

Agilent DigRF v4 Protocol Tester

Hardware Reference Guide



Agilent Technologies

Notices

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Safety Notices

CAUTION









A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

Safety Summary

Safety Symbols on Instruments

Safety Symbol	Description
	Indicates warning or caution. If you see this symbol on a product, you must refer to the manuals for specific Warning or Caution information to avoid personal injury or damage to the product.
	Frame or chassis ground terminal. Typically connects to the equipment's metal frame.
	Indicates hazardous voltages and potential for electrical shock.
	Indicates that antistatic precautions should be taken.
	Indicates hot surface. Please do not touch.
	Indicates laser radiation turned on.
	CSA is the Canadian certification mark to demonstrate compliance with the Safety requirements.
	CE compliance marking to the EU Safety and EMC Directives. ISM GRP-1A classification according to the international EMC standard. ICES/NMB-001 compliance marking to the Canadian EMC standard.

General Safety Precautions

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument.

Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

General

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

Environment Conditions

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters.

Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Before Applying Power

Verify that all safety precautions are taken. The power cable inlet of the instrument serves as a device to disconnect from the mains in case of hazard. The instrument must be positioned so that the operator can easily access the power cable inlet. When the instrument is rack mounted the rack must be provided with an easily accessible mains switch.

Ground the Instrument

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere


Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

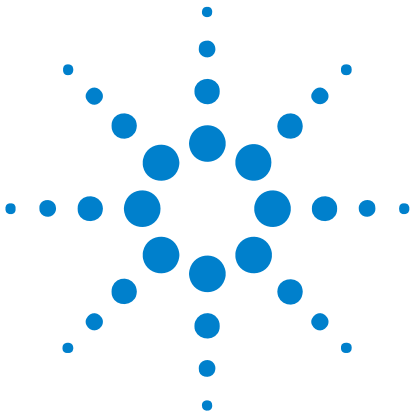
Environmental Information

	<p>This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/ electronic product in domestic household waste.</p> <p><i>Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.</i></p> <p>Do not dispose in domestic household waste.</p> <p>To return unwanted products, contact your local Agilent office, or see www.agilent.com/environment/product/ for more information.</p>
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1 Introduction

Hardware Architecture 8

This chapter provides information on the modules of DigRF v4 protocol tester in N5302A/N5304A chassis.



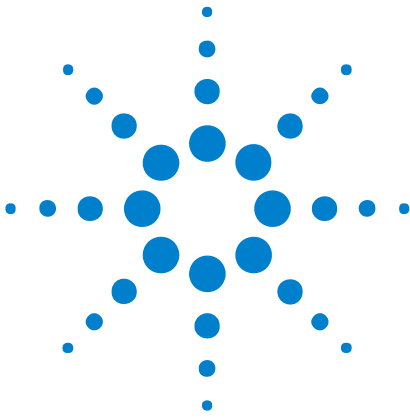
Hardware Architecture

DigRFv4 architecture is based on modules that are plugged into an two slot N5302A chassis. One module is the N5343A exerciser module and the other is the N5344A analyzer module. The N5343A exerciser module connects to a DUT using SMA connectors. The N5344A analyzer module probes the signal using a N5345A soft touch probe or a flying lead probe. Both the exerciser and analyzer module can be connected using USB or LAN.

The following figure shows the N5343A exerciser module and N5344A analyzer module plugged into a two slot N5302A chassis.



Figure 1 Modules in N5302A chassis



2 N5343A Exerciser Module

N5343A Exerciser Module 10

This chapter provides information on the N5343A Exerciser module used for DigRF v4 protocol tester.

N5343A Exerciser Module

The N5343A Exerciser module supports both DigRFv3 and DigRFv4.

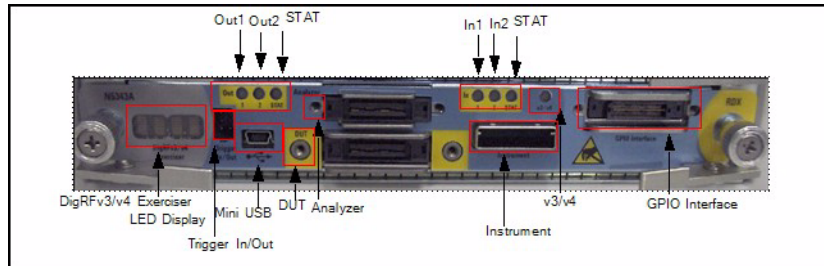


Figure 2 N5343A Exerciser Module

As shown in the above figure, the N5343A exerciser module has the following components:

- **LED Display**— This component is used to display the diagnostic information when fatal faults are discovered, and to indicate progress during the bootstrap. If everything is working properly, then this component displays the module number, such as 103.
- **Mini USB**— The mini USB features a direct USB connection for a PC to the module in order to allow fast data upload.
- **DUT**— The DUT SMA breakout connector is used to connect:
 - a DigRFv4 link (2 In / 2 Out)
 - b DigRFv3 link (2 In / 2 Out)
 - c 2 reference clock inputs
 - d 2 reference clock outputs
 - e 6 DigRFv3/v4 control signals
- **Analyzer**— The analyzer link connects the N5343A exerciser module and the N5344A analyzer module together. Both the input and the output data of the N5343A are transmitted to the analyzer module for further analysis through this link.
- **Instrument**— The instrument connector cable uses SMA to connect to the DUT for stimulus.
- **v3/v4**— Indicates if DigRFv3 or DigRFv4 interface is active.
- **GPIO Interface**— The GPIO bus connector features the 32-bit width GPIO bus which can be used for adding user customized stimulus.
- **LEDs**—
 - In1 – Activity indicator on input line 1

- In2 – Activity indicator on input line 2
- STAT – Status of input link
- Out1 – Activity indicator on output line 1
- Out2 – Activity indicator on output line 2
- STAT – Status of output link
- **Trigger IN/OUT**– The 6 pin header connector is used to connect external trigger signals and a 10 MHz time reference clock as shown in the following figure.

