Agilent N4850A/N4860A Digital Probes for DigRF v3

Design Guide

Agilent Technologies

Notices

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This manual is available online at www.agilent.com. It is not an orderable part.

Agilent Technologies, Inc.
1900 Garden of the Gods Road
Colorado Springs, CO 80907 USA

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1
Introduction

About this Document

This document will help you design a board so that it may be tested using the Agilent N4850A digital acquisition probe and the Agilent N4860A digital RF stimulus probe.

NOTE The information in this Design Guide is preliminary. Some of the recommendations may change as experience is gained with a variety of IC and test board designs .

Product Overview

The Agilent N4850A digital acquisition probe connects an Agilent Technologies logic analyzer between the baseband and RF components on a device under test, to allow decoding and display of DigRF V3 signals. The acquisition probe may be connected to a production board, as long as it incorporates the necessary connectors, or the probe may be connected to a test platform.

The Agilent N4860A digital RF stimulus probe allows you to generate the digital signals, emulating either a baseband IC or an RF IC. The stimulus probe is usually connected to a test platform which contains only one of the two chips.

Connection to the device under test

The Agilent N4850A acquisition probe uses the same 90-pin probe cable as the Agilent 1695x-series logic analyzer. That allows you to choose from a variety of probes to make the physical connection. See Probing Solutions for Logic Analyzers, available from www.agilent.com/find/logic.

The Agilent N4860A stimulus probe is connected using three SMA cables.

The parts of a measurement system

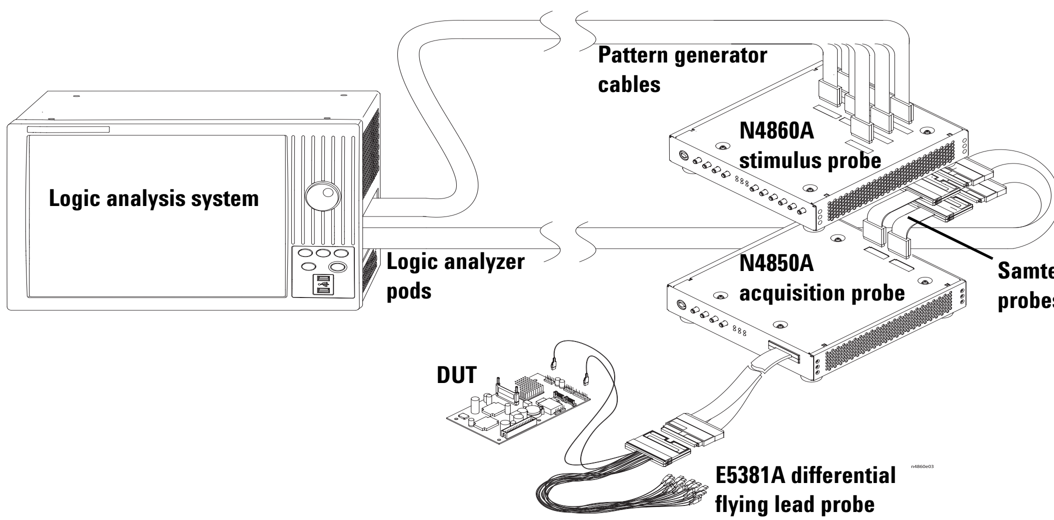


Figure 1 A complete measurement system

The device under test (**DUT**) is your board, which might include an RF IC, a baseband IC, or both.

The Agilent N4850A digital **acquisition probe** captures the digital signal between the two ICs. A **differential flying lead probe** (or another kind of probe, if needed) connects the DUT to the cable on the acquisition probe.

The Agilent N4860A **stimulus probe** can emulate an RF IC or baseband IC by supplying the missing digital signals. The stimulus probe connects to the DUT via 50-ohm coaxial cables using SMA connectors.

The Agilent N4860A stimulus probe *must* be used with an N4850A acquisition probe. The acquisition probe and stimulus probe are connected to one another through a short **option cable**.

A **logic analysis system** collects data from the acquisition probe and controls the stimulus probe. The logic analysis system must contain at least one **logic analyzer** card. For stimulus with the N4860A stimulus probe also requires a **pattern generator** card.

Each of the cables coming out of the logic analyzer card is called a **pod**. These pods require adapter cables, called **Samtec probes**, to mate with the connectors on the acquisition probe and stimulus probe.

For some logic analyzers, the logic analyzer card and pattern generator are built in, rather than being separate cards.

Software installed on the logic analysis system decodes the digital RF data and displays it as digital waveforms, as decoded packets, or as an RF signal.

Additional Information Sources

See the N4850A/N4860A product data sheet for a description of the product and its characteristics.

Detailed information on Agilent probes (such as the Agilent E5381A differential flying lead probe) is available by searching for the product number at www.agilent.com.

Additional application notes or white papers may be available from your Agilent representative.

2
Designing connectors for use with the N4850A acquisition probe

Overview

1 Decide where to probe the signals. The following table lists some options.

Table 1 Locations where the bus can be probed

Connection location	Advantages and disadvantages
Each signal probed near the destination chip. (Rx signals probed near the baseband IC, Tx signals probed near the RF IC.)	Each signal is probed near its destination. Requires use of flying leads. **This is the method that makes it the easiest to achieve good signal quality.**
All signals probed at one end of the bus.	Can be probed with a single, compact connector. Great care must be taken to maintain adequate signal quality—some signals may be probed too far from their destination chip to get adequate signal quality.
In the middle of the bus.	Can be probed with a single, compact connector. Great care must be taken to maintain adequate signal quality for all signals.

2 Decide which probe to use.

The probe uses the same 90-pin probe cable as the Agilent 1695x-series logic analyzer. That allows you to choose from a variety of probes to make the physical connection.

The probe you choose must meet the following requirements:

- The probe must have 90-pin logic analyzer connector.
- The probe must be able to probe differential signals.

See the sections which follow for more information on some recommended options. Be sure to read the design notes for the Agilent E5381A flying lead probe, no matter which probe you are using.

3. If you are using the flying lead probe (page 21), decide what kind of header to place on your board.
4. Decide which signals, if any, will be required for stimulus.
5. Design the transmission lines for the best signal quality.
6. Lay out footprints for the connectors you will using.

Using Agilent E5381A differential flying leads

The differential flying lead probe set has the flexibility of probing both differential signals as well as single-ended signals. Depending on the your connection, you have analog bandwidths up to 1.5 Gb/s (well beyond what is necessary for 312 Mbps signals. This probe is best used when the signals must be probed at the receivers (that is, when a series termination scheme is used or when parallel termination does not yield a reflectionless signal in the middle of the wire).

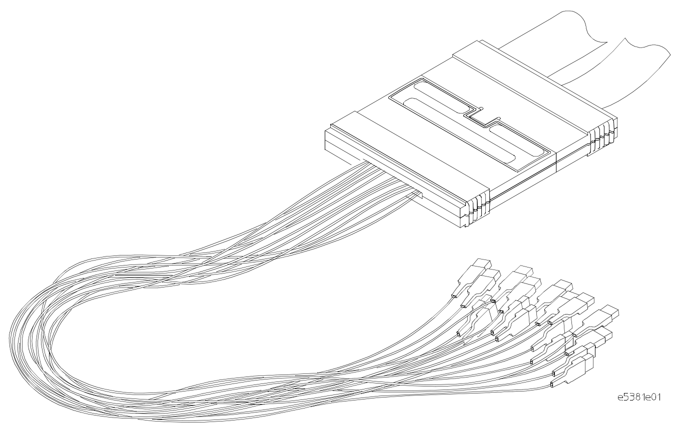


Figure 1 E5381A differential flying leads

Design notes

- Keep all connection points within about 38 cm. (15 inches) of each other.
- Both single-ended and differential signals can be probed.
- The tip of the each lead has positions for three pins, but the middle pin is not electrically connected to anything:

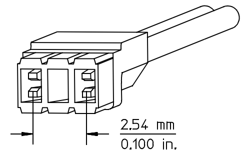


Figure 2 Tip of a flying lead

- Multiple adapters can be used side-by-side or in tandem by skipping one or more pins. Note that the body of the probe head precludes placing them back-to-back (see "Using socket adapters" on page 16 for more information on this).
- See the Agilent *E5381A Differential Flying Leads User's Guide* for more information on the probe and how to install it. To obtain this document, search for "E5381A" at www.agilent.com.
- Agilent recommends that you check the quality of each signal with an oscilloscope when you first connect the N4850A acquisition probe to your DUT. Plan for a way to probe each signal with an oscilloscope while the acquisition probe is connected.

