TDA Systems. The Interconnect Modeling Company™

Interconnect Probing Quick Guide

Probe Quick Tips

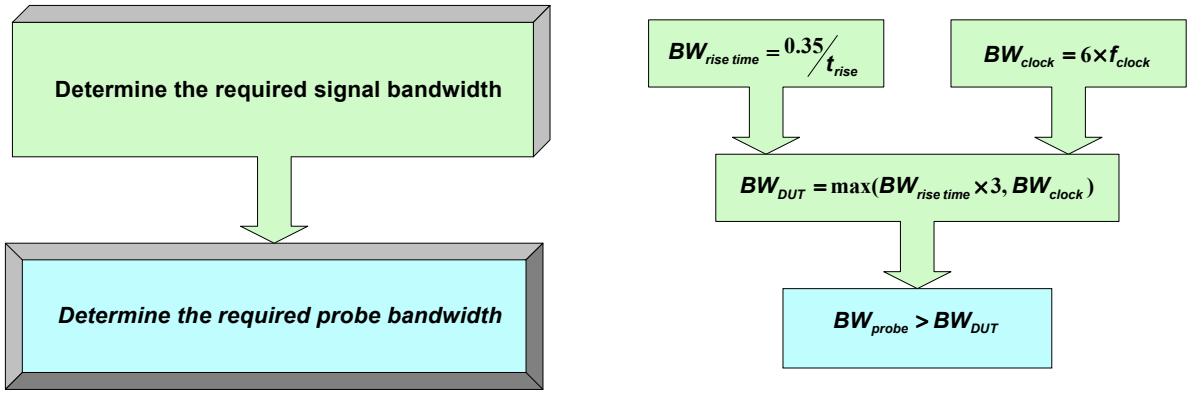
- A probe must ensure a stable repeatable electrical contact to the Device Under Test (DUT)
- Select a probe with 50 Ohm characteristic impedance for Time Domain Reflectometry (TDR) measurements. High input impedance probes will distort the TDR waveforms
- Use the probe with a small signal to ground current return path to minimize the parasitic inductance of the probe
- Define locations for the signal and ground connections on the DUT. Use the same small signal to ground spacing if possible
- Small fixed signal to ground spacing results in higher probe bandwidth and higher accuracy measurements
- Variable signal to ground spacing means variable (and often lower) bandwidth, and typically more complex setup
- Choose the probe tip material that will achieve low contact resistance between the probe and the DUT pads
- Select the probe tip size according to the size of the DUT pads
- Determine the height difference between the signal and ground contacts and select the probe with sufficient compliance
- Analyze any special requirements that you may have and choose the probe accordingly

Mechanical and Electrical Interfaces for the Probes and the DUT

- Probe stations and positioners will provide mounting and positioning mechanisms for the DUT and the probes, and will allow the probe to access the DUT contact areas
- Determine the connector types on the probe and the measurement instrumentation and use quality high-speed coaxial cables with compatible connectors or adapters
- Ensure that an appropriate mounting mechanism for your DUT is provided. Alternatives include vacuum, clamping mechanisms, double-sided adhesive tape
- Estimate the size of your DUT and verify that sufficient area on the probing station is available. A large area Printed Circuit Board (PCB) may require special positioners with longer arms to access remote areas on the board
- Ensure that there is enough area and an adequate mounting mechanism for the positioners on the probing station. Typically, positioners are mounted using integrated vacuum or magnetic bases.
- Determine whether a microscope is required to view the DUT and position the probe on the DUT contact areas. Verify that the probing station has a microscope mounting mechanism
- Analyze if over-temperature characterization is necessary and ensure that a temperature control system with an appropriate temperature range is available

Defining the Required Probe Bandwidth

The probe bandwidth that is required to propagate the measurement signals without distortion must be determined from the signal rise time or system clock frequency



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Probing and Fixturing Approaches Pros and Cons

Probing		Fixturing	
Pro	Eliminate the cost of any additional fixturing and measurement de-embedding hardware	*Pro*	Accommodate any specific measurement system by designing the fixture to match the measurement system interfaces
Pro	Provide a cost-effective solution for large amount of measurements of multiple devices of different types	*Pro*	Use inexpensive measurement interfaces (Example: coaxial connectors on the board)
Pro	Generate DUT models that do not include any external effects, and can be later used in the simulations of an arbitrary system	*Pro*	Evaluate the DUT in its intended environment of use (example: a package soldered on the board or mounted in the socket), simplifying inclusion of the model in the simulations of a specific design
Pro	Use a variable pitch[1] probe to access any pair of signal and ground contacts on the DUT	*Pro*	Eliminate the need for easily accessible contact areas directly on the DUT
Pro	Complement the fixturing solution by providing a high performance, robust, flexible measurement setup	*Pro*	Develop interfaces to high-performance probing solutions (Example: contact pads for high-performance microwave probes)
Con	Solution may not be cost-effective for single device measurements	*Con*	Device-specific solution may not be cost-effective for testing of different type DUTs
Con	Require easily accessible contact areas on the DUT	*Con*	Can not use the fixture for the DUT of a different type
Con	Variable pitch probes may decrease the measurement bandwidth and accuracy	*Con*	Need to define the test points on the DUT well in advance, during the fixture design process
Con	May require a high cost precision positioning system for accessing small contact areas on the DUT	*Con*	Must de-embed the fixturing from the DUT measurements

References

[1] Tom Lecklider, "Scope Probes Clinch Signal Integrity,"—*Test and Measurement World*, June 1997, pp. 22-29
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[3] Art Porter, "Differential Measurements Compensate for Imperfect Grounds,"—Test and Measurement World, September 1996, pp. 29-31
[4] *High-Speed Digital Microprobing, Principles and Applications*, —Cascade Microtech Application Note, March 1991
[5] *High-Speed Probing*, —Tektronix Applications Note, June 1998
[6] *Feeling Comfortable with Probing,* —Hewlett Packard Tutorial, 1995
[7] *ABCs of Probes*, —Tektronix Tutorial, 1998
[8] *Differential Measurements on Wideband Signals*, —Hewlett Packard Application Note, 1992

[1] Pitch—center-to-center spacing between the signal and ground contact areas

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