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PCB Failure Analysis Techniques

Christopher Hunt
9th November 2011

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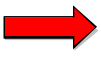
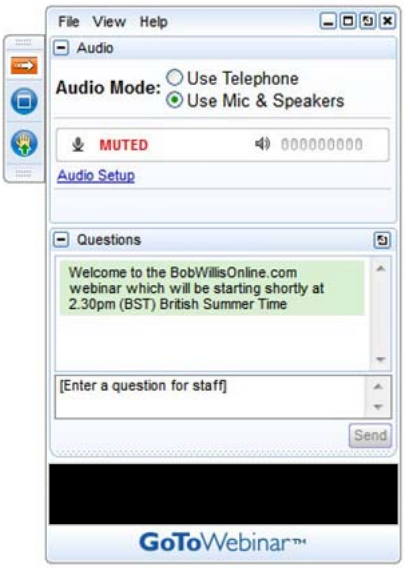
Full screen view

Raise hand for Q&A at the end





Submit text questions during or at the end

Seminar presentation from Bobwillisonline.com

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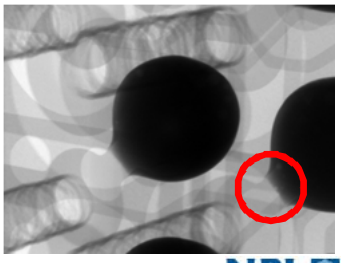
Failure Analysis Requirements

- Information on the failure mode and location
- Examples of failed assembly
- Example of the bare board, same batch
- Listing of assembly process and materials used
  - Solder alloy used and reflow time above liquidus
- Contact details for additional information
- Where were the products produced?
- Order for the investigation work

Optical & X-Ray Examination

- Optical inspection of joints
- Corner joints see most stress
- Look for joint consistency
- Look for good wetting optically and with x-ray
- Measure ball size on the four corners and the centre area
- Compare with known good PCB



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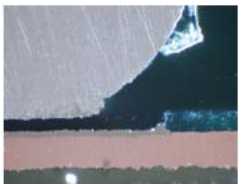
Microsection Samples

- Secure the BGA before cutting
- Corner joints see most stress
- Look for good intermetallic
- Check the nickel/gold plating thickness with reference PCB
- Check pad size to design files
- Compare results with known good PCB assembly sections



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Examination of Bare Board Samples

- Optical inspection of pads for consistent gold coverage and nickel surface topography
- Reference to IPC 4552
- Check for surface contamination like solder mask residues
- Compare surface with know good boards or inspection criteria

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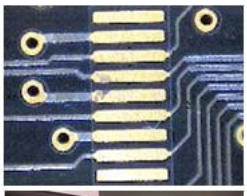
XRF Measurements of Samples

- Measure the plating thickness on multiple pads on the bare board
- Measure any non soldered pads on the board under examination
- Compare with known good PCB
- Compare results with customer, supplier specification and the IPC



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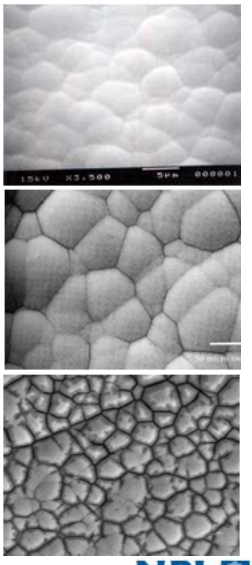
Scanning Electron Microscope SEM

- Examine failed and reference sample under SEM
- Compare the surface of the nickel with reference samples from chemistry supplier
- Look for nickel boundary condition
- Look for significant reduction in solderable area
- Conduct surface analysis on the failed sample and reference good board



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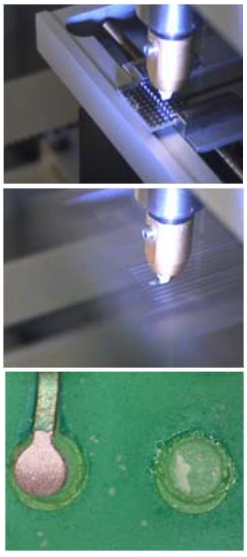
Low or High Speed Shear Testing

- Measure the shear force on sample balls reflowed on reference board and from known good board under the same reflow conditions
- Compare the pad/ball failed surface after shear testing to see consistent failure mode
- Pad interface failures can be examined under optical or SEM



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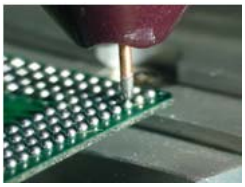
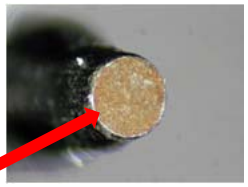
Hot Pull Testing

