Designation: F 1812 – ~~97a~~02

Standard Test Method for Determining the Effectiveness of Membrane Switch ESD Shielding[1]

This standard is issued under the fixed designation F 1812; 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 is used to determine the electrostatic ~~static~~ discharge (ESD) shielding effectiveness of a membrane switch assembly. This test method may be used to test a membrane switch to destruction, that is, to determine its maximum ESD shielding effectiveness, or it may be used to test the ability of a membrane switch to withstand a predetermined level of exposure.

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

1.3 *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 *discharge pulse count*—number of applied discharges.

2.1.2 *discharge pulse interval*—time duration between applied voltage.

2.1.3 *ESD (electrostatic ~~static~~ discharge) event*—detection of applied charge at input/output (I/O) points.

2.1.4 *I/O points*—specified conductive area, location, or circuitry, typically all circuit paths, traces and wires.

3. Significance and Use

3.1 Nearly all electronic devices are susceptible to possible damage or degradation from ESD encountered in their operating environments. The sensitivity of the equipment, the potential consequences of a malfunction, and the expected environmental conditions all impact the level of ESD protection needed.

3.2 ESD shielding effectiveness test may be destructive, and units that have been tested should be considered unreliable for future use.

4. Interferences

4.1 The following parameters may affect the results of this test:

4.1.1 Temperature may affect the tenda~~e~~ncy of an ESD event to occur~~e~~,

4.1.2 Relative humidity may affect the tenda~~e~~ncy of an ESD event to occur~~e~~,

4.1.3 Barometric pressure may affect the tenda~~e~~ncy of an ESD event to occur~~e~~, and

4.1.4 The composition of the work bench may influence the test results.

5. Apparatus

5.1 *Discharge Probe*.

5.2 *ESD Simulator*— Commercially available device for applying required or specified voltages, monitoring for ESD event and selecting various voltage levels, and probes for contact or air discharge.

6. Procedure: Direct Application of Discharge

6.1 *Pretest Setup*:

6.1.1 Place switch on a nonconductive surface, or as specified.

6.1.2 If applicable, connect the ESD shield, ground trace, or ground plane to earth ground.

6.1.3 Connect all circuitry pin inputs or outputs to the ESD generating device's ground.

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6.1.4 Ambient laboratory conditions to be within:
6.1.4.1 Relative humidity 30 to 60 %,
6.1.4.2 Temperature 15 to 35°C, and
6.1.4.3 Atmospheric pressure 680 to 1060 mbar or otherwise specified.
6.2 *In Process*:
6.2.1 Accumulation of charge on the membrane switch must be dissipated between successive tests.
6.2.2 Set the initial voltage level to 2Kv. Set discharge pulse interval as specified.
6.2.3 Place discharge tip perpendicular, and in contact, with switch surface at the specified point.
6.2.4 Trigger the ESD discharge and monitor.
6.2.5 Check the ESD discharge event to I/O points.
6.2.6 If no ESD event occurs, discharge accumulated voltage on surface to earth ground.
6.2.7 Reset and increase test voltage to next level in accordance with Table 1 (or as specified). Repeat 6.2.3-6.3.
6.3 If ESD discharge event is noted, report and terminate test.
6.4 Repeat 6.2.1-6.3 for other test points.

7. Procedure: Air Gap Discharge

7.1 *Pretest Setup*:
7.1.1 Position switch on a nonconductive surface, or as specified.
7.1.2 If applicable, connect the ESD shield, ground trace, or ground plane to earth ground.
7.1.3 Connect all circuitry pin in or outputs to the ESD generating device's ground.
7.1.4 Ambient laboratory conditions to be within:
7.1.4.1 Relative humidity to be between 30 to 60 %,
7.1.4.2 Temperature 15 to 35C, and
7.1.4.3 Atmospheric Pressure 680 to 1060 mbar or otherwise specified.
7.2 *In Process*:
7.2.1 Set the initial voltage level to 2Kv. Set discharge pulse interval as specified.
7.2.2 Place contact air discharge tip 2 in. (50.8 mm) away from, and perpendicular to switch surface at the specified point.
7.2.3 Trigger the ESD discharge and monitor.
7.2.4 Check for ESD discharge event at specified I/O points.
7.3 If no ESD event occurs, discharge accumulated voltage on surface to earth ground.
7.3.1 Reset and increase test voltage to next level in accordance with Table 1 (or as specified). Repeat 7.2.1-7.4.
7.4 If ESD discharge event is noted, report and terminate test.
7.5 Repeat 7.1.1-7.1.4 for other test points.

8. Report

8.1 Report the following information:
8.1.1 Humidity,
8.1.2 Temperature,
8.1.3 Atmospheric pressure,
8.1.4 Description of I/O points,
8.1.5 Description of apparatus,
8.1.6 Description of test points,
8.1.7 Description of unit under test (UUT),
8.1.8 Maximum voltage data,
8.1.9 Type of test (contact or air),
8.1.10 Physical description of damage (if applicable),
8.1.11 Date,
8.1.12 Time,
8.1.13 Operator,
8.1.14 Discharge pulse count,
8.1.15 Discharge pulse interval, and
8.1.16 Description of probe.

TABLE 1 Voltage Levels

Contact	Air
2 Kv	2 Kv
4 Kv	4 Kv
6 Kv	8 Kv
8 Kv	15 Kv

9. Precision and Bias

The precision and bias of this test method are under investigation.

10. Keywords

10.1 ESD; membrane switch; shielding