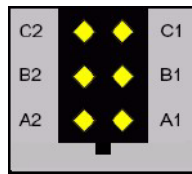


Figure 3 N5343A Trigger I/O connector pinout

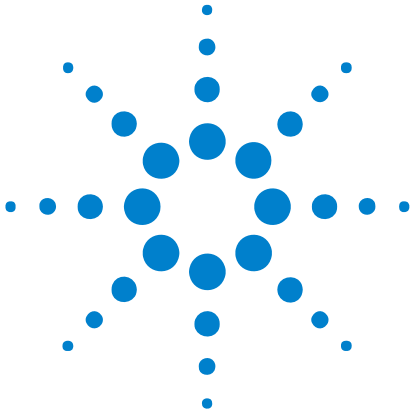
Pin	Signal Name	Description	Comment
A1, A2	Ground	LVC MOS level, active high (low: 0 V; high: 3.3 V)	Signal is active for minimum of 30 ns
B1	External Trigger Out	LVC MOS level, active high (low: 0 V; high: 3.3 V)	Signal must be active for a minimum of 20 ns
B2	External Trigger In	LVC MOS level, active high (low: 0 V; high: 3.3 V)	
C1	10 MHz TimeRefClk		
C2	Not connected		

WARNING

Do not directly touch any component on the N5343A module. It may be hot.

CAUTION

Components on the N5343A module are sensitive to the static electricity. Therefore, take necessary anti-static precautions, such as wear a grounded wrist strap, to minimize the possibility of electrostatic damage.



3 N5343A DUT Cable

N5343A DUT Cable 14

This chapter provides information on the N5343A Device under test (DUT) Cable used for DigRF v4 protocol tester.



N5343A DUT Cable

The DUT connector cable uses SMA to connect to the DUT for stimulus.

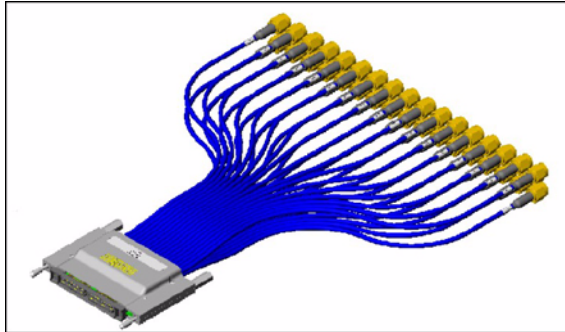


Figure 4 N5343A DUT Cable

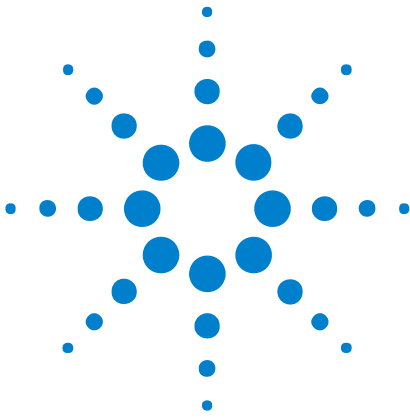
As shown in the previous figure, the N5343A instrument cable has the following connector pin out:

Table 1 N5343A DUT connector pin out

Pin	Signal Name	Signal Name	Pin
1	DCOM	DCOM	2
3	V4_REFCLK_IN	V4_OUT1_P	4
5	DCOM	V4_OUT1_N	6
7	V3_SYSCLK_IN	DCOM	8
9	DCOM	V4_IN1_P	10
11	V3_SYSCLKEN_IN	V4_IN1_N	12
13	V3_SYSCLKEN_OUT	DCOM	14
15	DCOM	V4_IN2_P	16
17	V3_OUT2_P	V4_IN2_N	18
19	V3_OUT2_N	DCOM	20
21	DCOM	V4_OUT2_P	22
23	V3_OUT1_P	V4_OUT2_N	24
25	V3_OUT1_N	DCOM	26
27	DCOM	V3_SYSCLK_OUT	28
29	V3_IN1_P	DCOM	30
31	V3_IN1_N	V4_REFCLK_OUT	32
33	DCOM	DCOM	34
35	V3_IN2_P	V4_REFCLKEN_IN	36
37	V3_IN2_N	V4_REFCLKEN_OUT	38
39	V4_DIGRFEN_OUT	V4_DIGRFEN_IN	40

Table 2 N5343A DUT connector signal levels pin out

Interface	Signal		Direction	Typical Levels	Maximum Levels
DigRFv4	IN1	Differential	Input	Vin diff: 200 mV...400 mV Vcm: 200 mV	Vdiff: 125 mV...2000 mV Vcm: 150 mV...800 mV
DigRFv4	IN2	Differential	Input	Vin diff: 200 mV...400 mV Vcm: 200 mV	Vdiff: 125 mV...2000 mV Vcm: 150 mV...800 mV
DigRFv4	OUT1	Differential	Output	Vin diff: 400 mV Vcm: 200 mV	Vdiff: 200 mV...400 mV
DigRFv4	OUT2	Differential	Output	Vin diff: 400 mV Vcm: 200 mV	Vdiff: 200 mV...400 mV
DigRFv3	In1	Differential	Input	Vin diff: 200 mV Vcm: 1200 mV	Vin diff: 100 mV...1000 mV Vcm: 50 mV...3000 mV
DigRFv3	In2	Differential	Input	Vin diff: 200 mV Vcm: 1200 mV	Vin diff: 100 mV...1000 mV Vcm: 50 mV...3000 mV
DigRFv3	OUT1	Differential	Output	Vout diff: 340 mV Vcm: 1200 mV	Vout diff: 250 mV...455 mV Vcm: 1.125V...1.375V
DigRFv3	OUT2	Differential	Output	Vout diff: 340 mV Vcm: 1200 mV	Vout diff: 250 mV...455 mV Vcm: 1.125 V...1.375 V
DigRFv4	REFCLK_IN	Single Ended	Input		1.8 V compliant
DigRFv4	REFCLK_OUT	Single Ended	Output		Vout: 1.8 V compliant
DigRFv4	REFCLKEN_IN	Single Ended	Input		1.8 V compliant
DigRFv4	REFCLKEN_OUT	Single Ended	Output		Vout: 1.8 V compliant
DigRFv4	DIGRFEN_IN	Single Ended	Input		1.8 V compliant
DigRFv4	DIGRFEN_OUT	Single Ended	Output		Vout: 1.8 V compliant
DigRFv3	SYSCLK_IN	Single Ended	Input		1.8 V compliant
DigRFv3	SYSCLK_OUT	Single Ended	Output		Vout: 1.8 V compliant
DigRFv3	SYSCLKEN_IN	Single Ended	Input		1.8 V compliant
DigRFv3	SYSCLKEN_OUT	Single Ended	Output		Vout: 1.8 V compliant