Signal-to-channel mapping

Table 2 Connections for E5381A flying leads

Signal	Lead to connect	Comments
SysClk	Ch 3, positive	
SysClkEn	Ch 4, positive	
Vsense	Ch 6, positive	Required if using the N4860A stimulus probe. Optional if using the N4850A acquisition probe alone.
TxDataP	Ch 8, positive	

Table 2 Connections for E5381A flying leads

Signal	Lead to connect	Comments
TxDataN	Ch 9, positive	
RxDataP	Ch 15, positive	
RxDataN	CLOCK, positive	

The TxData and RxData lines are probed both as single ended and differential, even though the your physical connection is only single ended. This is done so that the “sleep” state, where positive and negative signals go to almost the same voltage, can be unambiguously detected.

The negative sides of all of these connections *must* be connected to ground.

Laying out pads for the 3-pin headers

See the Agilent *E5381A Differential Flying Leads User’s Guide* for dimensional drawings of the pad sizes for the 3-pin headers and equivalent load models that include the 3-pin header. One example of a 3-pin header is Samtec part number FTR-103-02-S-S.

RxDataP and RxDataN

Probe as close as possible to the chip which receives the data; in other words, place the connector near the pads of the baseband IC. You can probe RxDataP and RxDataN using two 3-pin connectors as follows:

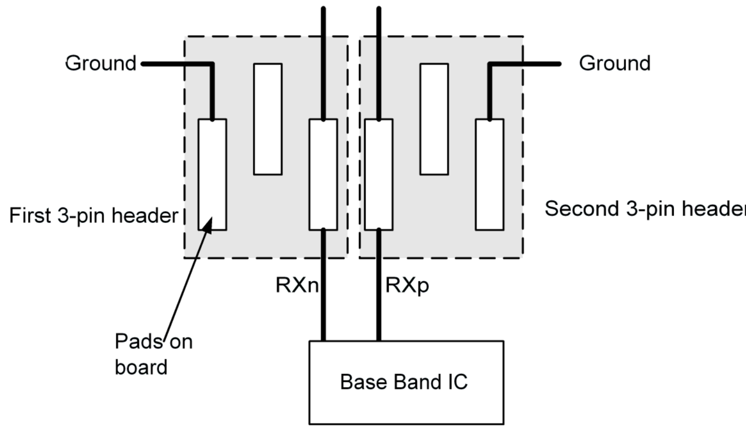


Figure 3 Rx signal connections for side-by-side 3-pin headers

Be careful of the spacing between the 3-pin headers. There must be 0.1 inch between pins:

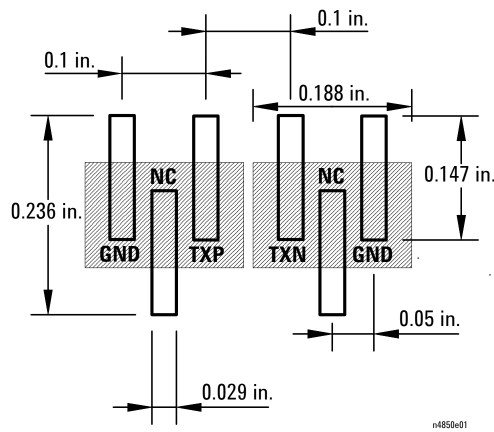


Figure 4 Spacing of pads for two side-by-side 3-pin headers

TxDataP and TxDataN

Lay out the 3-pin headers in the same way as you did for RxDataP and RxDataN. Probe as close as possible to the chip which receives the data; in other words, place the connector near the pads of the RF IC.

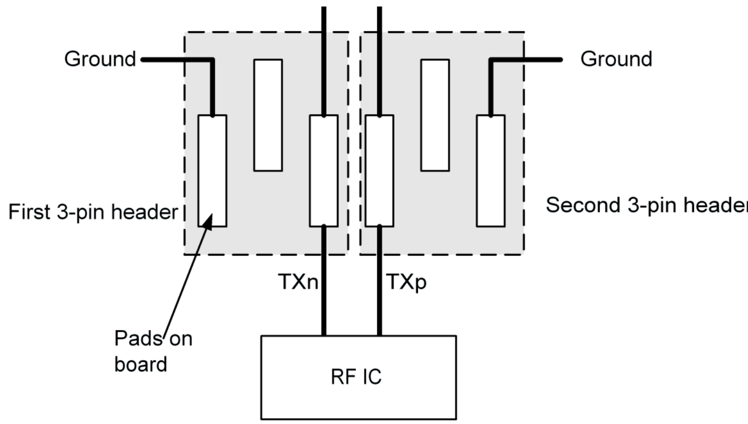


Figure 5 Tx signal connections for side-by-side 3-pin headers

SysClk

Probe SysClk near the receiver. Take care to ensure good signal integrity at the connector. Be sure to connect the negative side of the flying lead to ground.

If SysClk is AC coupled at the source, you must also place a DC blocking capacitor after the point where the acquisition probe is connecting to the signal. This is because the acquisition probe will bias the signal to 750mV. In this case, set the Vthreshold for SysCLk to 750mV, not ground, due to this bias. If you cannot add a DC blocking capacitor after the point where the acquisition probe connects to SysClk, you can add a resistor to ground to pull the middle voltage back toward ground; the 750mV will look like it has a 20K resistor between the point where it is probing SysClk and the 750mV. See the probe load model Figure 20 on page 29 for a typical load model.

SysClkEn

If practical, probe SysClkEn near the receiver. This is a very low frequency signal, so the location of the connector is not critical. Be sure to connect the negative side of the flying lead to ground.

Vsense

You must connect Vsense if you are using the N4860A stimulus probe. Vsense is a DC input which tells the N4850A acquisition probe whether the DUT has power. This information is sent to the N4860A stimulus probe, which will not drive the stimulus signals until the DUT is active.

You will enter a minimum voltage for Vsense when you configure the logic analysis system. This voltage can be anywhere between 0.5V and 2.5V. Note that this will be a voltage that is used to detect the “power up” state, so you can use 2.5V even if the voltage is +5V.

Vsense is optional if you are only using the N4850A acquisition probe.

Connect Vsense to a signal which goes low when the IC is powered off (or in any state where it should not receive stimulus). In many cases, a good choice is to connect Vsense to Vcc somewhere near the SMA connectors.

Using socket adapters

Use a header with 4 pins, 0.025 inch diameter, that are 0.1 inch center-to-center. Connect the outer two pins to ground, and the inner two pins to the positive and negative sides of TxData (or RxData).

