2-Axis Probe Adapter for DVT-FPPNN Differential Probes (40 GHz to 110 GHz)

Overview

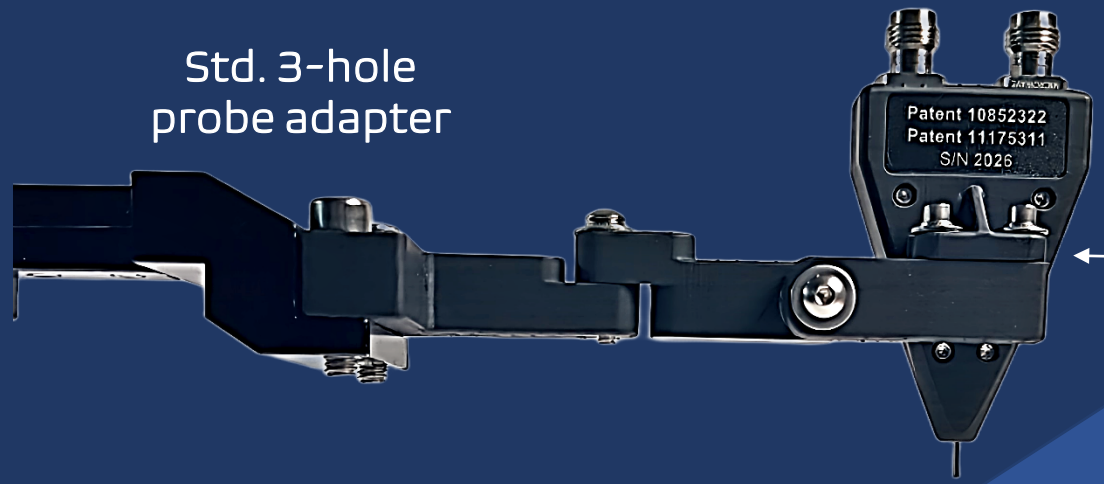
- Assembling the DVT-FPPNN Probe to the 2-Axis Adapter
- Configurations for Probing Vertical or Horizontal Mounted PCBs
- Probing Applications for the 2-Axis Probe Adapter
- Contact Information

Giga Probes

Assembling the DVT-FPPNN probe to the 2-Axis Adapter

Std. 3-hole
probe adapter

Probe positioner arm



Probe Adapter Flange

Attach probe to standard 3-hole adapter using 2 Allen screws.

Arm movement
up/down

Arm movement
left/right

Attach the probe to the 2-Axis Adapter by unscrewing and threading the probe into the flange probe adapter located on the side of the probe.

Giga Probes

DVT-FPPNN Differential 2-Axis Probe Adapter
9 different configurations (top-down view)

Horizontal
Side-by-side probing
- Arm is straight
- Probe on the right or left side
- Probe straight down

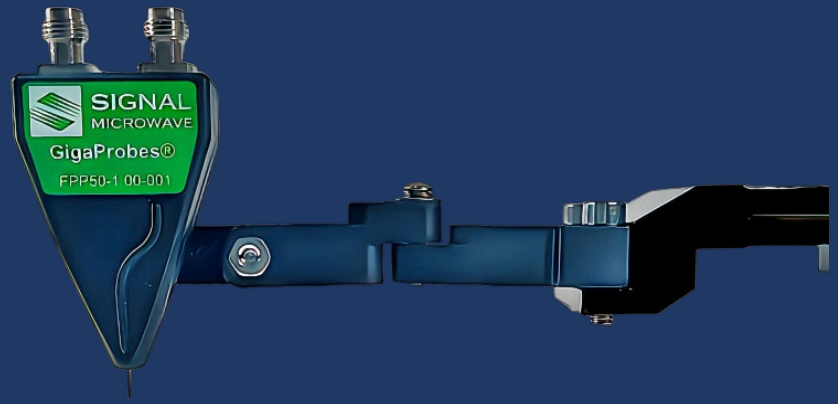
Vertical
Vertically fixtured PCB
- Arm is straight, probe can be placed on the righ or/left side
- Probe is lifted to contact horizontally oriented test pads

Horizontal probing with 45° oriented test pads on a horizontal fixtured PCB
- Probe can be on left/right side
- Probe straight down

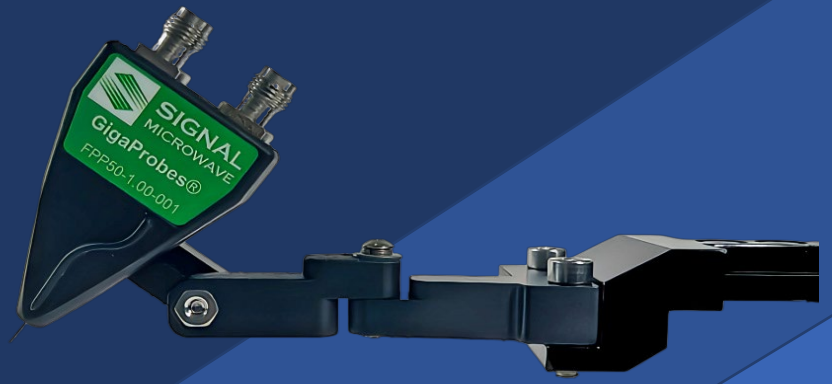
Vertical probing with arm 90° to a vertically fixtured PCB
- Probe is lifted to contact vertically oriented test pads

Horizontal probing: 90° oriented test pads on horizontal fixtured PCB
- Probe can be on left or right side
- Probe straight down

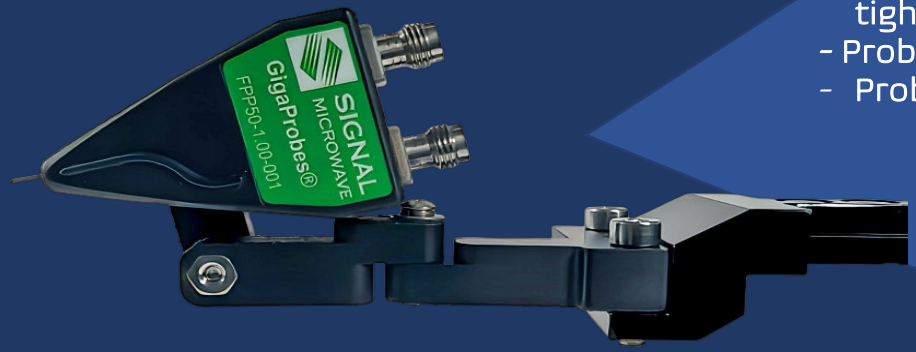
DVT-FPPNN Differential 2-Axis Probe Adapter
3 different probing configurations (side view)



