Increase Test Coverage

Higher Density – Large Boards
What's Involved?

Control -
- UUT has an ICT friendly design
- Increase your odds in the manufacturing process

• Don't fight the board
- Let the board select the fixture
Design ICT Friendly UUT

- Even distribution of test pads
- Tooling holes P0.125 on a diagonal, non plated
- Filled/Plugged vias: Plan on probing only  
  Type VII Filled and Capped vias
- Agilent Bead Probes avoid manufacturing issues and  
  place at 0.075" centers
- Probing gold-plated fingers may cause blemishes from probes  
  - Check company quality acceptance practices  
  - Add test point location
- Test pads located 0.0625 away from edge of board, and or 0.125 away  
  from edge of rails.
- Test pad minimum spacing from **component edge to test pad center**  
  0.018" plus half solder pad width per IPC-9850 placement guideline.
Test Pad Location to Component

Half the solder pad width plus probe clearance equals total test pad clearance required.

<table>
<thead>
<tr>
<th>Component Height</th>
<th>X75</th>
<th>X50</th>
<th>X39</th>
<th>X31</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; .080&quot;</td>
<td>.038</td>
<td>.0312</td>
<td>.0264</td>
<td>.024</td>
</tr>
<tr>
<td>&lt; .100&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; .300&quot;</td>
<td>.080</td>
<td>.073</td>
<td>.0684</td>
<td>.0654</td>
</tr>
<tr>
<td>&gt; .300&quot;</td>
<td>.110</td>
<td>.103</td>
<td>.0984</td>
<td>.0954</td>
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</table>

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Probe Spacing Choices

 Probe Plate  Spacer Plate  Termination Plate

Standard Technology

<table>
<thead>
<tr>
<th>Spacing</th>
<th>.039</th>
<th>.050</th>
<th>.075</th>
<th>.100</th>
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</thead>
</table>

X-Probe Technology

<table>
<thead>
<tr>
<th>Spacing</th>
<th>.100 - .075 Spacing</th>
<th>.050 Spacing</th>
<th>.039 Spacing</th>
<th>.030 Spacing</th>
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</thead>
<tbody>
<tr>
<td>Probe</td>
<td>100 mil probe</td>
<td>75 mil probe</td>
<td>50 mil probe</td>
<td>39 mil probe</td>
</tr>
</tbody>
</table>

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Test Pad Minimum Spacing

Relative to Each other

Minimum Recommended Probe / Receptacle Spacing

<table>
<thead>
<tr>
<th></th>
<th>100-Mil Probe</th>
<th>75-Mil Probe</th>
<th>50-Mil Probe</th>
<th>39-Mil Probe</th>
<th>31-Mil X-Probe</th>
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</thead>
<tbody>
<tr>
<td>100-Mil Probe</td>
<td></td>
<td>.085&quot;</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>75-Mil Probe</td>
<td>.068&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-Mil Probe</td>
<td>.048&quot;</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>39-Mil Probe</td>
<td></td>
<td></td>
<td></td>
<td>.039&quot;</td>
<td></td>
</tr>
<tr>
<td>31-Mil Probe</td>
<td></td>
<td></td>
<td></td>
<td>.030&quot;</td>
<td></td>
</tr>
</tbody>
</table>
Increase Your Odds

PCB Manufacturing

- Solder mask clearance from edge of pad P .2mm
- Filled/Plugged vias: Plan on probing only IPC 4761 Type VII Filled and Capped vias
- Copper plated vias and pads can be more difficult due to oxidation and OSP
  - other plating options to consider:
    - ENIG,
    - Immersion Ag or Sn,
    - SAC (SnAgCu)
- Keep lead lengths to 0.050" for 100 – 75 mil probes
  - Probing leads with < 75mil probes is not recommended
- Agilent Bead probes – correct stencil aperture and orientation
The Board Selects...

UUT Characteristics selects the fixture

- Smallest test pad size
- Probe spacing
- Probe count
- Board size
- Test points both sides
- Test access through connectors
- Switching power supplies & regulators
- Thermal loading during test
<table>
<thead>
<tr>
<th></th>
<th>Vacuum</th>
<th>vs.</th>
<th>Pneumatic</th>
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<tbody>
<tr>
<td>Smallest test pad size</td>
<td>0.18&quot;/.016&quot;</td>
<td></td>
<td>0.16&quot;/.016&quot;</td>
</tr>
<tr>
<td>Probe spacing</td>
<td>0.030&quot;</td>
<td></td>
<td>0.025&quot;</td>
</tr>
<tr>
<td>Probe count</td>
<td>9,100</td>
<td></td>
<td>20,000</td>
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<tr>
<td>Max UUT size</td>
<td>19.5 x 21.0</td>
<td></td>
<td>28 x 39.5</td>
</tr>
<tr>
<td>Single or dual sided</td>
<td>Both</td>
<td></td>
<td>Both</td>
</tr>
<tr>
<td>Side access</td>
<td>3 sides</td>
<td></td>
<td>4 sides</td>
</tr>
<tr>
<td>Bi-Level</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Tri-Level</td>
<td>No</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Quad-Level</td>
<td>No</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Component Cooling</td>
<td>y 18 watts @ 90°C</td>
<td>y 35 watts @ 90°C</td>
<td></td>
</tr>
</tbody>
</table>
Smaller Test pads w/Guided Probe

0.016" Test Pad
Probe contacting inner 2/3\(^{rd}\)s of test pad.

Top plate "funnel" drilled slightly larger than probe shaft.

Probe/Socket tilted in mounting hole, UUT pushed to maximum tolerance extreme.

Receptacle mounting and fit are less of a concern when probes are guided.

0.035 Test Pad
Probe contacting edge of test pad.

Probe/Socket tilted in mounting hole, UUT pushed to maximum tolerance extreme.
Guide Plate Options

“Guide Plate” added for Top Side probing

"Quick Plate®" is cut out of the Top Plate
Not enough probable area on the large 307x fixture?

Long wire kit not really an option?

Custom solutions to expensive or turn time too long?
Extended Probing Kit limits

Large usable area:
- 19.5" front to back
- 21.032" left to right

Mandatory keep out areas for pull down Towers.

Transfer probe area if required may reduce available UUT size if Movement to side is not possible.

Vacuum port locations will change to accommodate the UUT positioning.
Extended Probe Field

Normal .250 stroke probes in the 307x rail area and beyond.
Oversize Wireless Options

Near Standard Design  Vacuum or Pneumatic

• Maximum Size UUT without increased T-Board Cost
  – Maximum probe-able UUT size 19.5" front to back and 21" left to right.

• Transfer pins from top access and side access units may affect maximum size.

• Keep out areas associated with tester's pull downs

Custom Wireless Design  Pneumatic only

• Maximum UUT size without keep out areas
  – When money is not a consideration 28.0" x 39.5"

• Lead time based on complexity
Summary

• PCB - design optimized for ICT test.
• Manufacturing - considerations to increase first pass yield and reduce NDFs.
• Increase Test Coverage:
  – Decreased probe spacing 0.8 & 1.0mm
  – Smaller test targets
• UUT - matched to fixture capabilities
• Extended probing up to 19.5" x 21.0"
Questions?