *Resistance Measuring Device,* (that is, ohm meter) equipped with test leads and probes. The device should be capable of measuring resistances up to 100 MΩ with an accuracy of greater than 1.5 % of full scale reading. Test probes should have tips that are 25 to 250 % of the width (*W*) of the printed conductor test pattern. If your device is not equipped with a feature that allows the resistance of the leads to be negated then measure the lead resistance and subtract that from the resistance measurements.

5.2 *Test Surface,* to be flat, smooth, unyielding and larger than circuit under test.

5.3 *Thickness Measuring Device,* capable of measuring to the nearest 0.00005 in. (1.25 µm).

5.4 *Dimensional Measuring Device,* capable of measuring to the nearest 0.001 in. (25 µm).

6. Procedure

6.1 *Pre-Test Setup:*

6.1.1 Secure circuit (that is, printed and cured conductive material) on the test surface.

6.1.2 Measure the geometry of the test pattern as follows:

6.1.2.1 Measure the length (*L*) of the printed test pattern. (*L*) is the length of the conductive path between test probes.

NOTE 1—It is possible that (*L*) is smaller than (*W*).

6.1.2.2 Measure the width (W) of the printed test pattern.

6.1.2.3 Divide the length (L) by the width (W) to calculate the number of squares of the printed test pattern.

NOTE 2—Measuring the length (L) and width (W) of the actual printed

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[1] This test method is under the jurisdiction of Committee F01 on Electronics, and is the direct responsibility of Subcommittee F01.18 on Printed Electronics.

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