

## 1.0 PURPOSE

- 1.1 The purpose of this test is to measure the internal water vapor content level of a hermetically sealed device in accordance with the requirements of MIL-PRF-38534.

## 2.0 APPLICABLE DOCUMENTS

### 2.1 Internal

xxxx	Preventive Action
xxxx	Requirements for Vendor Services
xxxx	Use of the Discrepancy Report
xxxxx	Record Retention

### 2.2 Others

MIL-STD-883	Test Methods and Procedures for Microelectronics, Method 1018
MIL-PRF-38534	Hybrid Microcircuits, General Specification for

## 3.0 RESPONSIBILITIES

- 3.1 Prior to the sample being sent to a lab for testing, Quality Assurance (QA) shall confirm that the lab appears on the DSCC-VQ "List of Commercial Laboratories Suitable for Testing Military Devices" and is certified for Method 1018 of MIL-STD-883 if the product is MIL-PRF-38534 compliant.
- 3.1.1 Quality Assurance shall verify that the procedure to be used and any customer specified requirements are consistent with Method 1018 of MIL-STD-883 and MIL-PRF-38534 and are correctly reflected on the purchase order in accordance with xxxx, Requirements for Vendor Services.
- 3.1.2 Most labs have a form for RGA testing that is required to be completed and sent with the samples. Any required forms shall be completed by QA prior to shipment of the samples.
- 3.2 QA shall review the test results from the lab and determine if the devices meet all of the requirements of this document and of MIL-PRF-38534. The requirements of MIL-PRF-38534 shall take precedent in the event of a conflict between the requirements of the two documents.

## 4.0 PROCEDURE

- 4.1 A sample shall be selected from devices that are representative of the materials and processes and have completed all of the screens on the applicable traveler. Electrical failures can be used, however, devices which have seen temperatures beyond those of the production lot are a greater risk for failure and should be avoided if possible.
- 4.1.1 Fine and gross leak testing shall be performed prior to the parts being sent to the laboratory. Most labs will not perform leak testing unless specifically requested on the individual purchase order.
- 4.2 A sample of five (5) devices should be sent to the lab with the instructions that three (3) devices are to be initially tested and the balance tested as specified below:

If all three pass the water content requirements, stop the testing and do not test the other two. The lot passed.

If two or more of the first three fail, stop the testing and do not test the other two. The lot failed.

If only one of the first three fail, then test one more. If it passes, then test the fifth one. If the fourth one fails, stop the testing. The lot failed.

If five devices are tested and have 0 or 1 failure, the test has passed.

If three or more are tested and all pass, the test has passed.

- 4.2.1 If one (1) unit of five (5) has failed, the lot passes, however the failed unit must be subjected to evaluation by Engineering.
- 4.2.2 The evaluation may include data to support materials used, element evaluation of materials, cure process time and temperature, bake-out process, seal chamber environment, seal process, adequacy of hermeticity test process, trend analysis, historical data review, or the consideration of other gases present. The Engineering evaluation data will be kept on file and be available for review.
- 4.3 The lab report is to be evaluated by Quality Assurance for water vapor content level and all other gas levels. Gas species present in quantities greater than 100 parts per million volume (0.01 percent) will be reported by the lab.
- 4.3.1 The recommended levels and required actions are as follows:

Internal water vapor content or moisture level-must not exceed 5,000 ppm by volume. Notify Process Engineering if the level is exceeded. This is cause for rejection of the device.

Helium-helium should be between 5% and 10%, notify the Process Engineer if different. It is not cause for rejection of the lot if outside those levels, but the device must be replaced and the gas settings should be reviewed.

Nitrogen-together with the percentage of the helium level should total a minimum of 99%. Notify the Process Engineer if less. It is not cause for rejection of the device if outside these levels, but the device must be replaced and the gas settings should be reviewed.

Fluorocarbon-presence is indication of a non-hermetic device and is cause for rejection.

Oxygen is normally less than 100 ppm.

Argon is normally 100 to 200 ppm.

If the Oxygen to Argon ratio is approximately 22 to 1 it indicates a leak and the outside atmosphere has entered the device. High levels of both along with reduced levels of helium and nitrogen might also be an indication of sealing box and gas flow problems. Notify Process Engineering.

- 4.3.2 A device which exhibits an abnormally low total helium and nitrogen gas content shall constitute a failure if it is not replaced. Such a device may be replaced by another device from the same population. If the replacement device exhibits normal total gas content for its type, neither it nor the original device shall constitute a failure for this cause.
- 4.4 Lots failing this test shall be documented on a Discrepancy Report per xxxxx, and dispositioned by Quality Assurance and Engineering.
- 4.5 If the initial test samples (three or five devices) fail internal water vapor, a second complete sample may be tested at an alternate laboratory that has been issued suitability by DSCC.
- 4.5.1 An additional three samples will be held by the manufacturer until final disposition of the test report.
- 4.5.2 If this test passes, the devices and data from both test submissions will be submitted to the customer or qualifying activity for review of internal water vapor criteria.
- 4.6 Records shall be retained in accordance with procedure xxxxx, Record Retention.

## 5.0 RGA AS A PROCESS EVALUATION

- 5.1 Samples of various package types shall be taken at intervals specified by Quality Assurance. It is recommended that the interval begin with once per week and gradually be increased as the RGA results provide confidence in the process controls.
- 5.1.1 Additionally a sample of the atmosphere in the sealing box shall be taken at intervals specified by QA to ensure the proper gas mixture is being used.

- 5.2 The samples shall be submitted to an approved lab and the test results reviewed by QA to ensure the helium and nitrogen together total 99% and the rest of the gas readings indicate the process is under control.
- 5.2.1 RGA reports shall be reviewed by QA to watch for deviations in the readings of all gas levels from unit to unit within one test lot and also in comparison with a previously tested lot.
- 5.2.2 The levels should be similar from lot to lot and elevated levels of one or more gases may indicate a problem in the process or materials even if the RGA test passes.
- 5.2.3 Such increased levels should be evaluated by QA and Engineering and the process reviewed to try to determine the cause as part of the Preventive Action program in accordance with xxxxx.
- 5.2.4 Process Engineering shall be notified of any readings outside of these levels in order to adjust the process and/or equipment settings.
- 5.3 A brief report of the evaluation performed when deviations are investigated is recommended to be attached to the lab report and filed for future reference.