Horizontal Probing: Probe horizontal or Vertically oriented test pads on horizontal fixtured PCB
- Probe can be on left or right side
- Probe arm is in the straight position

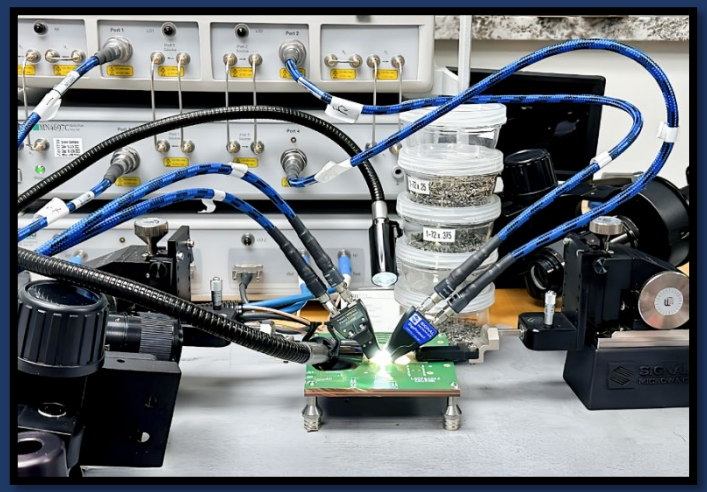


Horizontal 45° probing: Horizontally fixtured PCB
- Probe into deep test sockets or face-to-face tight-pitched test pads
- Probe can be on left or right side
- Probe arm is in the straight position

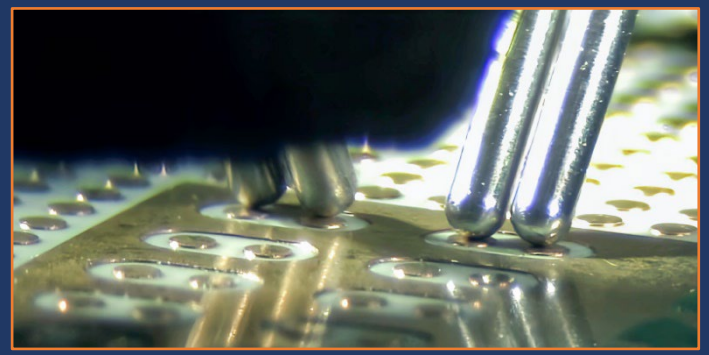


Vertical 90° Probing: Probe horizontal oriented test pads on vertical fixtured PCB
- Probe can be on left or right side
- Probe arm is lifted into position

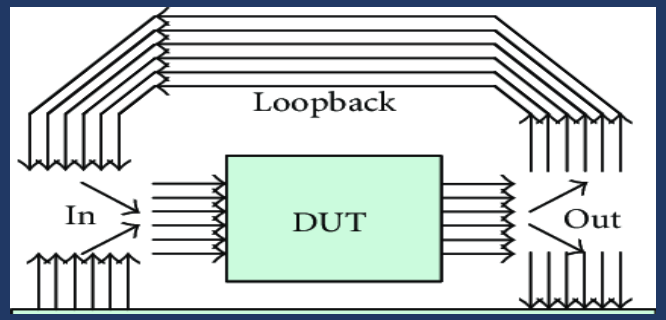
Application: Probe 1 mm pitch differential face-to-face PCI loopback coupons for 40 GHz to 110 GHz S-parameter analysis



Probes are placed face to face on test pads

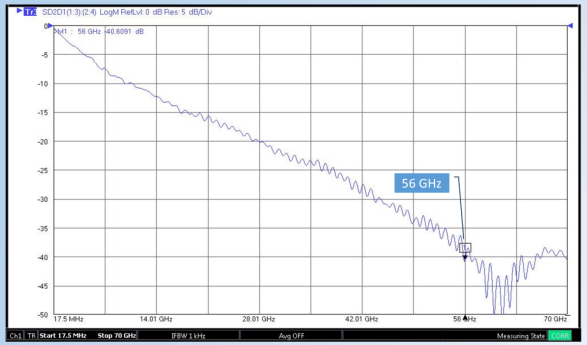


Probe tips placed with 1 mm spacing

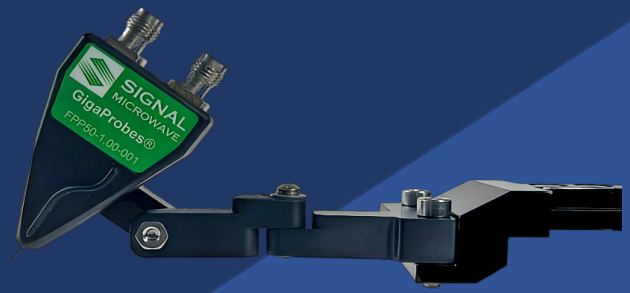


Insertion loss bandwidth measurements are made on differential traces simulating the connection from the input to the output of a semiconductor device.

Row 1 Insertion loss
(Measurement Spec is 56 GHz)

