Agilent Medalist
Bead Probe
Technology (AMBPT)

Name
Designation
Presentation Outline
What will we see today?

- In-Circuit Access and Industry Challenges
- Solution: Agilent Medalist Bead Probe Technology (AMBPT)
- Using AMBPT
- Questions
In-Circuit Access
What’s the Problem?

No layout space for targets
  – Board density increasing rapidly
    • More devices, smaller devices, with more device pins – more densely packed
    • Finer trace-space routing – tighter routing restrictions

Targets affect board performance at higher frequencies
  – Targets are 3 to 6 times wider than traces (e.g., 30 mil target on 5 mil trace)
    • Big targets present a lumped capacitance to ground somewhere mid-trace
    • Lumped capacitance creates an impedance mismatch – causes reflections
In-Circuit Access
What’s the Problem?

Board designer perceives unacceptable schedule and performance risks due to “non-value-added” test requirements

– Adding test points disturbs the “best” layout, may hurt performance
– Takes time and skill to do, yet can’t do all that are requested
– Causes friction between Design and Test Departments

No test points, ideal layout

Two added test points
Solution: Agilent Medalist Bead Probe Technology
A New Way of Looking at Access

Old Way (Close Up):
- Place target on the Board
- Hit it with a pointed probe in the Fixture

New Way (Close Up):
- Place target in the Fixture
- Hit it with a pointed probe on the Board
Solution: Agilent Medalist Bead Probe Technology
Solution: Agilent Medalist Bead Probe Technology
Sectional views

End Section

Side Section

Solder
Trace
Mask

FR4

Bead

Trace

FR4

Bead
Solution: Agilent Medalist Bead Probe Technology
Bead Contact with Target

Bead Flattened

FR4

End Section
Wiping Action of Test Probes

- Pointing error inherent to test probes
- As the plunger draws back to the barrel, the tip of probe swings back and forth a few times.
- This creates “wiping action”
- Provide good contact after initial deformation
Solution: Agilent Medalist Bead Probe Technology
Bead probes take on the width of the underlying trace and therefore provide “Layout Independent Test Points”. We don’t have to change the layout to get test access!
Solution: Agilent Medalist Bead Probe Technology
Bead probes, compared to standard test pads have virtually no performance impact.

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Bead probes also have superb high-frequency performance. The board’s normal performance is completely unaffected by their presence.

![Graph showing SIC (Centered) 1, 2, 3 with and without Bumps](image)


Note, some traces had as many as 30 beads.
Solution: Agilent Medalist Bead Probe Technology
How are bead probes made? (The short story)

Bead Probes are created using standard solder paste/reflow technology
  – No new processing steps are required
  – No unusual masking, stenciling or soldering parameters are required

There are two, similar types of Bead Probes
  – Soldermask-defined Beads (on planar copper)
  – Metal-defined Beads (on signal traces)

Manufactured the same way
  – Open a hole in the soldermask over desired Bead location
  – Apply paste with a stencil aperture (same step as all other paste applied)
  – Reflow (same process as all other paste is reflowed)
Solution: Agilent Medalist Bead Probe Technology
How are Bead Probes made? (The short story)

- Solder Mask Opening
- Cu Trace
- Solder Stencil Opening
- Stackup
Solution: Agilent Medalist Bead Probe Technology
How are bead probes made? (The short story)
After stenciling, a paste brick remains that flows into a bead upon heating.
Video Animation of Bead Probe Fabrication

Run video to show Bead Probe Fabrication
THE IMPLICATIONS

It’s proven.
It’s been done ...
Just got to do it the right way.
Fixture vendors

Headless probes

Spring force as per recommendation

Table 4  Various Bead Probe dimensions and the maximum spring force they can support

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Contract Manufacturers

Solder paste mix
Stencil aperture sizing
Reflow
Rework steps
Probe Makers

Flat-face headless probes

Figure 57  Flat-face probe shown with a common paper clip for scale
CAD Engineers

Solder mask opening

Test attributes
Expanding coverage opens doors

VTEP

iVTEP

NPM
Agilent Intellectual Property

- 16 patents and patents-pending
- Filed in the USA and other countries
Licensing

Types of licenses:
- Customer license
- Equipment license
  (for test equipment vendors)
Process for obtaining a Customer License

- Go to [www.agilent.com/see/beadprobe](http://www.agilent.com/see/beadprobe)
- Complete the licensing web-form
- A copy of the license agreement will be made available to you
- You will be contacted by Agilent
- Return the signed agreement to Agilent
- Agilent counter-signs and returns the agreement plus the Bead Probe Handbook
AMBPT wins prestigious EDN Innovation Award of the Year (2007) EM Asia Innovation Award 2007

- Based on product released in 2006. (AMBPT was launched Nov 2006)
- Results and ceremony on 3rd April 07.
- Agilent Medalist Bead Probe announced as Innovation of the Year
- Dr Ken Parker named as one of the finalist for Innovator of the Year

Thank You!

Questions?

See also:

www.agilent.com/see/beadprobe