Use the square-pin socket adapters:

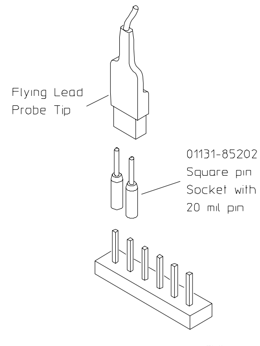


Figure 6 Socket adapters for flying leads

Using a two-row connector

If you do not wish to use a single row connector (due to load-shop considerations), you may use a two-row connector. The flying leads may be placed side-by-side, but not back-to-back:

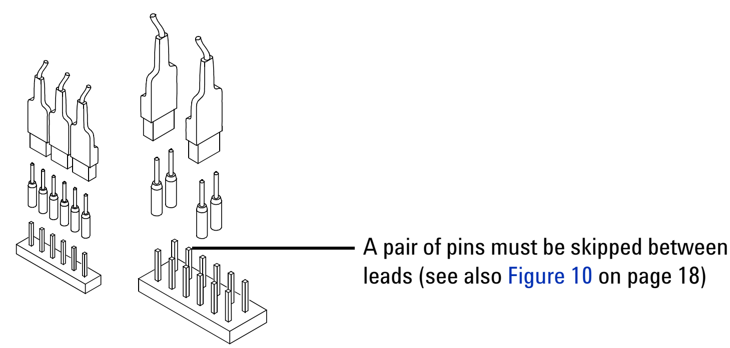


Figure 7 Using a single- or double-row connector

You cannot put the sockets back-to-back; there is a mechanical problem with the tips if you do that:

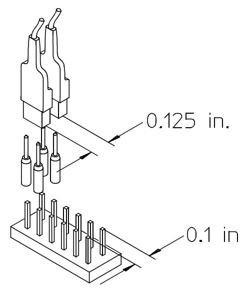


Figure 8 Mechanical interference between flying leads

You can see this with a dimensioned drawing of a 4x2 connector and overlaying the dimensions of the probe head:

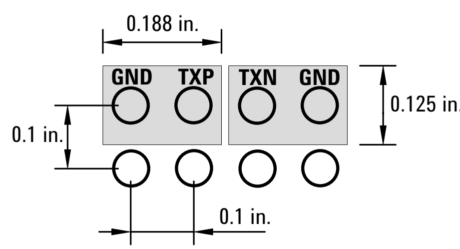


Figure 9 Two-row header with side-by-side flying leads

The connectors may also be placed in tandem by skipping a pair of pins:

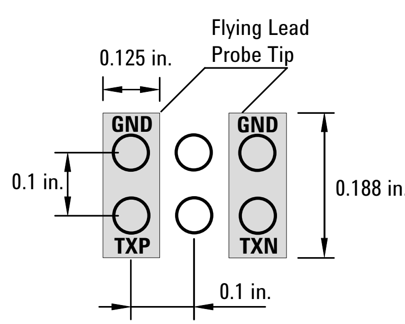


Figure 10 Two-row header with tandem flying leads

Designing the transmission lines

Especially with the two-row connectors, you will need to use care to maintain a constant trace capacitance per unit length between the traces. Traces for the two sides of a differential signal probably will need to spread apart to reach the pins of a header. Nevertheless, as much as possible, maintain a constant distance between both sides of a differential pair. Avoid stubs if at all possible; where stubs cannot be avoided (as with the connections to the N4850A acquisition probe), minimize their length.

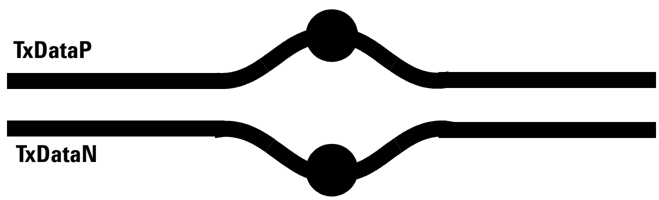


Figure 11 Best layout to maintain constant impedance

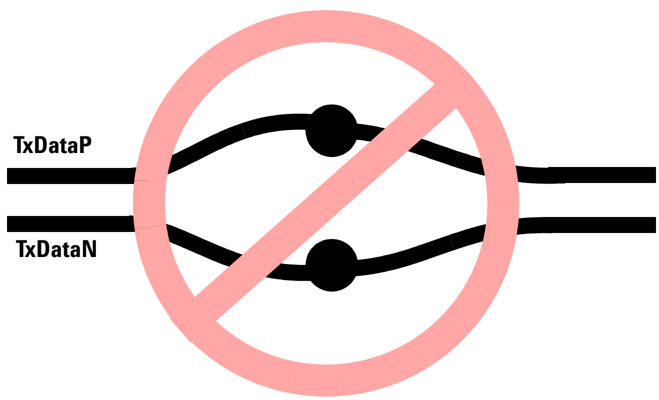


Figure 12 **Avoid** traces not designed to maintain constant impedance

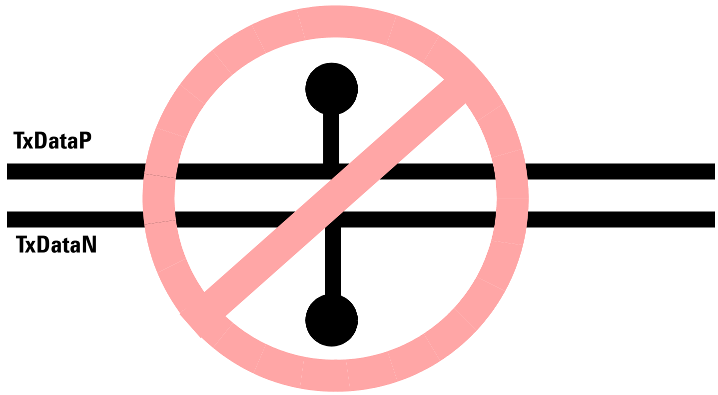


Figure 13 **Avoid** stubs

Probing without designed-in connectors

If headers are not available on your board, you may solder Agilent’s 82-ohm coaxial tip resistors directly to the leads of the receiving chip. See the Agilent *E5381A Differential Flying Leads User’s Guide* for information on how to install the tip resistors.

Using an Agilent E5387A and E5405A-pro series differential connectorless soft touch probe

The Agilent E5387A differential soft touch connectorless probe and Agilent E5405A-pro series differential soft touch connectorless probe have connections for up to 17 differential channels. The E5405A-pro series has a smaller footprint, so it is usually the better choice.

An Agilent soft touch probe is the least intrusive mass-termination method of connecting to the signals. It should only be used when the signal quality at the point of the soft touch footprint is acceptable—that is, free of ringing and "ledges." A good quality parallel termination with impedance controlled traces will typically achieve this, as will a trace which is so short its transmission time is less than one-sixth the rise and fall time of the signal. See "Signal quality" on page 28 for more information.

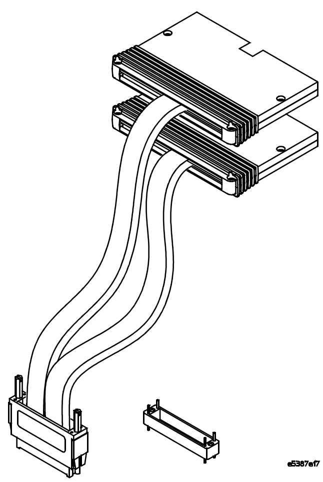


Figure 14 Agilent E5387A differential soft touch connectorless probe

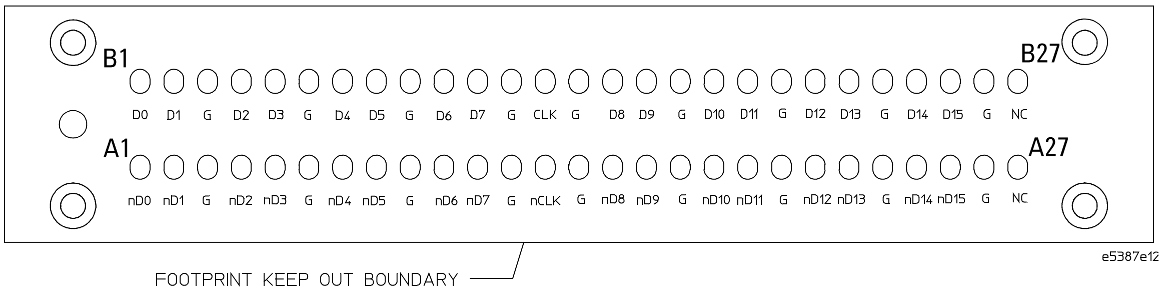


Figure 15 Footprint for E5387A soft touch probe

Table 3 Pad connections for E5387A soft touch probe

Pad number	Signal	Pad number	Signal
A1	NC	B1	NC
A2	NC	B2	NC
A3	GND	B3	GND
A4	NC	B4	NC
A5	GND	B5	SysClk
A6	GND	B6	GND
A7	GND	B7	SysClkEn
A8	NC	B8	NC
A9	GND	B9	GND
A10	GND	B10	Vsense
A11	NC	B11	NC
A12	GND	B12	GND
A13	GND	B13	RxDataN
A14	GND	B14	GND
A15	GND	B15	TxDataP
A16	GND	B16	TxDataN