- DAGE Hot pull force measurement can simulate the reflow process on reference board from the same batch with results from known good board
- Pad or solder joint interface failure can be analysed optically or under SEM after testing
- Example of pad/substrate separation
- Example of solder/nickel separation





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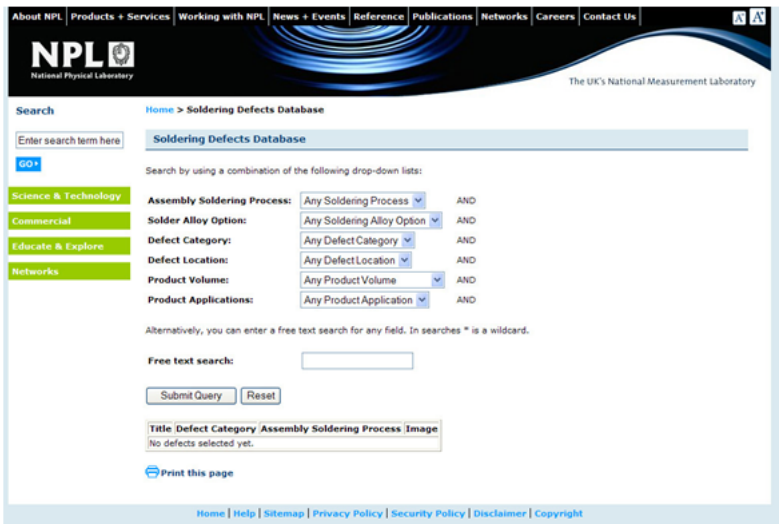

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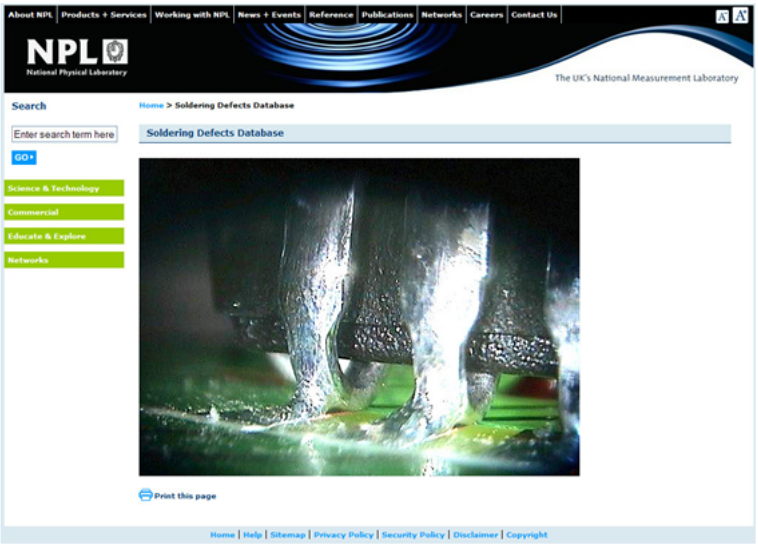

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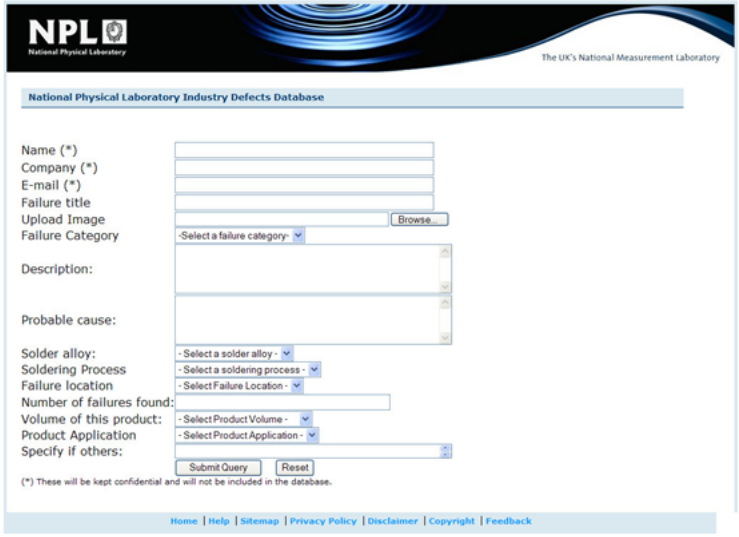

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Thank you for your attention

Any questions?

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