4 GPIO Bus Cable

GPIO Bus Cable 18

This chapter provides information on the GPIO Bus Cable used for DigRF v4 protocol tester.



GPIO Bus Cable

The GPIO bus cable has 36 signals. The pins are split into six different banks. Each bank has its own electrical characteristics.

Table 3 Electrical Characteristics

Bank	Number of Pins per bank	VCC	Input/Output Configuration	Comment
BankA/B	8	Programmable per bank(1.2 V, 1.8 V, 2.5 V)	Per pin	Fmax 20 MHz @1.2 V 50 MHz @ other voltages
BankC/D	8	Programmable, same for both bank(1.2 V, 1.8 V, 2.5 V)	Per bank	Fmax 100 MHz
BankE	2	fix at 3.3 V	Per pin, can be configured as open drain output	
BankF	2	fix at 1.8 V	Per pin, can be configured as open drain output	

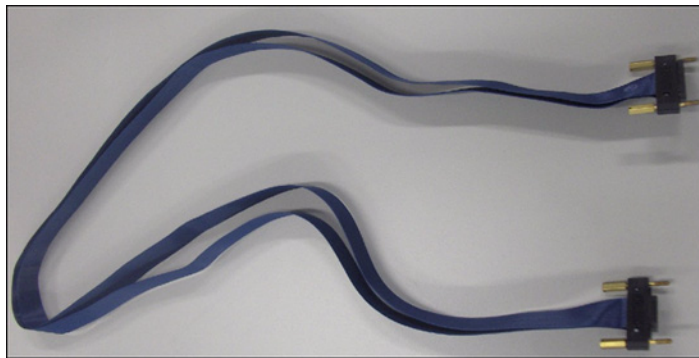


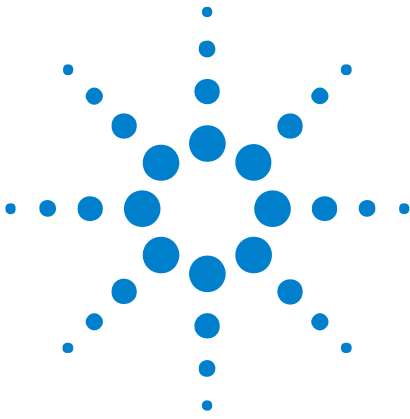
Figure 5 GPIO Bus Cable

As GPIO connector an edgemount samtec is used (QTH-030-01-L-D-EM2). The following table shows the GPIO connector pinout.

Table 4 GPIO Bus connector pinout

Pin	Signal Name	Signal Name	Pin
1	GND	GND	2
3	n.c	n.c	4
5	n.c	n.c	6
7	GND	GND	8
9	n.c.	n.c.	10
11	n.c.	n.c.	12
13	GND	GND	14
15	GPIO_E0	GPIO_F0	16
17	GPIO_E1	GPIO_F1	18
19	GND	GND	20
21	GPIO_A0	GPIO_C0	22
23	GPIO_A1	GPIO_C1	24
25	GPIO_A2	GPIO_C2	26
27	GPIO_A3	GPIO_C3	28
29	GND	GND	30
31	GPIO_A4	GPIO_C4	32
33	GPIO_A5	GPIO_C5	34
35	GPIO_A6	GPIO_C6	36
37	GPIO_A7	GPIO_C7	38
39	GND	GND	40
41	GPIO_B0	GPIO_D0	42
43	GPIO_B1	GPIO_D1	44
45	GPIO_B2	GPIO_D2	46
47	GPIO_B3	GPIO_D3	48
49	GND	GND	50
51	GPIO_B4	GPIO_D4	52
53	GPIO_B5	GPIO_D5	54
55	GPIO_B6	GPIO_D6	56
57	GPIO_B7	GPIO_D7	58
59	GND	GND	60

4 GPIO Bus Cable



5 N5344A Analyzer Module

N5344A Analyzer Module [22](#)

This chapter provides information on the N5344A analyzer module used for DigRF v4 protocol tester.



N5344A Analyzer Module

The N5344A analyzer module will be able to connect to a N5345A soft touch probe or a flying lead probe. Thus, it can analyze both RX and TX traffic between any BBIC and RFIC.