Table 3 Pad connections for E5387A soft touch probe

A17	GND	B17	GND
A18	NC	B18	NC
A19	NC	B19	NC
A20	GND	B20	GND
A21	NC	B21	NC
A22	NC	B22	NC
A23	GND	B23	NC
A24	NC	B24	GND
A25	GND	B25	RxDataP
A26	GND	B26	GND
A27	NC	B27	NC

See the *Agilent Technologies Soft Touch Connectorless Probes User's Guide* for more information on this probe.

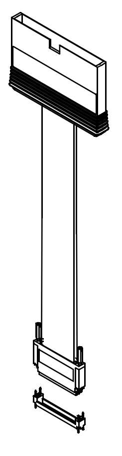


Figure 16 Agilent E5405A-pro series differential soft touch connector-less probe

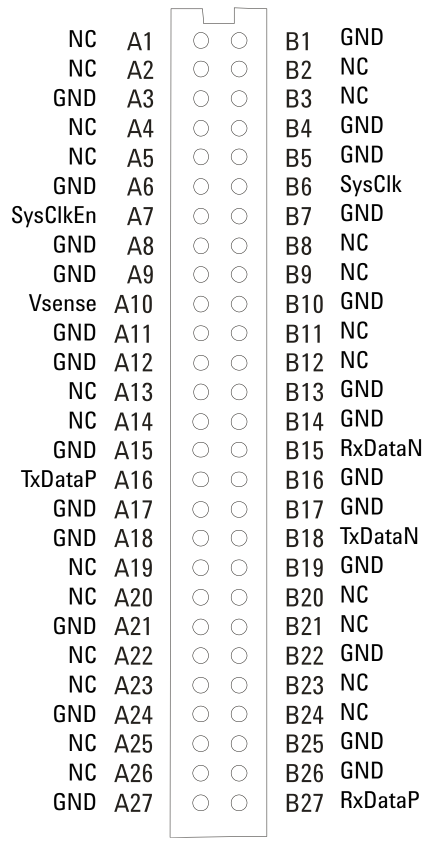


Figure 17 Footprint for E5405A-pro series soft touch probe

See the *Agilent Technologies Soft Touch Connectorless Probes User's Guide* for more information on this probe.

Using an Agilent E5379A 100-pin differential Samtec probe

The E5379A probe is a little more intrusive electrically than the soft touch probes, but that should not be a problem. As with the other probes, the signal quality at the connector must be good.

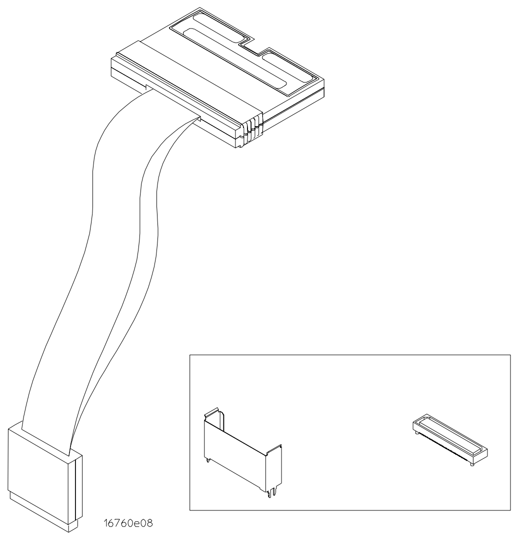


Figure 18 Agilent E5379A 100-pin differential probe

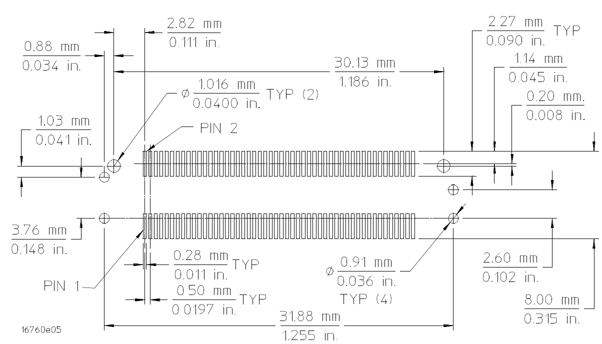


Figure 19 Agilent E5379A 100-pin differential probe connector footprint

Table 4 Pin connections for Agilent E5379A 100-pin differential probe

Pin number	Signal	Pin number	Signal
1	Ground	2	Ground
3	NC	4	NC
5	Ground	6	Ground
7	NC	8	NC
9	Ground	10	Ground
11	NC	12	NC
13	Ground	14	Ground
15	NC	16	NC
17	Ground	18	Ground
19	Ground	20	SysClk
21	Ground	22	Ground
23	Ground	24	SysClkEn
25	Ground	26	Ground
27	NC	28	NC
29	Ground	30	Ground
31	Ground	32	Vsense
33	Ground	34	Ground
35	NC	36	NC
37	Ground	38	Ground
39	Ground	40	TxDataP
41	Ground	42	Ground
43	Ground	44	TxDataN
45	Ground	46	Ground
47	NC	48	NC
49	Ground	50	Ground

Table 4 Pin connections for Agilent E5379A 100-pin differential probe

51	NC	52	NC
53	Ground	54	Ground
55	NC	56	NC
57	Ground	58	Ground
59	NC	60	NC
61	Ground	62	Ground
63	NC	64	NC
65	Ground	66	Ground
67	Ground	68	RxDataP
69	Ground	70	Ground
71	NC	72	NC
73	Ground	74	Ground
75	NC	76	NC
77	Ground	78	Ground
79	Ground	80	RxDataN
81	Ground	82	Ground
83	NC	84	NC
85	Ground	86	Ground
87	NC	88	Ground
89	Ground	90	NC
91	NC	92	NC
93	Ground	94	Ground
95	NC	96	Ground
97	Ground	98	NC

For more information on this probe, search for “E5379A” at www.agilent.com.

Signal quality

Minimum signal quality

In order to insure the analyzer will accurately probe the signals you must insure the following is present at the location where you will be probing the signal:

- 1.7 ns eye width at 312 Mbps
- 200 mV p-p differential voltage levels
- 350 mV p-p single ended voltage levels (SYSCLK)

Probe load model

It is strongly suggested you use a circuit modelling system such as SPICE to verify compliance across the variability of printed circuit board impedance characteristics, driver characteristics, and components.

The following equivalent circuit shows the effect of placing any of the recommended Agilent probes into your circuit. The model is good up to about 6 GHz. Use this schematic to create a SPICE deck (or equivalent for your modelling system).

