TJ GREEN ASSOCIATES, LLC

739 Redfern Lane
Bethlehem, PA 18017 USA
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Process Certification and Defect Recognition: Hybrids, Microcircuits and RF/MMIC Modules

(4 DAYS)

Course Description:

Most companies struggle to introduce new lines and waste countless manhours and resources resolving old problems on the manufacturing floor. Much of this waste is directly tied to the knowledge and training level of the responsible individuals. This course is designed teach the fundamental materials and processes used in microelectronics manufacturing and develop an understanding of the relevant visual inspection criteria. "Knowing what to do" is the first step towards lower costs, improved quality, and faster throughput. Multimedia PowerPoint presentations and video clips introduce the basics in a classroom setting over four days, and there is always plenty of time for questions and discussion as needed.

Learning Outcomes:

- Advance your understanding of the basic materials and processing steps used in the assembly of Hybrids, Microcircuits and RF/MMIC Modules.
- Know what you're looking at and what constitutes a "reject" in the production flow along with the technical rationale to support the decision.
- Be able to explain to others visual defects that result from the basic manufacturing processes: i.e. wirebond, component attach, thick and thin film processing, etc.
- Learn how to interpret and apply the visual inspection criteria contained in MIL-STD-883 and MIL-STD-750

Who Should Attend:

This course is a must for process engineers, manufacturing engineers, and senior technicians and ideal for inspectors and line operators looking to broaden their knowledge base and understanding of visual inspection criteria. The course is also a must for newly assigned engineers and QA personnel looking to learn the basic terminology and key concepts vital to the manufacturing floor. Trained instructors with years of industry experience deliver the material in a straightforward and easy to understand format.

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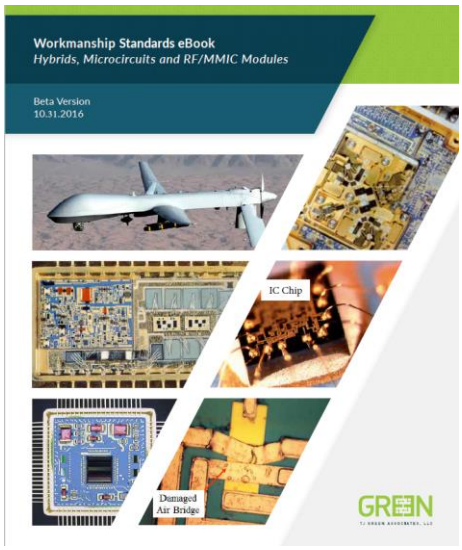

http://www.tjgreenllc.com/workmanship-ebook/

Workmanship Standards eBook… Hybrids, Microcircuits and RF/MMIC modules is an online illustrated guide depicting photos of common workmanship defects as seen during production and each defect slide is tied to a particular page in MIL-STD-883. Its intended as an on-the-floor working document for operators, inspectors and quality engineers to facilitate an understanding of defects generated during the manufacture of hybrids, microcircuits and RF/MMIC modules and how they relate to the contractual requirements of MIL-STD-883. This on line document will be referenced throughout the week.

Why buy a subscription?

- One digital document with up to date visual inspection criteria from MIL-STD-883 and MIL-STD-750, which decreases time spent looking for requirements and increases productivity and quality.
- Easily accessible by computer, tablet of phone for all subscribers throughout the plant.
- Valuable training aid with over 300 color defect photos linked to applicable mil spec visual inspection.
- Saves countless hours interpreting the often ambiguous visual requirements contained in the mil specs.
- Know the source requirements… tie defect pics to the specific requirement in MIL-STD-883 and MIL-STD-750.
- A single authoritative source of microelectronics inspection criteria updated quarterly by TJ Green, Associates.

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CLASS TIMES: 0830-430 pm

Course Outline

DAY 1

Hybrid Materials and Processing Overview
- Review of terminology

Overview of Mil-PRF-38534 and associated requirements
Visual inspection requirements flow down
- MIL-STD-883 TM 2017 TM 2010
- MIL-STD-750

Introduction to Hybrid manufacturing processes
Terminology and product definitions
- Hybrids, MCMs , RF/MMIC modules microcircuits and Discretes

Manufacturing Assembly Process Overview
- Basic manufacturing process flows

Semiconductor IC and MMIC Processing Overview
Transistors, MOSFETS and Diodes
- Wafer Saw and Probing
- Foreign Material Identification and Control
- What is acceptable?