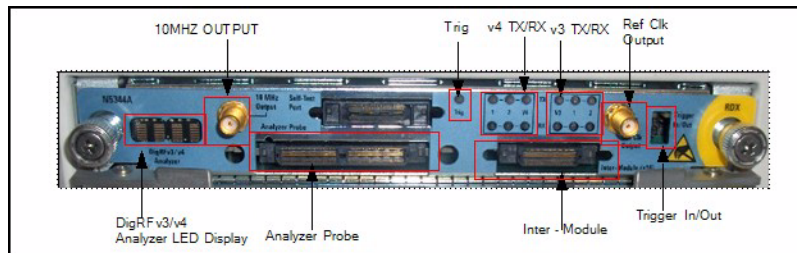


Figure 6 N5344A Analyzer Module

As shown in the above figure, the N5344A analyzer module has the following components:

- **LED Display**– This component is used to display the diagnostic information when fatal faults are discovered, and to indicate progress during the bootstrap. If everything is working properly, then this component displays the module number, such as 103.
- **Analyzer Probe**– The analyzer probe connects to a N5345A soft touch probe or a flying lead probe, which connects the N5344A analyzer module to the DUT.
- **Ref Clk Output**– External reference clock output.
- **Trig** – Activity indicator on trigger.
- **10 MHz Output**– Output a 10 MHz time reference clock.
- **v4 TX/RX**– Activity indicator on TX/RX for DigRFv4. The upper indicators for TX and the lower indicators for RX.
- **v3 TX/RX**– Activity indicator on TX/RX for DigRFv3. Activity indicator on TX/RX for DigRFv4. The upper indicators for TX and the lower indicators for RX.
- **Trigger In/Out** Trigger In/Out connector– This is a six pin header.
 - **In** – Trigger the protocol analyzer from an external source.
 - **Out** – Generate a Trigger Out signal to trigger an external instrument like an oscilloscope.

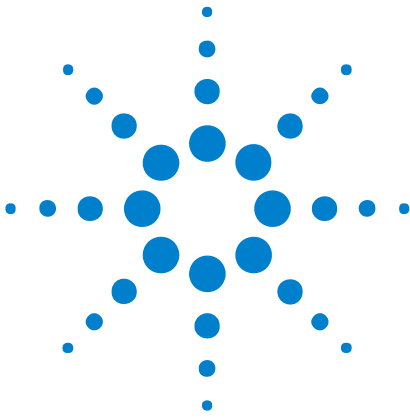
WARNING

Do not directly touch any component on the N5344A analyzer module. It may be hot.

CAUTION

Components on the N5344A analyzer module are sensitive to the static electricity. Therefore, take necessary anti-static precautions, such as wear a grounded wrist strap, to minimize the possibility of electrostatic damage.

5 N5344A Analyzer Module



6 Analyzer Probing

N5345A Soft Touch Probe 26

N5346A Flying Lead Probe 39

This chapter provides information on the Analyzer probing cable set used for DigRF v4 protocol tester.



N5345A Soft Touch Probe

The N5345A soft touch probe is specially designed to support a full line with two TX and two RX lines.

To use a N5345A soft touch probe, a Soft Touch 2.0 probe footprint must be designed into the target board. A 3 pin header must also be designed into the target board if it is required to supply a reference clock to the analyzer. This document is intended to provide information needed by platform and system design teams for integration of the N5345A soft touch probe into their designs. It provides a mechanical and electrical solution space for the N5345A soft touch probe.

NOTE

Although information on DigRF v4 interface and specifications will be given, this document is not intended to take the place of other DigRF v4 interface design documentation. It is assumed that a design team utilizing this document for their design constraints will validate their designs through pre and post route electrical simulation and keep-out volume analysis.



Figure 7 Agilent N5345A Soft Touch Probe

The N5345A soft touch probe offers a number of different options for different applications. The platform designer has the flexibility to configure a probing solution that best meets the needs of the system.

- ["Installation Instructions"](#) on page 27
- ["Characteristics"](#) on page 28
- ["Mechanical Design"](#) on page 28
- ["Electrical Design"](#) on page 33

Installation Instructions

- 1 First solder and secure the retention module onto the device under test (DUT) on two sides of the soft touch 2.0 footprint.
- 2 Select the N5345A soft touch probe cable that best suits the design.
- 3 Connect the wide connector of the N5345A soft touch probe to the analyzer module and tighten the thumbscrews.



Figure 8 N5345A soft touch probe aligned over back plane

- 4 Identify the white bullet on the probe label indicating pin 1.
- 5 Align it to the pin 1 on the layout board.

While designing the layout make sure pin 1 is defined and marked. A vertically aligned probe is shown in the previous figure.

- 6 Slide the probe into the retention module, and gently tighten the thumbscrews located at the top of the N5345A soft touch probe head.

A screwdriver may be used to ensure that there is a secure connection. The thumbscrews should be tightened to a snug fit but do not over tighten.

- 7 Connect the external clock cable of the N5345A soft touch probe to the reference clock header on the target board, if an external reference clock is to be supplied to analyzer.

Characteristics

CAUTION

Carefully read the specifications stated below before setting up the design for N5345A soft touch probe.

Probe Inputs:	Input Voltage: 25 V max or 3 V rms into 250 Ohms.
Temperature:	Operating 0 to 40 Deg C with 200 linear feet per minute airflow. Storage -40 to 70 Deg C.
Humidity:	Operating 15% to 95% non condensing.
Altitude:	Operating: to 3000 meters (10000 ft).
Airflow:	For a single probe with no heat sources within 1 inch, 140 linear feet per minute of air flow is required. For two probes, placed side by side with minimum spacing and no other heat sources within 1 inch, 200 linear feet per minute of air flow is required.

Mechanical Design

This section contains information on mechanical design for the N5345A soft touch probe.

- ["Footprint Dimensions and Specifications"](#) on page 28
- ["Connecting the Retention Module"](#) on page 30

Footprint Dimensions and Specifications

Please ensure the following prerequisites are met for the design:

- Solder mask must not extend above the pad height for a distance of .005 inches from the pad.
- Via-in-pad is allowed if the vias are filled level with the pad or the via hole size is less than .005 inches.
- Permissible surface finishes on pads are HASL, immersion silver, or gold over nickel. The height of the pads contacted by the probe must be within +/- .007 inches of the bottom surface of the retention module.