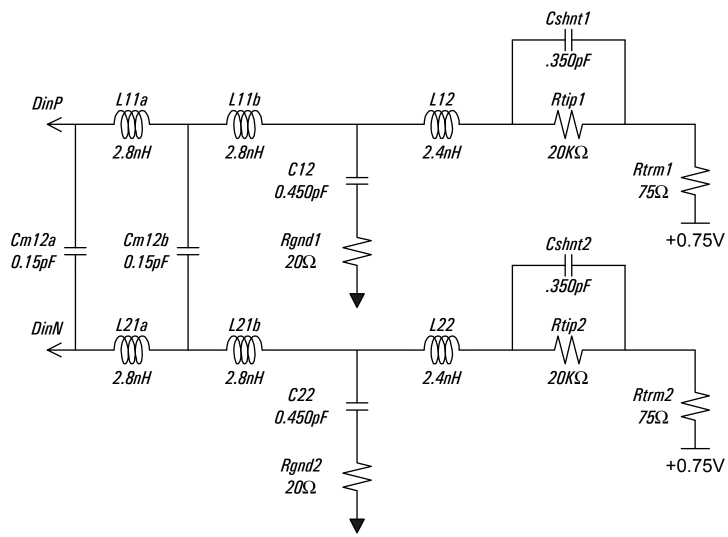


Figure 20 Typical load model for Agilent E5381A flying leads

Probe close to the receiving chip

The probe cannot measure your signals at the ideal location—that is, just inside the die of the chip which is receiving the digital signal.

Probing as closely as possible to the receiving chip's pads is a good way to optimize the probed signal.

Example: How probing location affects signal quality

As an example, consider a signal with the following characteristics:

Table 5 An example LVDS signal

Characteristic	Value
Rise/fall time	2 V/ns, or 500 ps
Voh	1.4 V
Vol	1.0 V
Termination	series

Terminated LVDS at receiver With a transmission line that is 50 ohms + 10% (single ended) an a termination resistor that is 100 ohms - 5%, a transmission line with an delay of 1.4ns (that is, a demo board with room for lots of connectors!), the signal at the receiver looks pretty good:

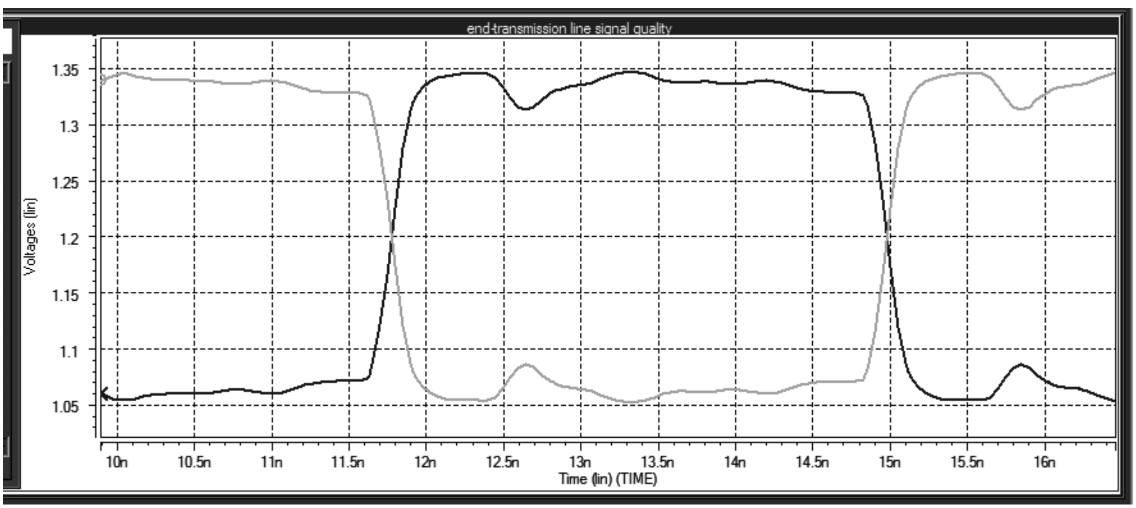


Figure 21 Signal terminated at the receiver

Terminated LVDS at middle of bus However, measuring this same signal in the center of the transmission line (and this is without the load model of the actual probe!) looks much worse:

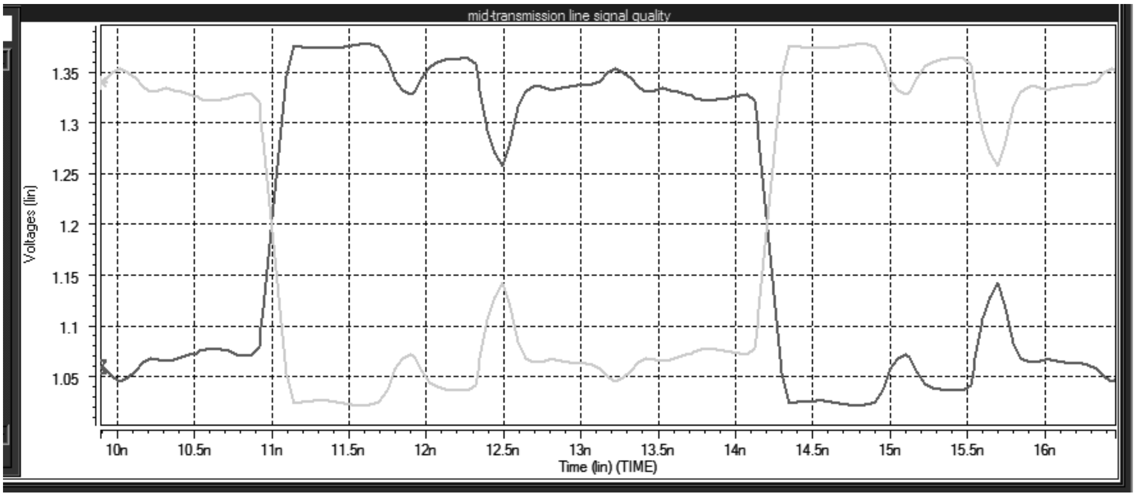


Figure 22 Signal terminated at the middle of the bus

3
Designing connectors for use with the N4860A stimulus probe

Stimulus Overview

The Agilent N4860A stimulus probe allows you to test an RF or baseband IC. Another way of looking at this is that the stimulus probe emulates a baseband IC or RF IC. The emulation capability is not a complete emulation, but can be useful for chip turn on and interface testing.

Testing an RF IC

A common use is to emulate a baseband IC in the testing of an RF IC. In this mode the stimulus probe outputs TxDataP, TxDataN and SysClkEn. These three signals are each output individually on an SMA connector.

Testing a baseband IC...why the acquisition probe is necessary

To emulate an RF IC in the testing of a baseband IC, the stimulus probe outputs RxDataP, RxDataN, and SysClk. These three signals are each output individually on an SMA connector.

The stimulus probe must be configured to test either an RF IC or a baseband IC—it cannot do both. In addition, the stimulus probe relies upon output from the Agilent N4850A Digital Acquisition Probe to properly function.

The acquisition probe interprets DigRF speed commands and provides additional clues to the stimulus probe. The acquisition probe must always connect to seven signals; the six standard interface signals (TxDataP, TxDataN, SysClkEn, RxDataP, RxDataN, and SysClk) and the VSense signal. The VSense is used to determine if the target IC has power and will disable driving the stimulus lines when power is off.

NOTE Remember, both the stimulus probe and acquisition probe must be connected to the device under test for the stimulus to function properly.

Labeling the connectors

It is important to label each of the SMA connectors with:

- Signal name
- Common mode voltage level
- Voltage swing

The output voltage of the N4860A stimulus probe is user-configurable (using the software running in the logic analysis system).

CAUTION Be careful to set voltage levels correctly before plugging the N4860A stimulus probe into your board. If the output voltage level is configured at a level too high for your board, your board may be damaged.

