Failure Analysis of Electronic Devices

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Course Objectives:
The supply chain of electronic devices is large and complex. It comprises designers, component suppliers, board manufacturers and assembly providers. When something goes wrong, the failure mechanism is not always obvious. It is the role of the Failure Analysis team to establish the link between the failure mode and the failure mechanism. Once that link is understood, the path to the solution and the responsible party for it becomes clear. In this course we will review the tools of failure analysis, explaining each technique and what information it provides. Concrete examples will be used.

Who should attend?
This course presents an overview of failure analysis techniques for design engineers, component engineers, and quality engineers who may not be familiar with the physics behind FA tools available to them, internally or externally, to resolve their customer returns or supplier quality issues.

About the Instructor:
Dr. Simard-Normandin has over 40 years experience in microelectronics, specializing in semiconductor device physics, reverse engineering and electrical and material characterization. She has authored or co-authored more than 50 scientific journal and conference papers on microanalysis. Dr. Simard-Normandin holds a B.Sc. in physics from the Université de Montréal, a M.Sc. and Ph.D. in astronomy from the University of Toronto. She was awarded an Industrial Postdoctoral Fellowship from the American Physical Society, focusing on microelectronics, and recently the prestigious Medal of the Faculty of Arts and Sciences of the Université de Montréal. Dr. Simard-Normandin has held the positions of Manager - Materials and Device Analysis at STMicroelectronics' Centre for Microanalysis and Manager of Materials and Structures Analysis at Nortel Networks. In 2002 she founded MuAnalysis Inc., a privately-owned Canadian company offering expertise in failure analysis, materials analysis and reliability testing.

Outline

Introduction
- Why is FA important
- 8D reports
- Supply chain
- Failure modes vs failure mechanisms
- Localisation
- Information you need to gather yourself

The tools of FA and what they tell you with case studies
- Visual Inspection
    - Metallurgical. LSM
- XRAY imaging
    - 2D, 2.5D, 3D

- Acoustic microscopy
  - Plan view, Through-scan
- Thermography
- Decapsulation
- Micro-probing
- Liquid crystal
- Emission microscopy
  - Front side, Back side
  - OBIC, OBIRCH, TIVA
- Micro-sections
- SEM imaging
  - Plan view, Cross-sections , EDX analysis
- Less common but useful
  - FTIR spectroscopy
  - Raman spectroscopy
  - TEM
  - SIMS
  - AES
  - XPS
- Active discrete components
  - Power transistors, diodes, LEDs
- Bond wire failures
- BGA issue examples
  - Dye and Pry
- Passive component FA examples
- Board FA issues

Counterfeit components
- What to look for
- Examples