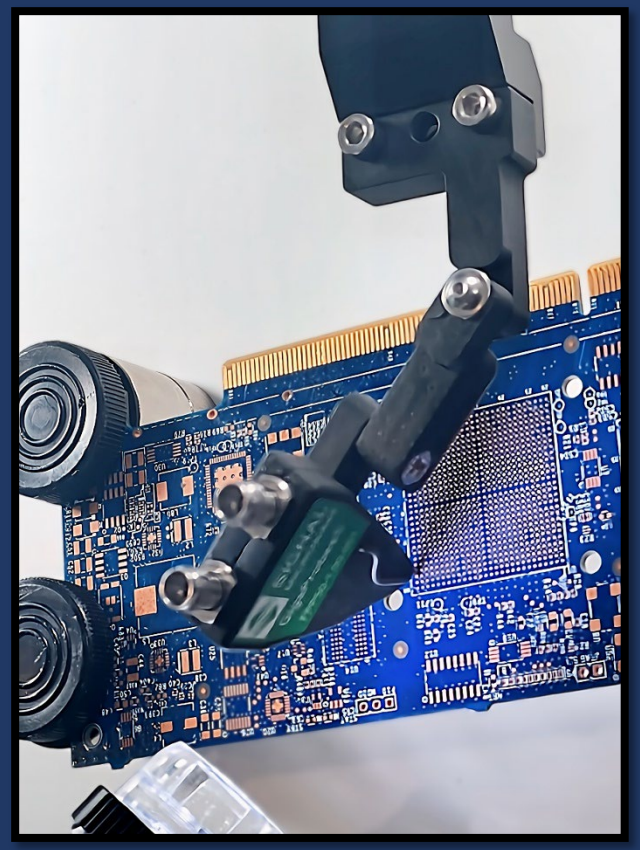


S-parameter measurement to 70 GHz

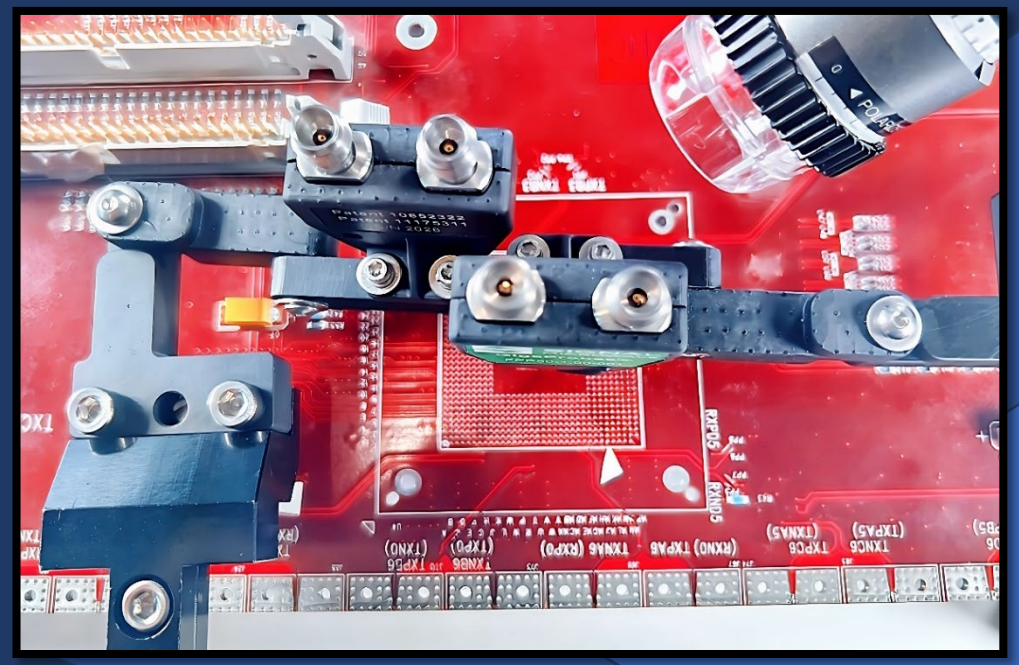


Horizontal 45° probing: Horizontally fixtured PCB
- Probe into deep test sockets or face-to-face tight-pitched test pads
- Probe can be on left or right side
- Probe arm is in the straight position

Application: Probe Test Pads at 0° to 90° or Side by Side

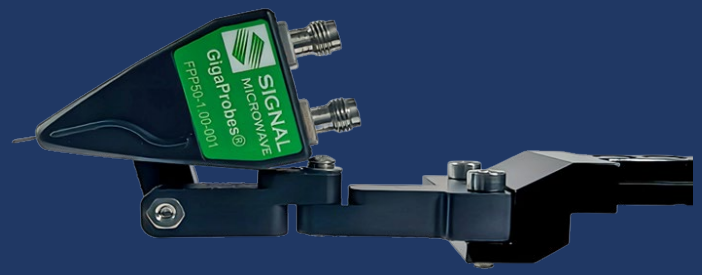


Horizontal probing: 45° oriented test pads
on horizontal fixtured PCB
- Probe can be on left/right side
- Probe straight down

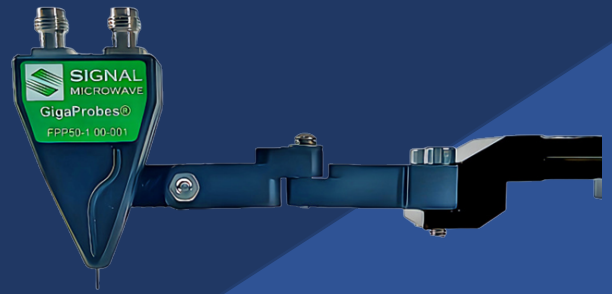


Horizontal probing: 90° oriented test pads
on horizontal fixtured PCB
- Probe can be on left/right side
- Probe straight down

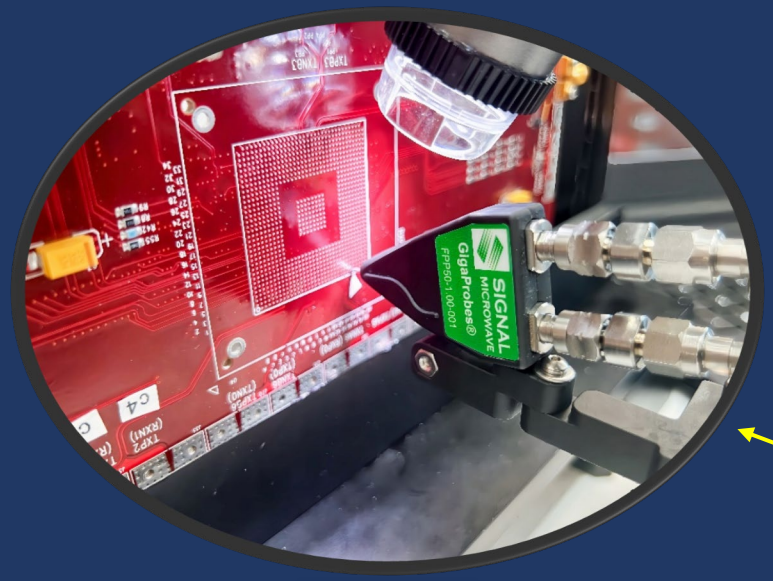
Application: Two-sided Vertical probing of Horizonal or Vertical oriented test pads