The N5345A soft touch probe footprint, that needs to be designed into the target board, can be observed in the following figure. The following figure displays the detailed layout dimensions for the footprint. Notice that the connector has 50 pins.

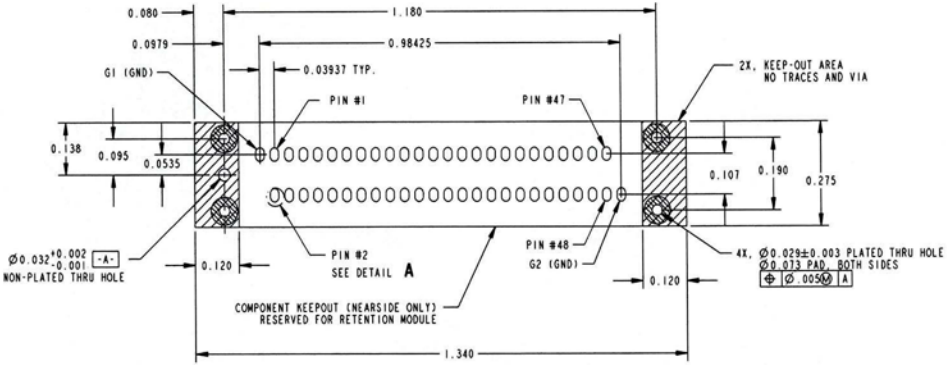


Figure 9 N5345A soft touch probe footprint dimensions, pin numbering, and specification

The following figure displays detailed view of a pad with geometrical information on it.

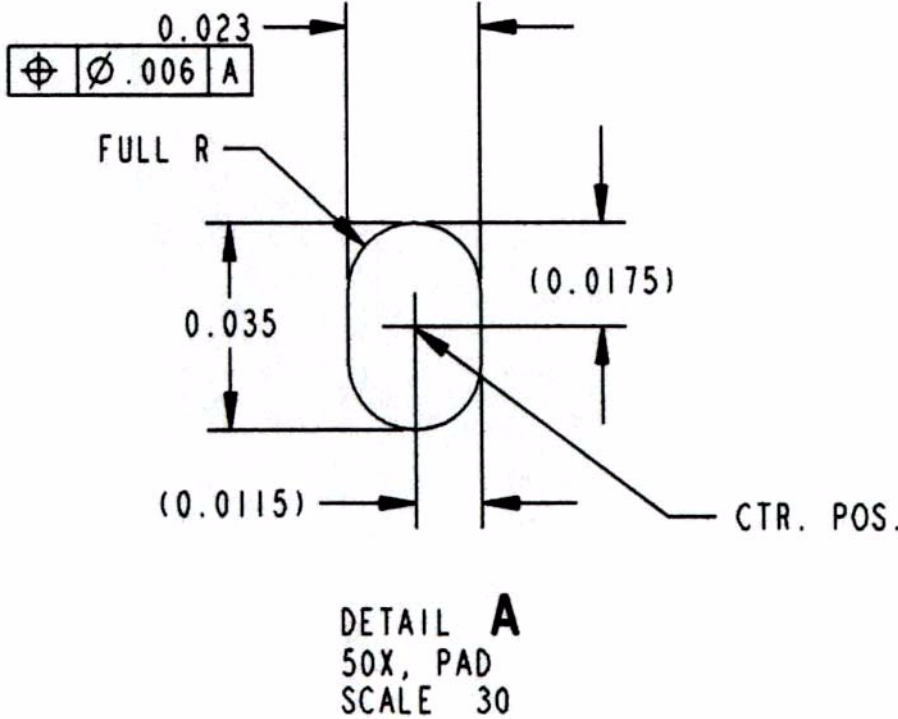


Figure 10 Detail A - detailed view of a pad.

Connecting the Retention Module

The retention module helps to connect the N5345A soft touch probe to the device under test (DUT). To achieve this, the retention module must be soldered onto the DUT. After this is done, the probe can be easily plugged into this retention module.

The following figure displays the dimensions of the N5345A soft touch probe, which is plugged into the retention module.

