

MIL-STD-750 Test Method 1001 Barometric Pressure (reduced) Clarification Status Update

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Historical Information Regarding DWV in 1001

- Test method 1001 did not include DWV requirements until revision 4 which occurred with MIL-STD-750-1A with change 1.
- Method 1001 Revision 3.
 - 1. Purpose. The purpose of this test method is to check the semiconductor device capabilities under conditions simulating the low pressure encountered in the nonpressurized portions of aircraft in high altitude flight.
- Method 1001 revision 4.
 - 1. Purpose. The purpose of this test method is to check the semiconductor device capabilities under conditions simulating the low pressure encountered in the nonpressurized portions of aircraft in high altitude flight. This test is intended primarily to determine the ability of component parts and materials to avoid dielectric-withstanding-voltage failures due to the lowered insulating strength of air and other insulating materials at reduced pressures. Even when low pressures do not produce complete electrical breakdown, corona and its undesirable effects, including losses and ionization, are intensified. The simulated high-altitude conditions of this test can also be employed to investigate the influence on components' operating characteristics, or other effects of reduced pressure, including changes in dielectric constants of materials, and decreased ability of thinner air to transfer heat away from heat-producing components.
- Rationale for change: DLA effort to compare and coordinate standardization of common test methods between the test standards (202, 750, and 883). Test standard 202 and 883 barometric pressure test methods have had the DWV requirement for over 20 years!

Dielectric Withstanding Voltage Test Method

- Test method 1081 is the DWV test method for MIL-PRF-19500 products.
 1. Purpose. This test method establishes a procedure for performing dielectric withstanding voltage test (also called high-potential, over potential, voltage breakdown, or dielectric-strength test) on semiconductor devices. The purpose of this test is to ensure that all devices have low electrical leakage from pin to case under the specified conditions. This test consists of the application of a voltage higher than rated voltage for a specific time between mutually insulated portions of a device or between insulated portions and ground. This is used to prove that the device can operate safely at its rated voltage and withstand momentary overpotentials due to switching, surges, and other similar phenomena. Although this test is often called a voltage breakdown or dielectric-strength test, it is not intended that this test cause insulation breakdown or that it be used for detecting corona, rather, it serves to determine whether insulating materials and spacing in the device are adequate. When a device is faulty in these respects, application of the test voltage will result in either disruptive discharge or deterioration. Disruptive discharge is evidenced by flashover (surface discharge), sparkover (air discharge), or breakdown (puncture discharge). Deterioration due to excessive leakage currents may change electrical parameters or physical characteristics.

No requirement in test method 1081 to perform the DWV testing at reduced barometric pressure.

Summary

- DWV requirement was added to test method 1001 to align the test method with the 883 and 202 barometric pressure (reduced) test methods.
 - TM 1001 also defines that the device shall be subjected to the maximum voltage under rated conditions.
 - TO-257 isolated packages easily pass the test at reduced barometric pressure when the device electrical terminals are biased at maximum rated breakdown conditions at 70,000 feet but fail the DWV test when bias is applied between the electrical terminals (shorted) and the isolated case.
 - Test method 1081 was developed to perform DWV testing of electronic components at standard atmospheric pressure.
 - Should there be an additional set of atmospheric pressure conditions added to test method 1081 to meet high altitude DWV requirements? Or should test method 1001 include both the DWV and maximum rated voltage conditions?
 - IR HiRel previous meeting report on testing indicates that 500V is a problem for TO-257 isolated packages, when bias is applied between package case and pins during TM1001 testing.
 - Plan to do more in-depth analysis of DWV test criteria in upcoming GWG meetings to address industry issue.
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Thank you!

- We would like to express our appreciation to the task group members, NASA NEPAG and SLS programs, Government Working Group, R HiRel, and DLA Land and Maritime for their continued support of this effort.

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Acronyms

- DLA – Defense Logistics Agency
- DWV- Dielectric Withstanding Voltage
- GWG– Government Working Group
- JEDEC– JEDEC Solid State Technology Association
- NASA– National Aeronautics and Space Administration