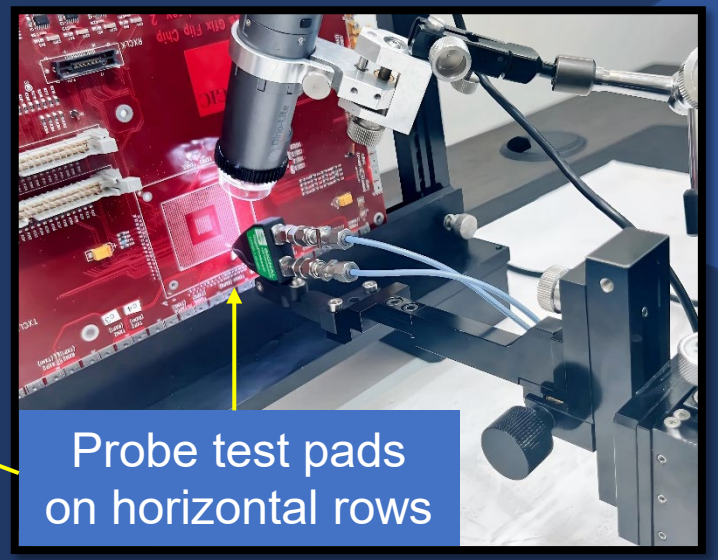


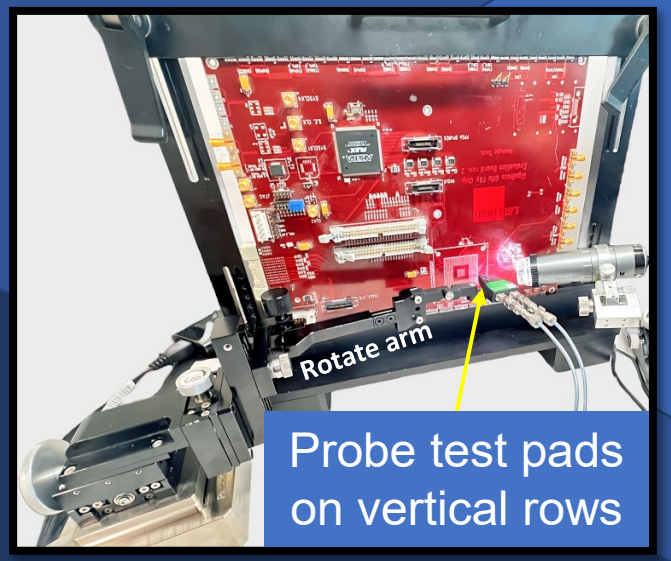
Vertical Probing: Probe horizontal oriented test pads on vertical fixtured PCB
- Probe can be on left/right side
- Probe arm is lifted into position



Horizontal probing: 45° oriented test pads on horizontal fixtured PCB
- Probe can be on left/right side
- Probe straight down

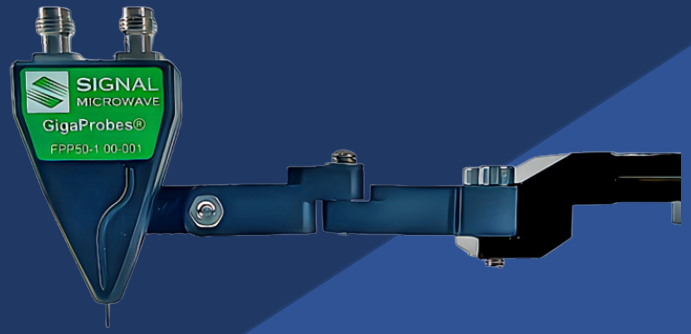




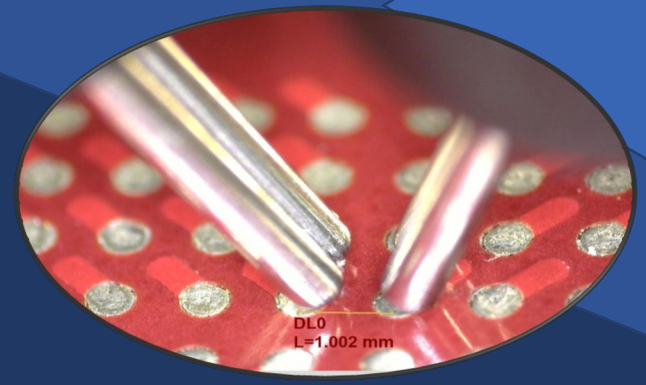


Application: Make accurate camera distance measurements on Probe Pitch and Test Pads

DVT-CS-3 or 1 camera system Dyno-Lite Edge Camera
- Includes software with calibration substrate
- Calibrates line tools to measure probe tips and test pad pitches
- Enables offset probing to probe small test pads with wider pitch probes

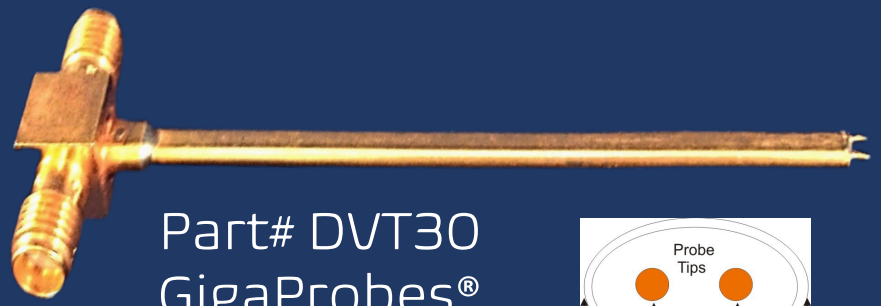


Horizontal probing: 45° oriented test pads on horizontal fixtured PCBs
- Probe can be on left or right side
- Probe straight down

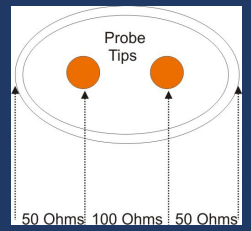


A Short History of the Differential Probe
2005 - DVT30 1st Multi-Mode TDR Probe

DVT Solutions, LLC invents the first true multi-mode balanced differential probe for TDR impedance measurements, under the GigaProbes™ trademark. It is used to test differential traces used in differential interfaces for LVDS semiconductor devices.