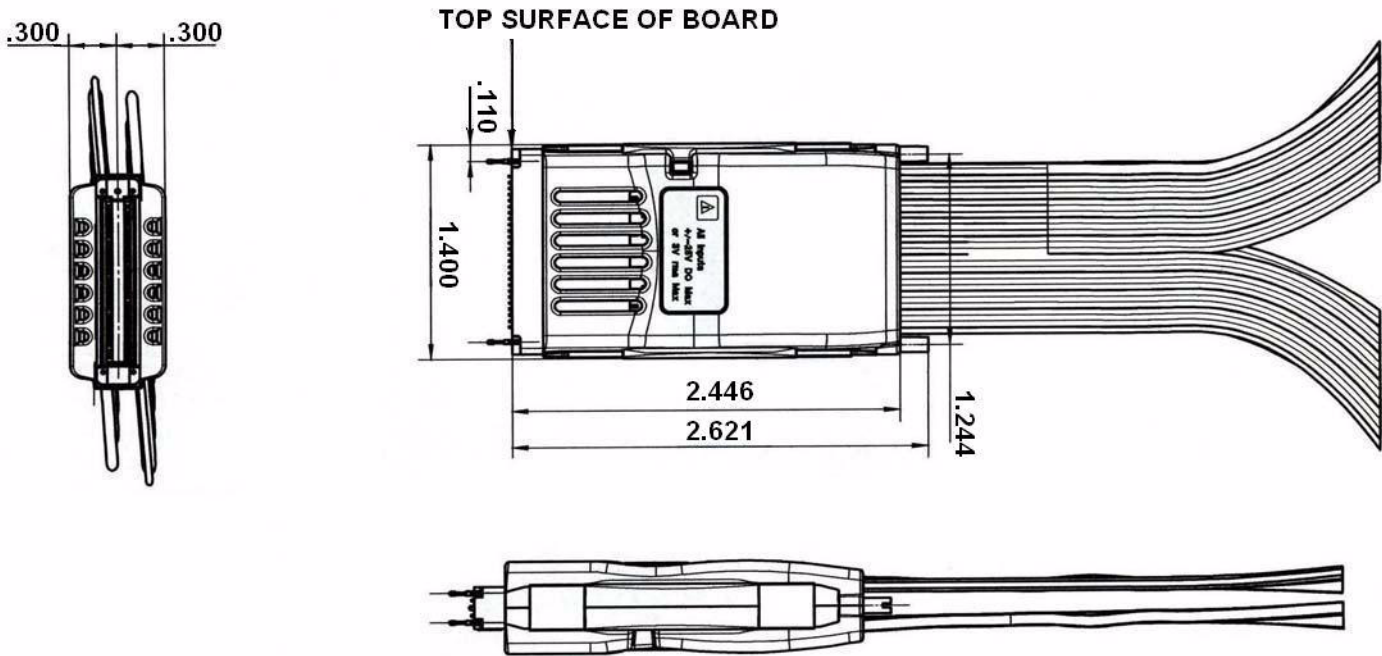


Figure 11 N5345A soft touch probe plugged into the retention module

The following figure displays the retention module.

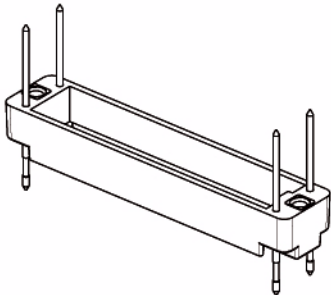


Figure 12 Retention module

The following figures show the dimensions of the retention module from different views.

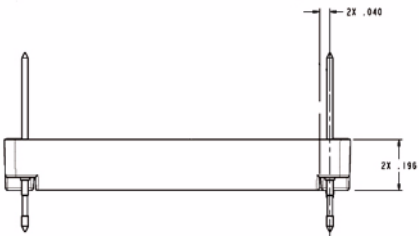


Figure 13 Dimensions of the Retention Module and its Parts

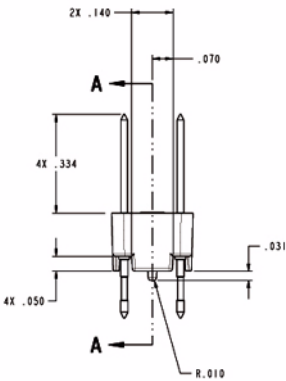


Figure 14 Dimensions of the Retention Module and its Parts

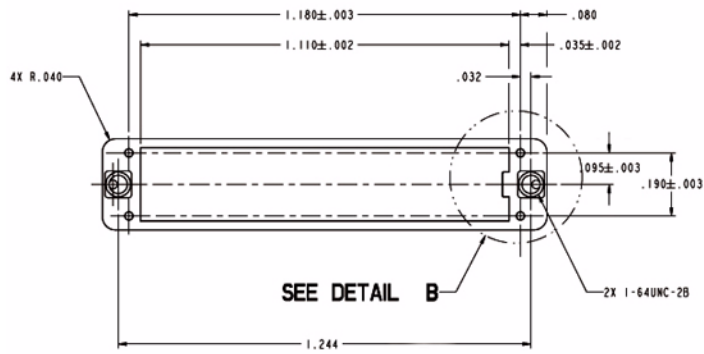


Figure 15 Dimensions of the Retention Module and its Parts

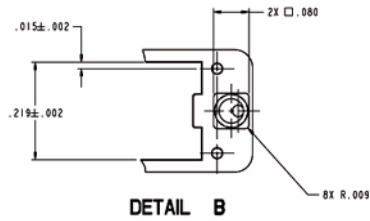


Figure 16 Dimensions of the Retention Module and its Parts

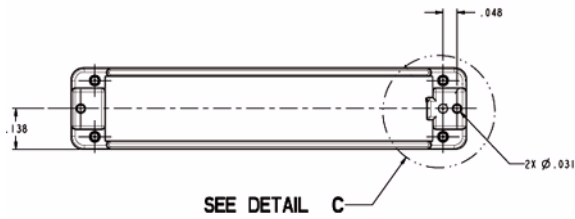


Figure 17 Dimensions of the Retention Module and its Parts

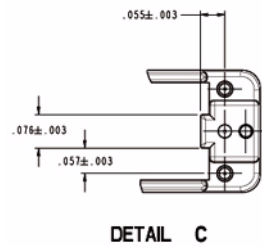


Figure 18 Dimensions of the Retention Module and its Parts

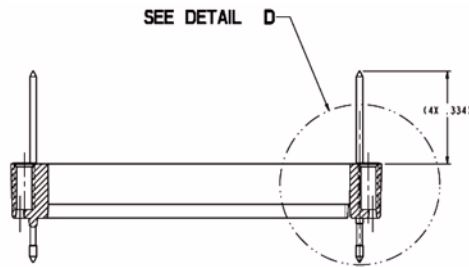


Figure 19 Dimensions of the Retention Module and its Parts

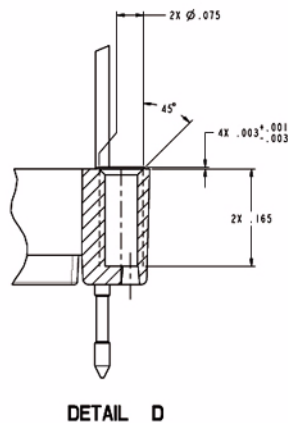


Figure 20 Dimensions of the Retention Module and its Parts

Electrical Design

This section contains electrical design details for the N5345A soft touch probe. These details include analyzer eye requirement definition, system impact due to probe presence, pin assignments, and load models.