Testing an RF IC (Emulating a baseband IC)

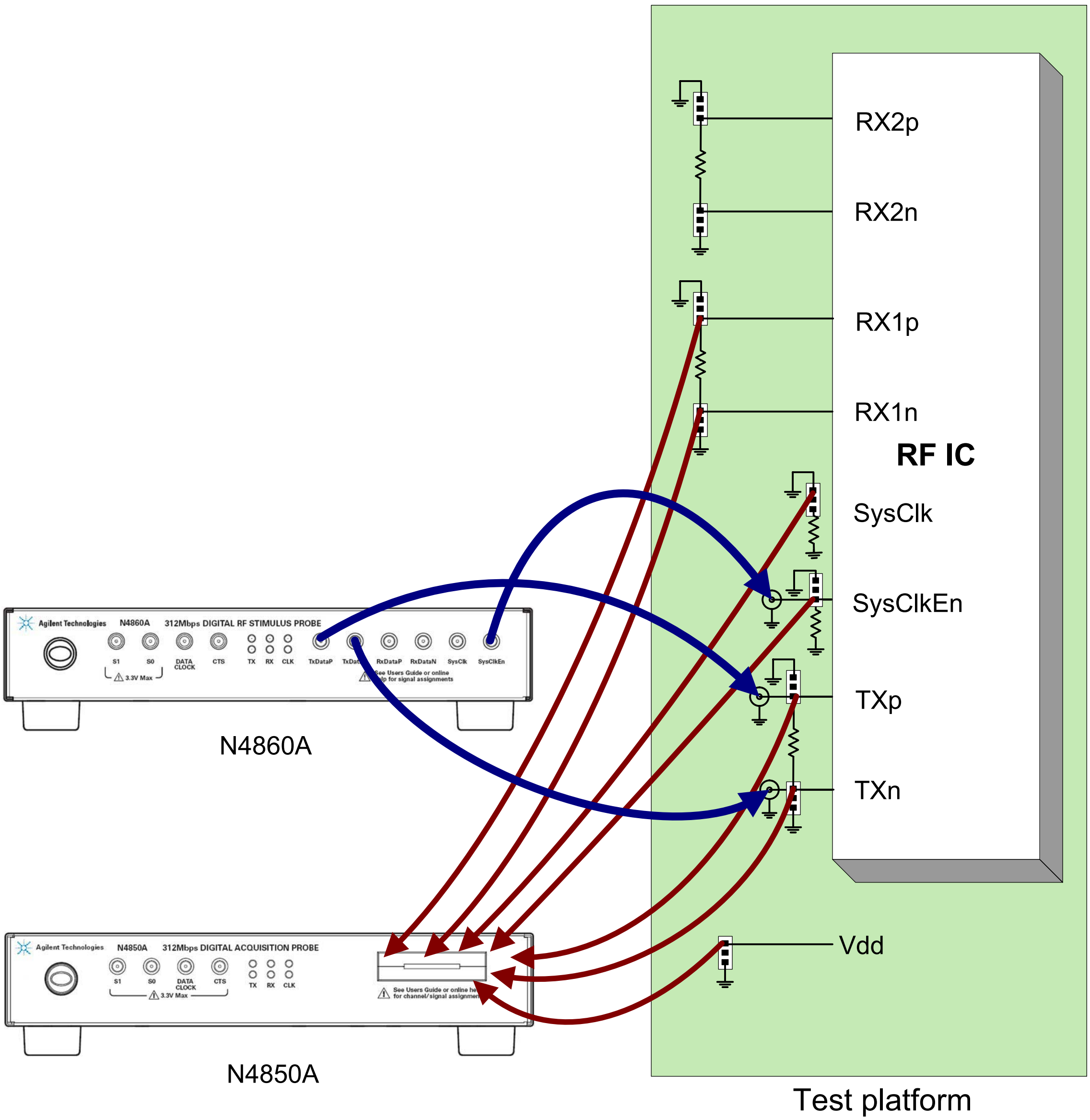


Figure 1 Signal connections for testing an RF IC

Connectors required

Your RF IC test platform needs to incorporate three female SMA connectors for TxDataP, TxDataN, and SysClkEn. You will need 3 length-matched SMA cables of approximately 1 meter length.

You also must include a connector for the N4850A acquisition probe. This connection should be between the SMA connectors and the RF IC. All seven signals, including Vsense, must be probed.

Positioning the connectors

Position the SMA connectors as close as possible to the RF IC. Minimize stub lengths.

Termination—single-ended signals

Figure 2 shows the ideal design:

- The trace impedance is 50 ohms.
- The connector for the N4850A acquisition probe is very close to the receiving chip.
- A 50-ohm termination resistor is used.
- The traces are as short as possible.

Signal degradation will occur with longer traces and/or mismatched impedances. In this case you may want to experiment with removing the 50 ohm resistor to improve the signal or make slight adjustments to the signal levels. The user interface allows you to set voltage levels and also adjust for no termination resistor.

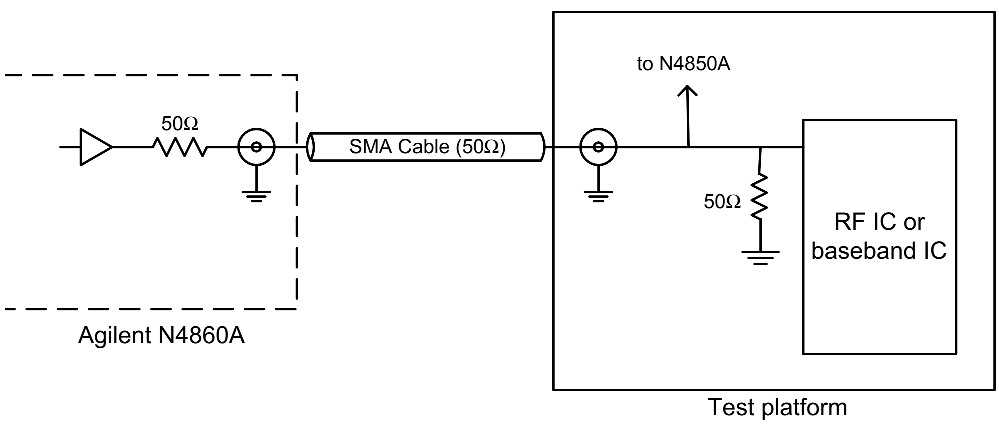


Figure 2 Terminating a single-ended signal

Termination—differential signals

Preferred design: one 100-ohm resistor

The DigRF v3 standard call for an optional 100-ohm resistor to terminate differential signals (section 5.3.6 of the standard). Using a 100-ohm resistor and a 50-ohm line impedance is the best way to ensure good signal integrity with the N4860A stimulus probe.

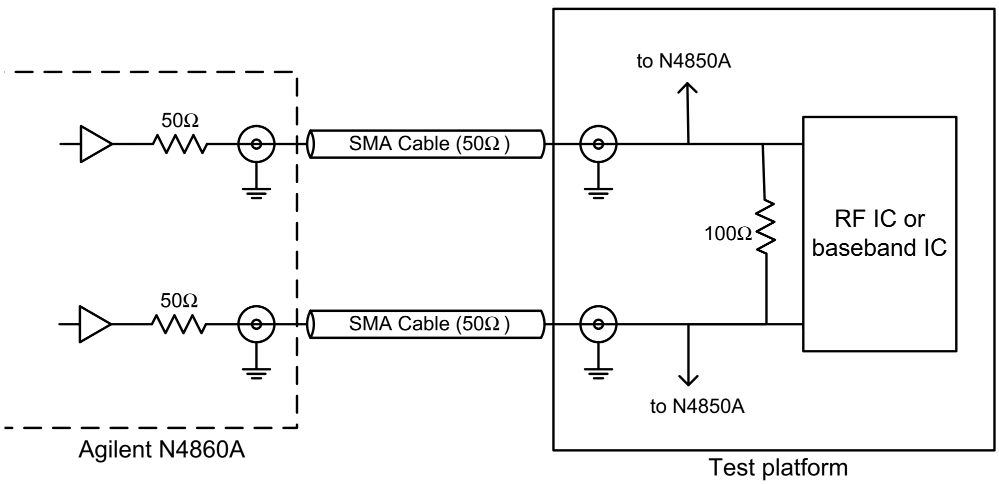


Figure 3 Terminating a differential signal with one 100-ohm resistor

Alternate design: no terminating resistor

The 100-ohm resistor can be left out with slightly less noise immunity. Be sure to adjust for this in the user interface so the correct voltages are set.