Part# DVT30
GigaProbes®



Time Domain Impedance Measurements

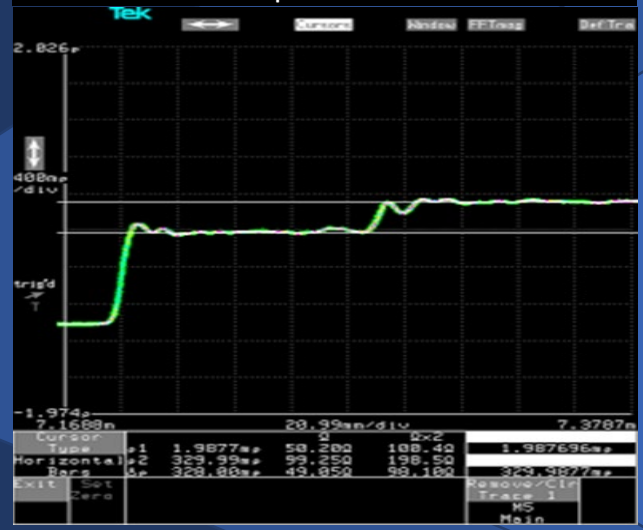


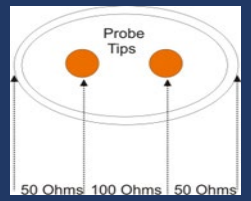
Fig 1
Differential measurement
with DVT30 probe

Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

A Short History of the Differential Probe
2011 - DVT40 1st Multi-Mode TDR & VNA Probe

Introduces a 40 GHz differential multi-mode balanced probe for differential VNA or TDR/T frequency and time domain measurements at DesignCon 2011.

Part# DVT40
GigaProbes®



Multi-Mode
Impedance

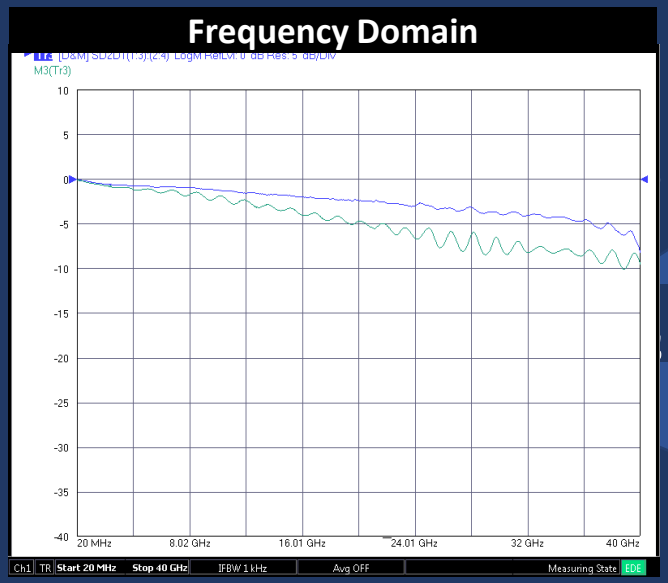


Fig 2
ISD Differential Probe De-embedding

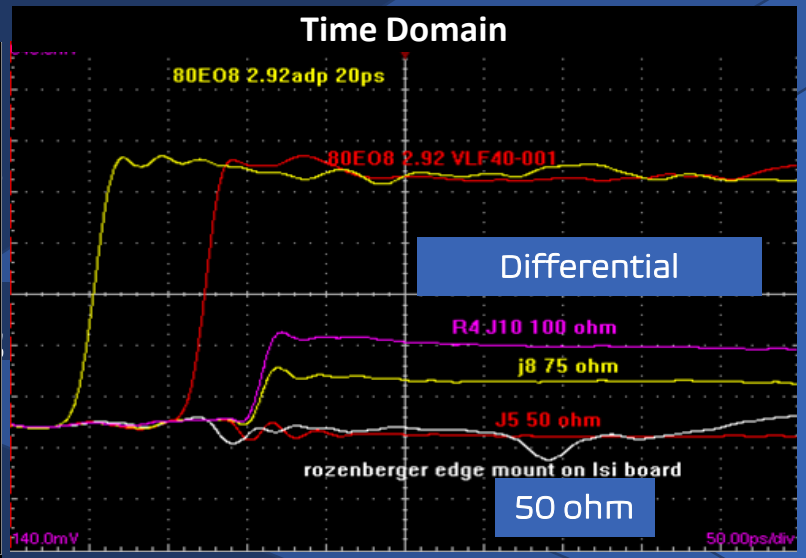
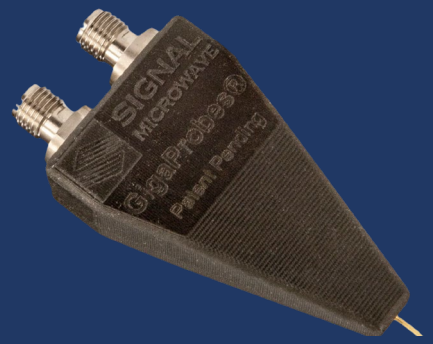


Fig 3

Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

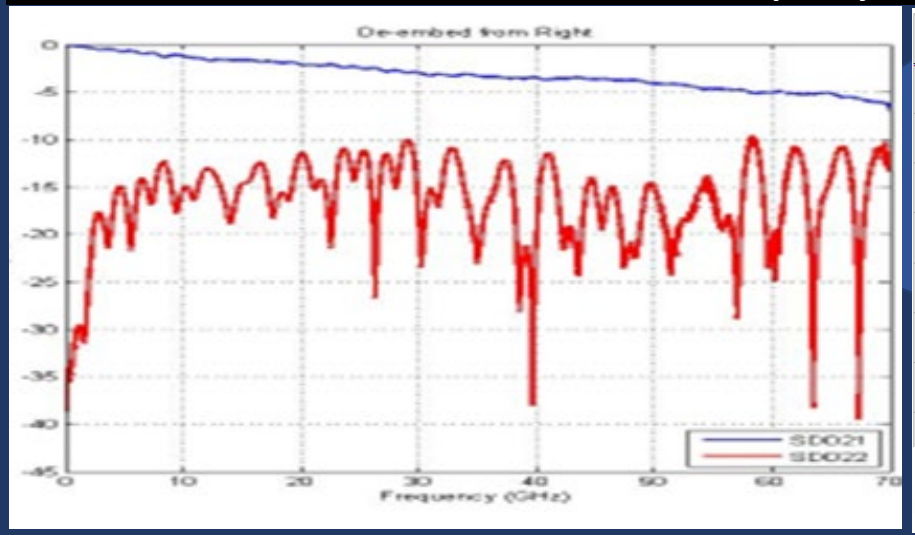
A Short History of the Differential Probe
2019 - DVT-FFP70 1st 70 GHz High-Fidelity PCB VNA Probe

