



TJ GREEN ASSOCIATES, LLC

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**Thomas J. Green, Principal  
TJ Green Associates, LLC**



*Curriculum Vitae*

**Teaching Experience:**

Designs, develops, and teaches professional engineering courses related to microelectronics (Hybrids, MCMs, and RF/MMIC modules) materials and processes for process engineers, designers, quality engineers, inspectors, and technicians. With 28 years of experience in industry, academia, and the DoD, Tom is uniquely qualified to teach and guide students in quality workmanship practices and process engineering curriculum.

Teaches the industry's only full day public hermeticity course, "Hermeticity Testing, RGA, and Near Hermetic Packaging Concepts," available twice a year through the International Microelectronics and Packaging Society (IMAPS).

In 2008 developed and taught the first IMAPS "Lunch and Learn" Webinar titled, "Hermeticity Packaging Concepts," attended by 28 students worldwide.

Teaches a variety of multi-day industry short courses at major companies around the globe including Sandia National Labs, NASA/JPL, BAE Systems, Lockheed Martin, Northrop Grumman, MIT Draper Labs, MITEQ Inc, L-3 Communications, ILC/DDC, and many others. Developed the four day "Process Certification and Defect Recognition for Hybrids, Microcircuits, and RF/MMIC Modules," and in close cooperation with engineers from Lockheed Sanders developed the associated Workmanship Standards (250 color photos).

Demonstrated "hands-on" expertise in wirebonding, component attachment, cleaning methods, hermetic sealing processes, leak test techniques, and substrate manufacturing processes.

## Consulting Projects:

- Hermeticity evaluation, testing, and product development for a medical implant
- Characterized the reliability and moisture ingress in near hermetic cavity-style Teflon® laminate packages for RF and telecom applications
- Developed hermeticity test techniques using both wired and wireless moisture sensors to determine real time moisture build up inside a hermetic package. Results published at IMAPS and the Minnowbrook Conference
- Drafted a revision to Mil-STD-883 TM 1014.11 (Seal) Optical Leak Test Method (OLT) incorporated into the spec in June 2004
- Regularly attend the Joint Electron Device Engineering Council (JEDEC) meetings (3 times a year) in support of Hermeticity Testing per TM 1014 and Residual Gas Analysis (RGA) per TM 1018
- Investigated and developed processes to minimize hydrogen outgassing in hermetic cavities and minimize moisture problems in microelectronic packages
- Analyzed and identified the failure mechanism for a heavy aluminum wire to thick film gold process . . . a critical Space System qualification test failure
- Drafted and delivered a complete Hybrid Microelectronics Workmanship and Quality Manual for the NASA Jet Propulsion Laboratory in Pasadena, CA
- Developed a critical 1 mil high temp wirebond process with full qualification and failure analysis
- Developed a MMIC wirebond process with complete documentation
- Developed heated plasma cleaning processes for laser cut diamond substrates
- Failure analyzed and implemented new processes for a 10 gigabit optical modulator line
- Optimized a gold/tin eutectic process using the Palomar 3500 die bonder, GaN chip to CMC heat spreader
- Studied outgassing behaviors of epoxies used in opto and high rel Mil applications
- Conducted a series of DOEs to optimize Au ball bonding to copper-clad PTFE
- Successfully diagnosed and resolved a major heavy wire (7 and 15 mil aluminum) problem with a commercial power module manufacturer. Three-month consulting project included problem identification via analytical methods and wirebond optimization experiments
- Installed RF thin film teaching laboratory overseas for the US State Department
- Developed and taught an ESD (electrostatic discharge) training course at Ft. Meade, MD, Honda of America, and other major corporations
- Installed an advanced Siemens pick-and-place line at the local college and taught numerous Siemens field service engineers how to operate and program the machines
- Developed a gold/tin die attach process for a 60 GHz SSPA
- Involved in numerous FA/process improvement activities: capacitor epoxy attach processes, seam welding issues, cracked glass seals, cratering of GaAs wirebond pads
- Conducted and analyzed numerous statistically designed experiments (DOE), which increased first pass yield, reduced costs, and improved product quality

## Previous Employment:

- Adjunct Professor at the National Training Center for Microelectronics, Northampton Community College, Bethlehem, PA (1996-2002).