- ["N5345A Soft Touch Probe with an Analyzer Interface"](#) on page 33
- ["N5345A probe placement within system topology"](#) on page 34
- ["DigRF v4 Interface N5345A Soft Touch Probe Pin Assignments"](#) on page 36
- ["Load Model"](#) on page 37

N5345A Soft Touch Probe with an Analyzer Interface

Logical probing of the DigRF v4 interface is achieved through tapping a small amount of energy off the probed signals and channeling this energy to the analyzer. In order to avoid excessive loading conditions, the use of tip resistors, or isolation resistors, is employed. These relatively high

impedance tip resistors enable the analyzer to sample bus traffic without significantly loading the probed signals. A high-level block diagram of a generic DigRF v4 interface bus with an analyzer interface is given in the following figure.

NOTE

This diagram would be repeated for each differential pair within a DigRF v4 interface.

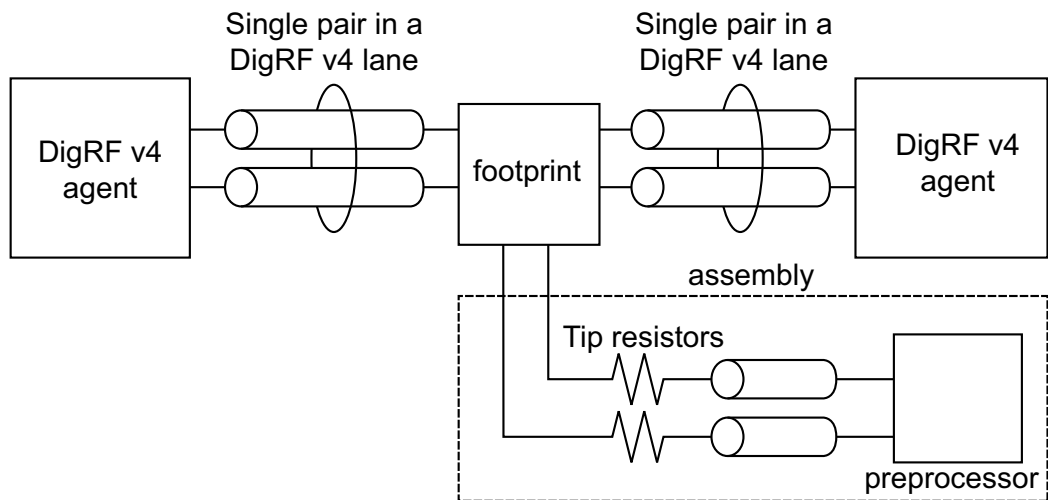


Figure 21 Block diagram example of a DigRF v4 interface with an analyzer

N5345A probe placement within system topology

In order for the analyzer to reliably capture logical transactions on the bus, adequate signal eye must be made available to the N5345A soft touch probe. It is incumbent upon the platform designers to ensure that sufficient signal eye is available to the probe while the probe load is in place so that proper signal capture can be performed. This must be verified via electrical simulation utilizing the load model provided in "[Load Model](#)" on page 37.

The eye requirements are measured by eye height and eye width, forming a diamond shape. These requirements are described pictorially in the following figure.

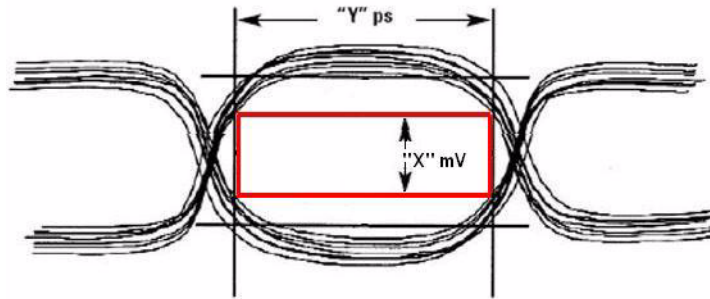


Figure 22 Example of eye specifications as seen at the N5345A probe pad

The following table details the specific eye requirements for Agilent Technologies. Address questions to Agilent Technologies for the most current eye requirements.

Table 5 DigRF v4 interface soft touch footprint placement interconnect specification

	Agilent Technologies Specification
Min. eye height at soft touch pad ¹	60 mV
Min. eye width at soft touch pad	0.6 UI (120 ps at soft touch footprint), that is, Jitter tolerance of 0.4 UI
Length matching requirements of the P/N sides of the differential pairs ²	±5 mil
Length matching requirements -pair to pair	same as DigRF v4 interface specification
¹ Measured in differential units, for example, $V_{ppdiff} = 2 * (V_p - V_n) $ ² Interconnect must length match ±5 mils from source to soft touch footprint pad for each polarity of the differential pair	

The eye characteristics given in the above table must be maintained for all probed channels, regardless of direction. Overall, these soft touch placement specifications limit the electrical distance between the driver pin and the probe attach point. Conceivably, probing both directions in lanes of a long DigRF v4 interface link may require two separate footprints and probe assemblies, while probing both directions of relatively short links may be accomplished with one probe. Regardless of implementation, refer to usage restrictions as listed in the "Overview and Configuration Support" section. The same soft touch eye requirements exist for all links substrates (for example, FR4, cables, etc.).

An additional constraint on the soft touch footprint placement involves the relative location of the AC coupling capacitors. The capacitors may be placed either between the driver and probe, or between the probe and

receiver, as long as both capacitors of a differential pair are placed in the same fashion. Other pairs within a link do not need to maintain this capacitor placement configuration.

DigRF v4 Interface N5345A Soft Touch Probe Pin Assignments

There is flexibility in the arrangement and layout of the soft touch footprint. Agilent will provide configuration of the probe to support the following pin layouts. There is a detailed view of these connections below.