- Introduces 40 GHz, 50 Ghz and 70 GHz High-Fidelity differential 1 mm pitch probes. NEW *patented* design, replaces internal probe wires with a 70 GHz PCB with differential traces.
- US Patents, 10852322 and 11175311 awarded jointly to DVT Solutions & Signal Microwave for probes using PCB for its internal differential interconnect.

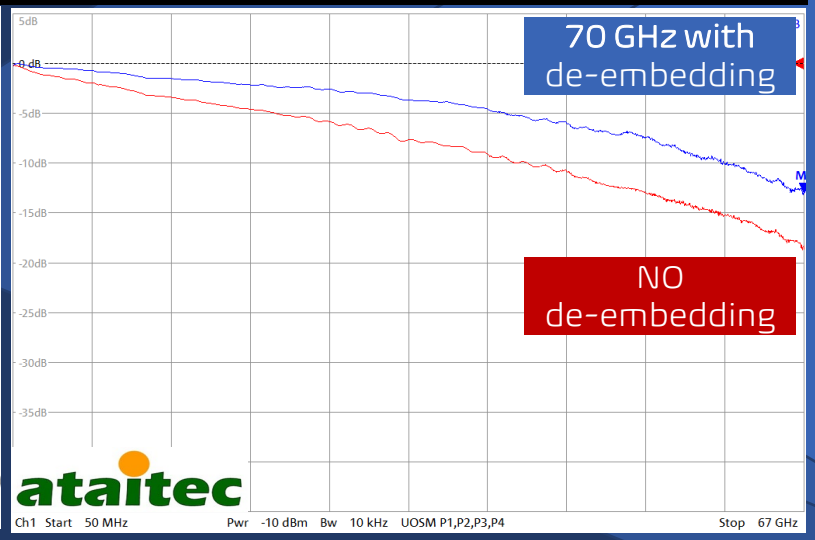


Part# DVT-FFP70
GigaProbes®

Frequency Domain



70 GHz



ISD Differential Probe De-embedding

A Short History of the Differential Probe
2020 - Differential Probe De-embedding

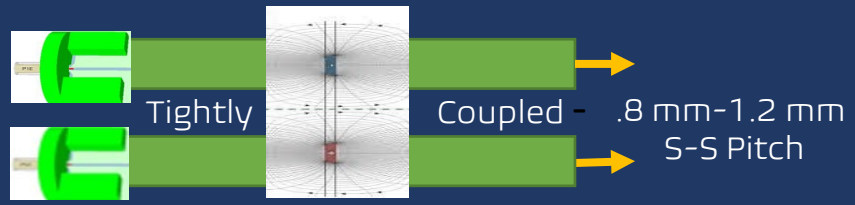
- Adds differential probe de-embedding using Ataitec ISD Software
- In-Situ De-embedding (ISD) is known for the "impedance corrected method" invented by AtaiTec
- Mitigates non-causal DUT simulation results
- Provides better correlation to improve de-embedding accuracy
- Improves differential probe bandwidth performance

Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

True Differential Probe Architecture

"Use a Differential Probe to Measure a Differential Trace"

Fig 4: Internal Differential Probe PCB Design



Balanced Differential Impedance
No Ground

True Differential Probes

Fig 5: DVT-FFP70 True Differential Probe

No Ground

- Patented High-Fidelity differential probe with internal printed circuit board (PCB) with two tightly coupled balanced differential 70 GHz trace conductor's
- No ground probe required. Only two Signal – Signal probe tips, reduces setup time
- 1 mm wide-pitch 70 GHz bandwidth measurements
- Offset probing pitch range .8 mm to 1.2 mm @ 70 GHz bandwidth
- Excellent common mode rejection prevents lab equipment noise from interfering with probe measurements

Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

Giga Probes

Touchtone (SnP) S-parameter Measurements

Differential vs DUAL Wafer Probe

4 port VNA Differential Probe S-parameters

Must Convert Single-Ended S-parameters Mix-Mode Differential to view SDD21/SDD11

Single-Ended to Mixed-Mode S-Parameters Conversion Equations

Differential-Differential	
SDD11 =	SDD12 =
0.5(S11-S13-S31+S33)	0.5(S12-S14-S32+S34)
SDD21 =	SDD22 =
0.5(S21-S23-S41+S43)	0.5(S22-S24-S42+S44)

True Differential Probe

- Touchtone File: Differential SDD21/SDD11 S-Parameters no Common mode
- Bandwidths : 40 GHz to 70 GHz
- Pitch Center 1 mm, .8 mm – 1.2 mm

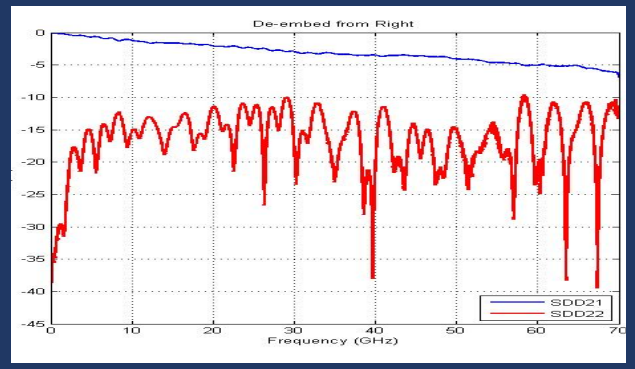


Fig 6: SDD11/SDD12 Differential S-Parameters Measurement Plot from VNA Display

4 port VNA DUAL Wafer Probe S-parameters

DUAL Wafer Probe

- 50-ohm probe. Measurements from DUAL *50-ohm cables. Isolated S*ignals with physical grounds (GSSG)
- Measurements: 16 Single-Ended S-parameters