Alternate design: two 50-ohm resistors

The TxDataP and TxDataN signals can both be terminated into 50 ohms.

Using two resistors with a shared ground allows you flexibility to experiment with improving signal quality: you can remove the resistors, or you can tie the midpoint between the resistors to ground.

Be sure to adjust and check the signal levels output before connecting to your target system. Note that the output drivers have 50-ohm series resistors built in which will cause a voltage division across termination resistors.

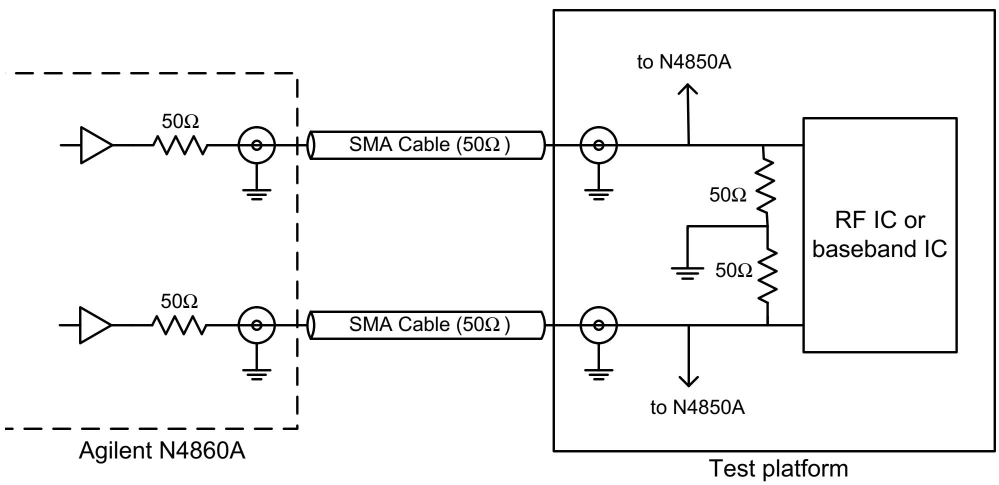


Figure 4 Terminating a differential signal using two resistors

Alternate design: other terminating resistor values

What if your design requires a different resistor value? The output voltage and slew rate of the N4860A stimulus probe is adjustable, so it can sometimes accommodate other resistor values.

Be sure to adjust and check the signal levels output before connecting to your target system. Once you connect the N4860A stimulus probe, some careful experimentation will be needed to determine which, if any, combination of output parameters will achieve adequate signal integrity while not damaging the DUT.

Testing a baseband IC (Emulating an RF IC)

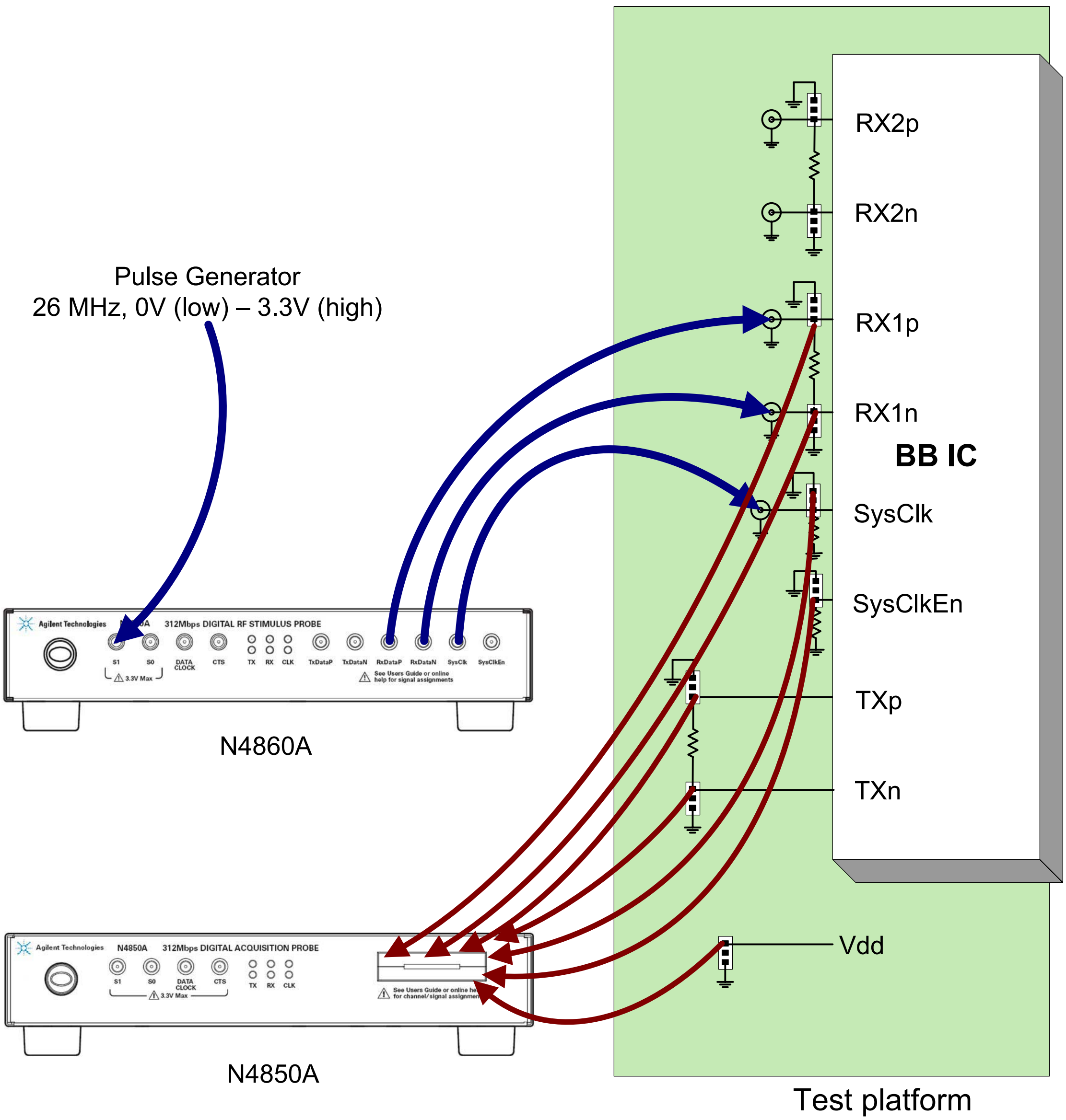


Figure 5 Signal connections for testing a baseband IC

Connectors required

Your baseband IC test platform needs to incorporate three female SMA connectors for RxDataP, RxDataN, and SysClk. You will need 3 length-matched SMA cables of approximately 1 meter length.

You also must include connections for the N4850A acquisition probe. These connections should be between the SMA connectors and the baseband IC. All seven signals, including Vsense, must be probed.

Positioning the connectors

Position the SMA connectors as close as possible to the baseband IC. Minimize stub lengths.

Terminating the signals

Termination requirements are the same as for testing an RF IC. See “Termination—single-ended signals" on page 37 and “Termination—differential signals" on page 38.

Baseband IC modes

Make sure there is a way to force the baseband IC into shutdown mode. When the pattern generator runs, the N4860A stimulus probe will assert SysClkEn and generate SysClk to wake up the TxData interface.

Generating SysClk

In most cases, you will want to use a pulse generator to provide SysClk to the N4860A stimulus probe. This allows you to test the response of your baseband IC to different clock rates. The pulse generator should be connected to SMA S1 on the N4860A stimulus probe .

CAUTION

The SysClk input must be non-negative. If a negative voltage is applied to the SMA, the N4860A stimulus probe may be damaged.

