TJ GREEN ASSOCIATES, LLC

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Copper and Gold Wire Bonding

Course Description

Wire Bonding is a welding process that is the dominant chip interconnection method. More than 15 trillion wires are bonded annually. In the past gold wire was the dominant material in use but in 2015 copper and palladium coated copper wire captured more than 51% of the total market. Copper provides benefits in cost, improved conductivity, stiffness and reliability. However, it is significantly harder than gold and achieving a robust, reliable process is more challenging.

With the high productivity and growth rate of wire bonding, it is one of the most reliable manufacturing processes. Achieving high yields requires rigorous attention to details and excellent statistical process control. Wire bonding high-volume lead-frames often generates defect rates below 10ppm, this presents a significant barrier to entry for any process competitor, but copper is meeting the challenge in high-volume manufacturing.

The course will cover:

- Introduction
  - A snapshot of some microelectronic packages
  - Size of the market
  - Cost of a wire bond
- Ultrasonic Welding
  - How ultrasonics effects a materials deformation
  - The principal ultrasonic welding parameters
  - Diffusion
- Intermetallics and Intermetallic Failures- Gold and Copper
  - Formation of intermetallic alloys
  - Diffusion transformations during the life and death of a bond
- Copper wire bonding
  - Effects of bonding parameters
  - Getting started with copper ball bonding
- Wire
- Wedge bond vs ball bond parameters and comparison
- Ball Bumping

Wire bond process engineers, technicians, quality control engineers and managers should take this course.

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Biography

Lee is a consultant for Process Solutions Consulting, Inc. where he provides process engineering consultation, SEM/EDS analysis, and wire bond training. Lee's previous experience includes 20 years as Principal and Staff Metallurgical Process Engineer at Kulicke & Soffa and Distinguished Member of the Technical Staff at Agere Systems. He has been awarded 4 patents, published more than 70 technical papers, and has won both the John A. Wagnon Technical Achievement award and the Daniel C. Hughes award from the International Microelectronics and Packaging Society (IMAPs). Major innovations include copper ball bonding, loop shapes for thin, small outline packages (TSOP and TSSOP, and CSPs) and introduction of DOE and statistical techniques for understanding semiconductor assembly processes. He is an IMAPs Fellow and a senior, life member of IEEE.

Lee is a graduate of Lehigh University, Bethlehem, Pa where he earned a degree in Metallurgy and Materials Engineering.