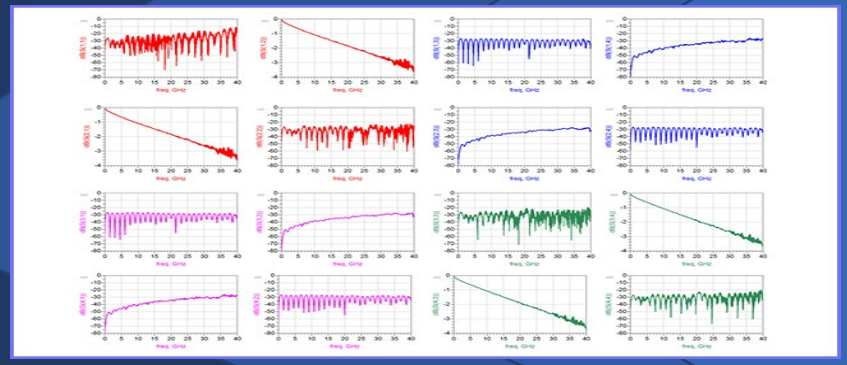


Fig 7: 16 Single-Ended Differential S-Parameter Measurement Plot

Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

Electrical Characteristics

Differential Probes

- Available from: DVT Solutions, Inc. since 2005
- Differential Probe Bandwidth measured at 1 mm pitch
- **De-embedding**: Use the AtaiTec ISD de-embedding tool to remove probe loss and set the reference plane to the probe tips.

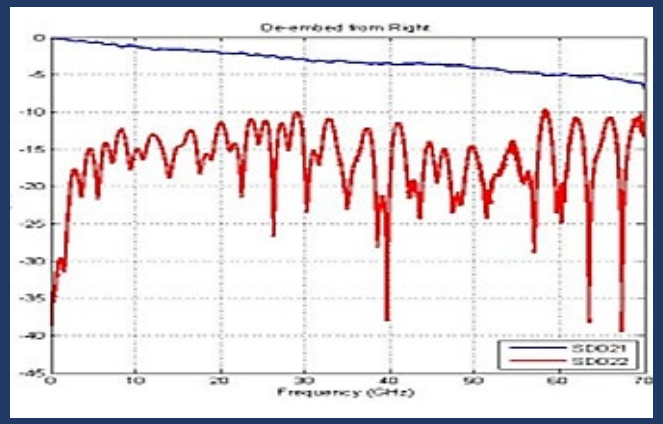
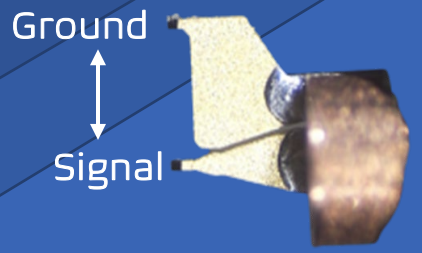


Fig 8: SDD11/SDD21 bandwidth plot for DVT-FFP70 70 GHz differential probe measured at 1 mm pitch

DUAL Wafer Probes

- Available from: GGB, Ind., GTL, MPI and Formfactor, since the 1980's
- Probe Bandwidth determined by Ground-to-Signal probe pitch
  - Wider pitch = lower bandwidth
- Probe Bandwidth measured with 50 um to 200 um probe pitch (~1 mm pitch bandwidth reduced ~60%)
- **Calibration**: SOLT/TOSM



Probe Pitch is the distance between Signal and Ground or Signal and Signal.

Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

Differential Probing Applications

- Time and Frequency measurements from "*final* prototype PCB product *form*" are verified against design specifications using visual analysis from VNA/TDR instruments
- Use DVT-FFP70 70 GHz differential probe to measure differential traces for 56 GHz Nyquist S-parameter of Pulse Amplitude Modulation 4-level (PAM4).

- With VNA, perform "Hot" (i.e. while chip is active) Return Loss Measurements on Transmitter/Receiver

Fig 9

- Characterize transmission path from transmitter output to scope input, using VNA. Scope de-embeds resulting S-parameters