The SysClk input to the N4860A stimulus probe must be non-negative. CMOS levels (0V–3.3V swing) are recommended. The 80MHz Agilent 33250A function/arbitrary waveform generator works well for this purpose.

4
Characteristics — N4850A

Operating characteristics

The following operating characteristics are not specifications, but are typical operating characteristics.

Table 1 N4850A Connectors

Connector	Characteristics
Input	Connectors for use only with an Agilent probe.
Logic Analyzer Pod Outputs	Two 38-pin Samtec connectors
SMA S0, S1	SMA Output. Min: 0.8V, Max: 3.3V, Max current 24mA DC-50 MHz.
DATA CLOCK	SMA Output. Min: 0.8V, Max:3.3V, Max current 24mA 10-160 MHz.
CTS	SMA Output. Min: 0.8V, Max: 3.3V, Max current 24mA DC-50 MHz.
Option Connector	Reserved for use with compatible Agilent products (such as the N4860A stimulus probe).

Table 2 Electrical Characteristics

Electrical Characteristics	
Power Requirements (Power Supply)	Input: 100-240 V, 1.5 A, 50/60 Hz, IEC 320 connector Output: 12 V, 5 A CAT II (Line voltage in appliance and to wall outlet)
Power Requirements (N4850A Probe)	Input: 12 V DC, 5 A. Use only with the provided power supply. CAT I (Mains isolated)
Load Model	See the documentation for the probe you are using.

Table 3 Mechanical Characteristics

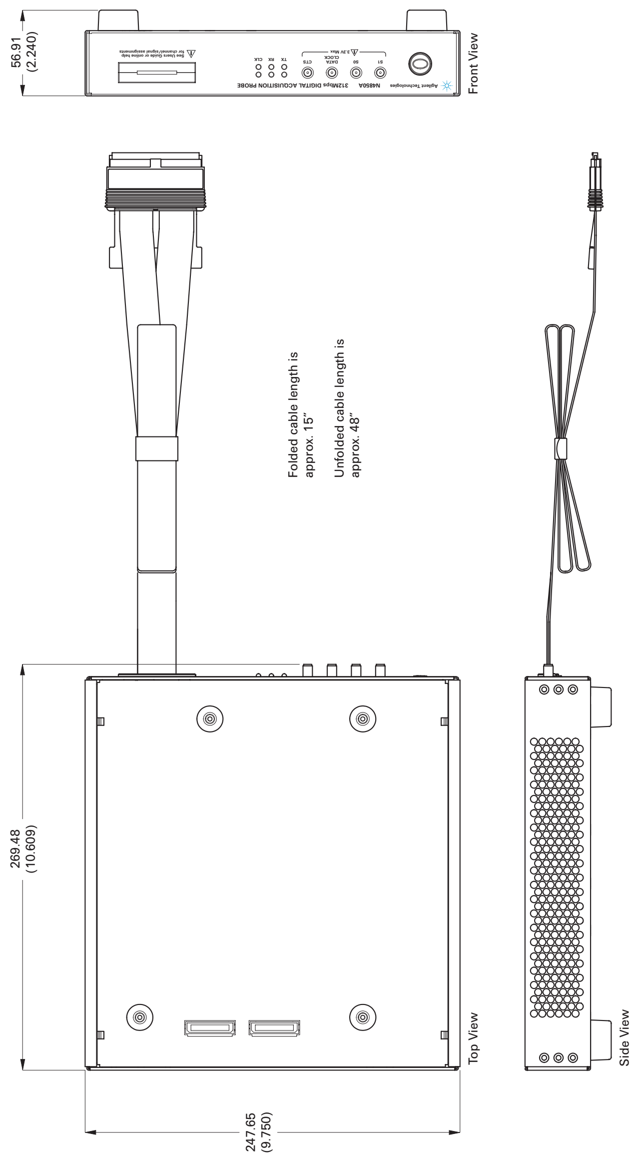
Mechanical Characteristics


Table 3 Mechanical Characteristics

Mechanical Characteristics	
Weight	Probe: 2.0 kg (4.4 lb), not including power supply

Table 4 Environmental Characteristics (Operating)

Environmental Characteristics (Operating)	
Temperature	Operating/non-operating: +0° to +55° C (+32° to +131° F)
Altitude	Operating/nonoperating 3000 m (10,000 ft)
Humidity	8 to 80% relative humidity at 40° C (104° F). Avoid sudden, extreme temperature changes which could cause condensation on the circuit board. For indoor use only. Pollution degree 2: Normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by pollution may occur.

5
Characteristics — N4860A

Operating characteristics

The following operating characteristics are not specifications, but are typical operating characteristics.

Table 1 N4860A Connectors

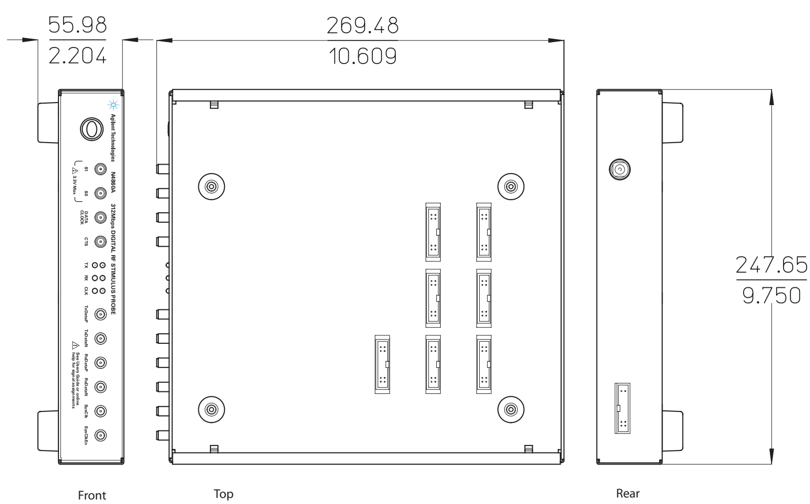
Connector	Characteristics
Pattern Generator Inputs	Seven connectors for use with an Agilent 16720A pattern generator or 16800-series portable logic analyzer with pattern generator.
SMA S0, S1	SMA connector (input/output function configured in software). Min: 0.8V, Max: 3.3V, Max current 24mA DC-50 MHz. CAT I (Mains isolated)
TxDataN, TxDataP, RxDataP, RxDataN	SMA Output. Min: -1.5 V, Max: 5 V (user configurable), Slew rate: Fast/Medium/Slow/Slowest (user configurable) Max current 60 mA
SysClk, SysClkEn DATA CLOCK, CTS	SMA Output. Min: -1.5 V, Max: 5 V (user configurable from 0V to 2.5V), Slew rate: Fast/Medium/Slow/Slowest (user configurable) Max current 60 mA
Option Connector	Reserved for use with the Agilent N4850A acquisition probe.

Table 2 Electrical Characteristics

Electrical Characteristics	
Power Requirements (Power Supply)	Input: 100-240 V, 1.5 A, 50/60 Hz, IEC 320 connector Output: 12 V, 5 A CAT II (Line voltage in appliance and to wall outlet)
Power Requirements (Agilent N4860A Probe)	Input: 12 V DC, 5 A. Use only with the provided power supply. CAT I (Mains isolated)
Load Model	See the documentation for the probe you are using.

Table 3 Mechanical Characteristics

Mechanical Characteristics	
Analysis Probe Dimensions	



N4860A Dimensional Drawing

Weight	Probe: 2.0 kg (4.4 lb), not including power supply

Table 4 Environmental Characteristics (Operating)

Environmental Characteristics (Operating)	
Temperature	Operating/non-operating: +0° to +55° C (+32° to +131° F)
Altitude	Operating/nonoperating 3000 m (10,000 ft)
Humidity	8 to 80% relative humidity at 40° C (104° F). Avoid sudden, extreme temperature changes which could cause condensation on the circuit board. For indoor use only. Pollution degree 2: Normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by pollution may occur.