- Retired Lieutenant Colonel, United States Air Force Reserve (26 years combined Active and Reserve duty). As a reservist spent ten plus years working in a technical capacity in a microelectronics group at a large government Defense Agency.
- Lockheed Martin Senior Staff Engineer, Denver, CO (1989-1996). Responsible for materials and manufacturing processes, including assembly and hermetic seal processes, used in building custom high reliability space qualified microcircuits (hybrids, MCMs, and RF modules) for military and commercial communication satellites.
- Reliability Engineer at USAF Rome Laboratories (1985-1989). Worked in a Reliability Physics group, analyzed component failures from AF avionic equipment, along with providing technical support for a variety of Mil specs and standards (MIL-PRF-38534 and MIL-STD-883).
- Flight Test Engineer at the 6545th Test Group Hill AFB, Utah, (1982-1985). Provided technical engineering support and conducted research, test, and development of unmanned aerial vehicles (UAVs) for USAF military operations.

### International Teaching and Training:

- Brisbane, Australia (March 2007). Teaching and Consulting
- Sittard, Netherlands (November 2005). Taught 23 circuit designers, process engineers, and technicians a 4-day course titled Process Certification and Defect Recognition for Hybrids, Microcircuits, and RF/MMIC Modules
- Cork, Ireland (February 2001). Taught 32 engineers/technicians a course titled Process Certification and Defect Recognition for Hybrids, Microcircuits, and RF/MMIC Modules. The course was held in plant at ILC/Data Device Corporation, a leading worldwide supplier of state-of-the-art hybrid circuits for military avionics equipment
- Lead instructor (1995-1998) for Siemens automatic SMT pick-and-place equipment. Instructed numerous process engineers from all over the world (France, Germany, Mexico) at the NTC facility

### Education:

- Masters of Engineering Administration, University of Utah, Salt Lake City, UT (1985)
- B.S. Metallurgy and Materials Engineering, Lehigh University, Bethlehem, PA (1982)
- USAF Air Command and Staff College (1999)

### Technical Publications:

- "Practical Guide to TM 1014 (SEAL)" – Free Download at [www.tjgreenllc.com](http://www.tjgreenllc.com)
- "Moisture Sensing in Fusion Bonded Teflon Laminate Packages for RF Power Applications," IMAPS Military Space and Homeland Security Conference, (2007) Baltimore, MD
- "Optical Leak Detection vs Conventional Helium Leak Detection in a Production Environment," JEDEX Conference (2003), San Jose, CA
- "Technology Insertion and Process Improvements - A Case Study," *Proceedings of the International Society of Hybrid Microelectronics* (1997), Philadelphia, PA
- "Using DOE to Reduce Costs and Improve the Quality of Microelectronic Manufacturing Processes," *Proceedings of the International Society of Hybrid Microelectronics* (1994), Boston, MA

- “Using DOE to Optimize Hermetic Package Seam Welding,” *Proceedings of the International Society of Hybrid Microelectronics* (1992), San Francisco, CA
- “Helium Fine Leak Testing Using the Berquist Method,” RADC/NIST Moisture Workshop (1992), Gaithersburg, MD
- “Corrosion of Chip Resistors within a Hybrid,” RADC/NIST Moisture Workshop (1992), Gaithersburg, MD
- “Air Force Field Failure Return Program,” Government Microcircuit Applications Conference (GOMAC) (1989), Orlando, FL
- “Air Force Field Failure Return Program,” International Reliability Physics Symposium (IRPS) (1988), Monterey, CA
- “A Review of EOD/ESD Failures from AF Avionics Applications,” EOS/ESD Symposium (1988). Also selected as one of the ten best ESD papers from the 1980s and published in book form

### **Professional Affiliations:**

#### *International Microelectronics and Packaging Society (IMAPS)*

- Fellow of the Society
- Keystone Chapter President
- National Professional Development Course Chair since 1993
- Ira Custman Award Winner
- Founder and General Chair of the IMAPS Optoelectronics Packaging Conference in Bethlehem, PA (2001/2002)
- Past Northeast IMAPS Regional Director, National Technical Committee Chair, Executive Council Member
- Chair of 2007 and 2008 Military and Homeland Security Conference (MASH)
- Founded and organized the IMAPS Regional Symposium at the National Training Center for Microelectronics (Northampton Community College), 1998-2002
- National Technical Committee Chair
- Initiated and produced “Hands-On” courses (Wirebond and Thick Film) at the Chicago, Boston, and Baltimore Symposia
- Individual/Corporate Member since 1988

Member IEEE since 2004