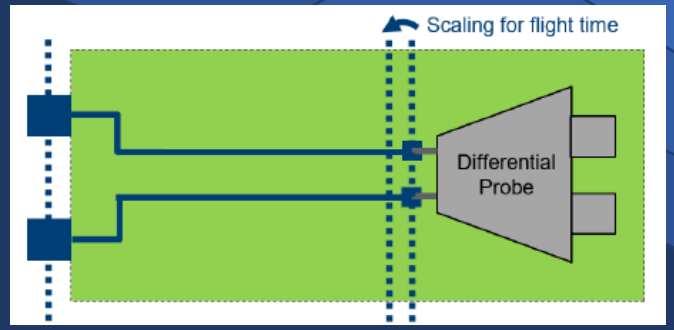


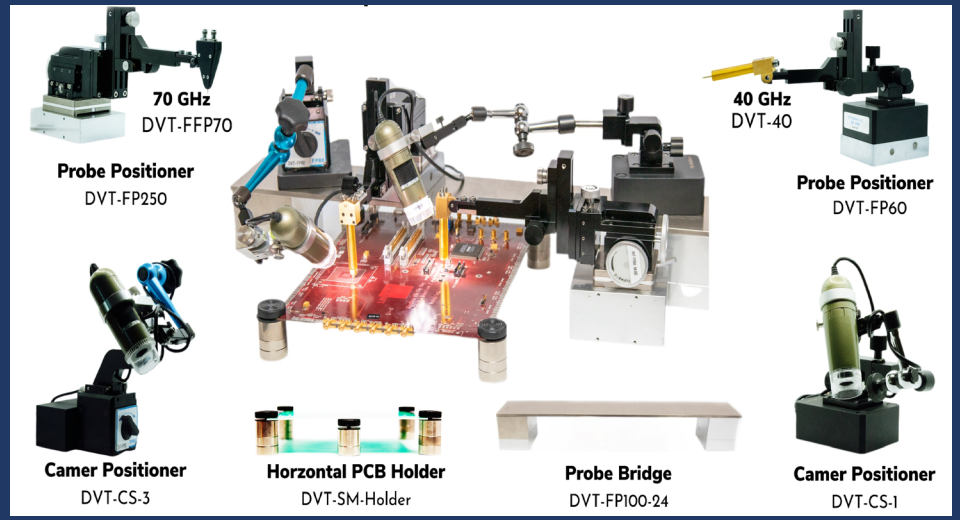
Fig 10

Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

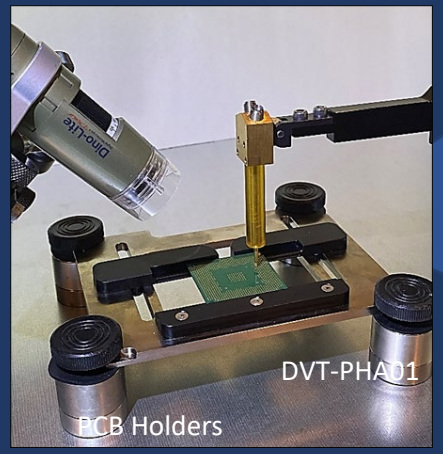
Desktop Probing System

Horizontal

Probe Large Horizontal Boards



Probe Small Boards



Configure a Modular Horizontal Probe System

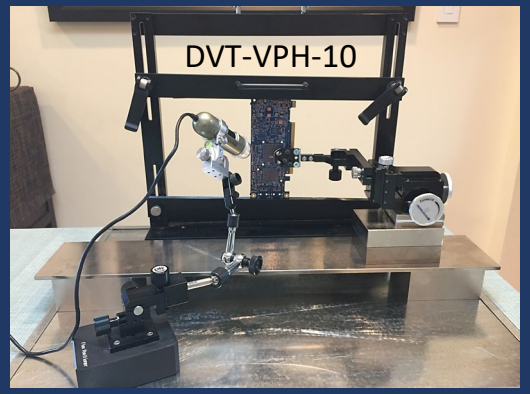
- Choose probe based on Bandwidth and Probe Pitch
- Determine size of PCB to be probed
- Select:
  - Probe Positioner & Camera system
  - Horizontal Fixturing:
    - PCB Holders and Probe Bridge
  - Probe System Size Location
    - 4' x 4' area on Table or Bench
    - Access on all 4 sides is preferred

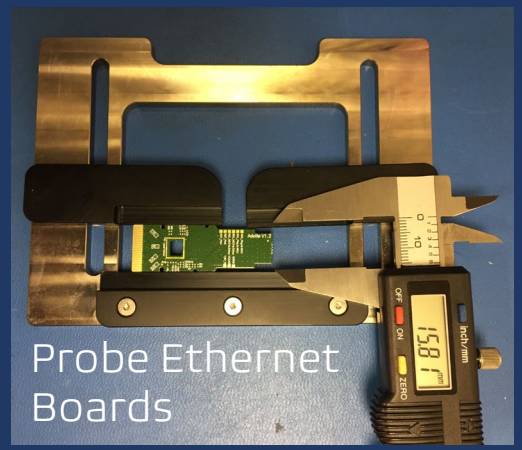
Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

Giga Probes

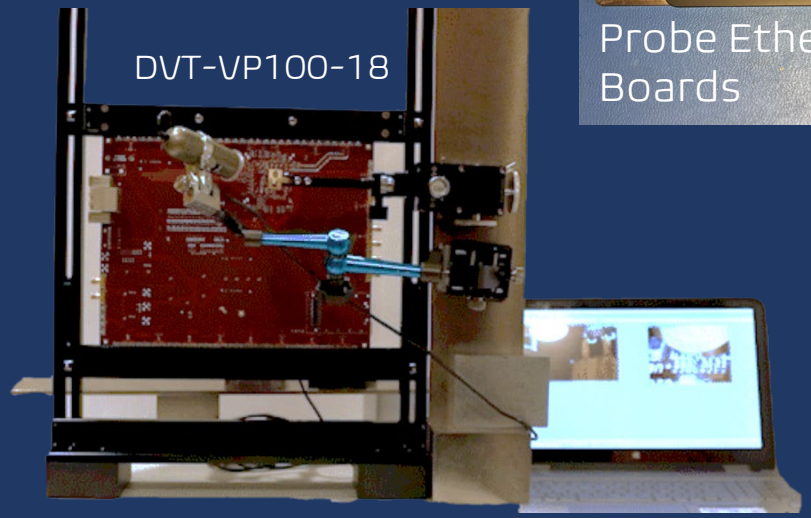
Desktop Probing System

Vertical

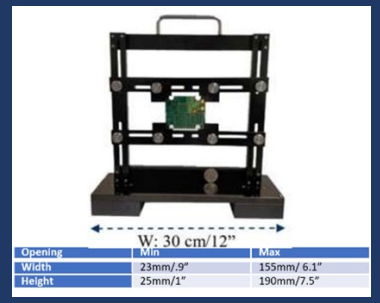




Place DVT-PHA01 in the DVT-VPH100-10, DVT-VP100-18 or DVT-VPH80 vertical fixture.



DVT-VPH-80



Configure a Vertical Probe System

- Choose probe based on Bandwidth and Probe Pitch
- Determine size of PCB to be probed
- Select:
  - Probe Positioner & Camera system
  - 1 Camera and Probe Positioner per side of Vertical Fixture
  - One or more Probe Bridges to Hold Camera/Positioners
  - PCB Vertical Fixturing:
    - Choose Vertical fixture to fit PCB sizes
  - Probe System Size & Location
    - 4' x 4' area on Table or Bench
    - Access on all 4 sides is preferred

Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

Giga Probes

Key Takeaways

- Rugged Wide-pitch probe design for probing printed circuit boards
- Bandwidth specifications measured at 1 mm pitch
- True balanced differential probes - No ground probe required
- Contains two Signal – Signal conductors
- Acquires differential S-Parameters SDD21/SDD11, stored to Touchtone files
- Use Ataitec ISD software to de-embed probe and to solve difficult measurement applications

Brian Shumaker, President DVT Solutions - sales@gigaprobes.com

Giga Probes

For further information, contact:

Brian Shumaker, President, DVT Solutions

Telephone: 1-650-743-5669
Email: sales@gigaprobes.com

Address: 9045 Artisan Way
Sarasota, FL 34240

Website: Gigaprobes.com