Cleanroom Requirements and Industry Protocols
Commercial vs. Military Visual Inspection Requirements

Incoming High Mag Wafer/Chip Inspection
- *Workmanship Standards eBook Review Semiconductor Fab related defects*
- *High Powered Inspection*
- *Monolithic silicon die*
- *MMIC airbridge defects*
- *Probe defects, scribing defects, edge cracks and chipouts*

DAY 2

Thick Film Processes
- Substrate fabrication and materials overview
- Screen printing machine variables and controls
- The drying and firing process
- Thickness measuring techniques
- Photo defined thick film processes

Cofired ceramics LTCC and HTCC

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Thin Film Processes
- Sputtering vs vapor deposition
- Photolithography, coat, and etch
- Plating Operations
- Electrolytic vs. electroless plating

Laser Trimming Processes
Thick and thin film resistors
Workmanship Standards eBook Review …. Substrate Related Defects
- *Cracks and chip outs*
- *Scratches, voids and other defects*
- *Defects related to laser trimming*
- *Plating defects and metal lift*

Review of passive components used in Hybrids
- MLCC, plate capacitors, chip resistors etc

Processing Fundamentals for Component Attach
Automated handling and assembly of bare die
Ag epoxy and non-conductive epoxy process overview
- Material properties and TM 5011 requirements
- Common problems and how to avoid…e.g. epoxy resin bleed

Die and Substrate Attach
- AuSn die attach of GaAs and GaN HPAs and MMIC
- Solder Attach process overview
- Die shear testing and X-ray

Workmanship Standards eBook Review … Die and sub attach
- *Looking for the proper fillet*
- *Component to pad alignment issues*
- *Epoxy bleed and runout*
- *Flux contamination*
- *Excessive solder*
- *F/M resulting from the cure process and their effect on wirebonding*

DAY 3

Overview of Common Cleaning Processes
- Wet chemicals, plasma, UV ozone

The Wire Bond Process
- Thermosonic gold ball bonding
- Wedge bonding
- Ribbon bonding

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Thermocompression bonding
Deep access wire bonding with 7th wedge
Heavy gage wirebond processes
Material properties of the bonding wire
Wire bonding tools
Selecting the proper tool
Factors that affect the wirebond process

Wire bond defects and related materials and process parameters
Die bonding processes and what to look for at wirebonding

Wire bond pull testing
Destruct pull test and Mil spec limits
Non-destruct pull testing

Factor that Affect the Wirebond Process
Wire Bonding Reliability and Yield Problems

Workmanship Standards eBook Review … wirebond defects
Over deformed bonds
Under deformed bonds
Bond placement issues
Intermetallic growth and what to look for
Defective bond pad metal and platings
Misplaced bonds
Lifted bonds
General wirebond defects

DAY 4 (Class ends 2:00 PM on Friday)

Hermetic Packaging Process Overview
Seam sealing, laser welding, solder sealing
Hermeticity Testing in accordance with TM 1014
Gross and fine leak testing
Helium methods, OLT, CHLD, Kr-85, HMS Condition A5 test methods
Residual Gas Analysis
Basis for the 5,000 PPM level and how to interpret an RGA report

Workmanship Standards eBook Review … External Visual per TM 2009
Cracked seals. .Poor welds…Marking Defects

Course Summary
Student Examination Test and Review
Student Feedback

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Seminar instructor:

Thomas J Green is an experienced process engineer and very knowledgeable instructor. Mr. Green designs curriculum and teaches industry short courses relating to advanced microelectronics manufacturing processes. He is a seasoned instructor with a B.S. in Metallurgy and Materials engineering from Lehigh University as well as a Master in Engineering. He has over thirty five years experience in the microelectronics industry at Lockheed Martin Astro Space and USAF Rome Laboratories. During that time period he was a Staff engineer responsible for the materials and manufacturing processes used in building custom high reliability space qualified microcircuits (Hybrids, MCMs and RF modules) for military and commercial communication satellites. Tom has demonstrated expertise in wirebonding, component attach, visual inspection and seam sealing processes. He has conducted and analyzed numerous statistically designed experiments which increased first past yield, reduced costs, and improved product quality. At Rome Labs he worked as a senior reliability engineer and analyzed component failures from AF avionic equipment along with providing technical support for a variety of Mil specs and standards (e.g. MIL-PRF-38534 and MIL-STD-883). Tom is a Society Fellow and active member of the IMAPS (International Microelectronics and Packaging Society) at both the regional and national levels.

To download Tom's Curriculum Vitae click here.