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Virtual Training Course Outline

Space and Military Standards for Hybrids and RF Microwave Modules

(3 Sessions, 2 hrs each)

Instructor: Thomas J. Green, TJ Green Associates, LLC

The US military specifications for the manufacture of hybrids and RF microwave modules can be confusing and overwhelming to the inexperienced user. This course is designed to explain in a logical manner the quality and manufacturing requirements for building custom Class H and K hybrids for military and space applications.

The governing document is MIL-PRF-38534 Hybrid Performance Specification, which in turn further calls out specific test methods in MIL-STD-883L Test Methods and Procedures for Microelectronic Devices. MIL-STD- 883 is a collection of destruct and non- destruct test methods used as screening and qualification tests to verify microelectronic performance requirements and to assess the reliability of finished modules. Each of these relevant Test Methods will be revied in detail on day two and three of this course.

The course is intended for anyone interested in gaining better insight and understanding of the quality and process control requirements for hi reliability space and military products. This course is especially suited for process, component and quality engineers/inspectors working to assemble complex hybrids for mil and space.

Course Outline

- **Overview of MIL-PRF-38534 Hybrid Performance Specification**
  - Description and intent of the specification
  - History and applicability
- **MIL-PRF-38534 General Hybrid Specification:**
  - General requirements, e.g., product classification, marking, ESD, clean room, etc.
  - Product verification
  - Quality management program Generic performance verification
    - element evaluation
    - process controls
    - device screening (100 %)
    - conformance inspection and periodic inspection (sample basis) qualification procedures and when to re-qualify the M&P baseline

- Design and construction requirements
- Radiation hardness assurance requirements for space applications

- **Review of applicable MIL-STD-883 test methods and procedures required for fully qualified Hybrids and RF MMIC Modules**
  - Nondestructive Wire Pull TM 2023
  - Internal Visual Inspection TM 2017
  - Temperature Cycling TM 1010
  - Constant Acceleration TM 2001
  - Particle Impact Noise Detection TM 2020
  - Burn-in TM 1015
  - Seal - Fine & Gross Leak Test TM 1014
  - RGA Residual Gas Analysis TM 1018
  - Radiographic (X-ray) 2012
  - External Visual Inspection TM 2009
  - Plus other TMs call out in the PRF document
- **Group B, C and D Periodic Inspection Test Methods Failure Analysis Tools and Techniques**
- **Course Summary**
- **Student Feedback and Course Critique**

INSTRUCTOR BIO

Thomas J. Green has more than 43 years combined experience in industry/academia and the DoD. He earned a B.S from Lehigh University in Materials Engineering and an MEA from Univ of Utah. He is a recognized expert in materials and processes used to assemble hybrids, RF microwave modules, Class III medical implants, optoelectronics, and other types of hermetic/non-hermetic packaged microcircuits and sensors. He has considerable expertise in hermetic testing methods per TM 1014 and moisture related failures in general. He is a consultant to companies developing next gen microelectronics for military and space. Serving as a Research Scientist at the U.S. Air Force Rome Air Development Center, Tom worked as a reliability engineer analyzing component failures and in industry, he was the process engineer at Lockheed Denver. He has invaluable experience in wirebond, die attach, hermetic sealing, FA and root cause identification and is an expert in the visual inspection criteria for hybrids and microcircuits Mil-Std-883 TM 2010 and TM 2017. For the last 20 years, Tom's expertise has helped position TJ Green Associates, LLC as a recognized industry leader in teaching and consulting services for high-reliability military, space, and medical device applications. Tom is a Fellow of IMAPS (International Microelectronics and Packaging Society) and retired LtCol USAFR with 28 years of service.