The pinout for the DigRF v4 interface N5345A soft touch probe is shown in the following table. It is imperative that designers understand there is some freedom associated with the pin/signal assignment relationship. These notes are given here:

Footprint channel vs. lane/link designations	<ul style="list-style-type: none"> • Channel = either an upstream OR downstream differential pair for a given lane • C<letter> = the designator for a Channel which accepts a given differential pair of signals • C<letter><'p' or 'n'> = the two signals of the differential pair. The signals within a given pair may be assigned to either 'p' or 'n' regardless of polarity
General rules for signal pair assignment	<p>The differential pairs that make up the DigRF v4 interface links must be assigned to specific pins of the footprint. However, there is some freedom in this pair assignment in order to minimize routing constraints on the platform. Additionally, note that the channel to footprint assignment configuration is closely related to the "direction" of the probed link. More specifically, a bi-directional pin assignment is different from a unidirectional pin assignment. See the following tables contained in this section for more information.</p>

The DigRF v4 interface provides general probing to suit different footprints on DUT.

Table 6 General DigRF v4 Interface N5345A soft touch probe pinout

Pin#	Signal name	Pin#	Signal name
		G1	GND
2	GND	1	V4_LS_RX0p
4	V4_LS_TX0p	3	V4_LS_RX0n
6	V4_LS_TX0n	5	GND
8	GND	7	V4_LS_RX1p
10	V4_LS_TX1p	9	V4_LS_RX1n
12	V4_LS_TX1n	11	GND
14	GND	13	V4_HS_RX0p
16	V4_HS_TX0p	15	V4_HS_RX0n
18	V4_HS_TX0n	17	GND
20	GND	19	V4_HS_RX1p
22	V4_HS_TX1p	21	V4_HS_RX1n
24	V4_HS_TX1n	23	GND
26	GND	25	V3_RXp
28	V3_TXp	27	V3_RXn
30	V3_TXn	29	GND
32	GND	31	NC
34-48, G2	NC	33-47	NC
Note: V4_LS_RX and V4_HS_RX are the same signals required to route more than one pin. The V4_LS... and V4_HS... names are given to make symbolic representation for the actual uses of these pins.			

Load Model

The Agilent Technologies load model for the N5345A soft touch probe is given in the following figure. This model is subject to change. For the most current models, it is recommended that the platform designer contact Agilent Technologies directly.

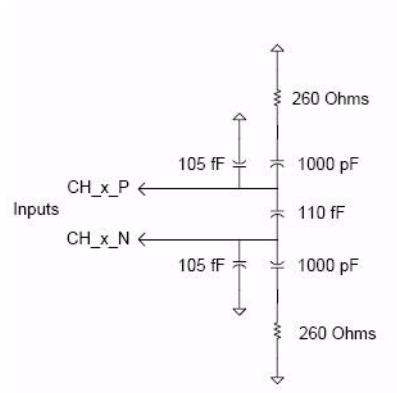


Figure 23 Load model for N5345A soft touch probe

N5346A Flying Lead Probe

The N5346A flying lead probe is a probing solution for the N5343 I/O module, which you can use in situations where it is difficult to use the N5345A soft touch probe.

The N5346A flying lead probe allows probing of individual lanes, regardless of where they are routed. This eliminates the need to have signals routed to one probing point.

Figure below shows the N5346A flying lead cable set for DigRF v4 protocol tester.

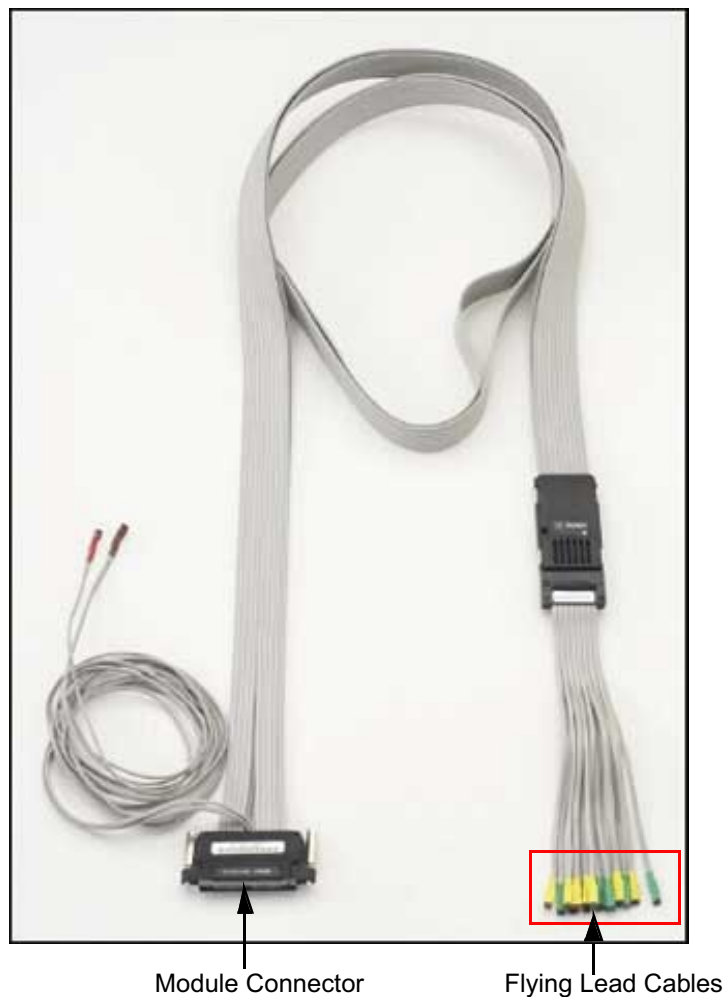


Figure 24 N5346A Flying Lead Probe

The components shown in Figure above are described below:

- **Module Connector**– This component connects to the Analyzer Probe component of the N5343A I/O module.
- **Flying Lead Cables**– This component connects to DUT. There are 16 flying lead cables that you can use to connect to DUT via resistors.

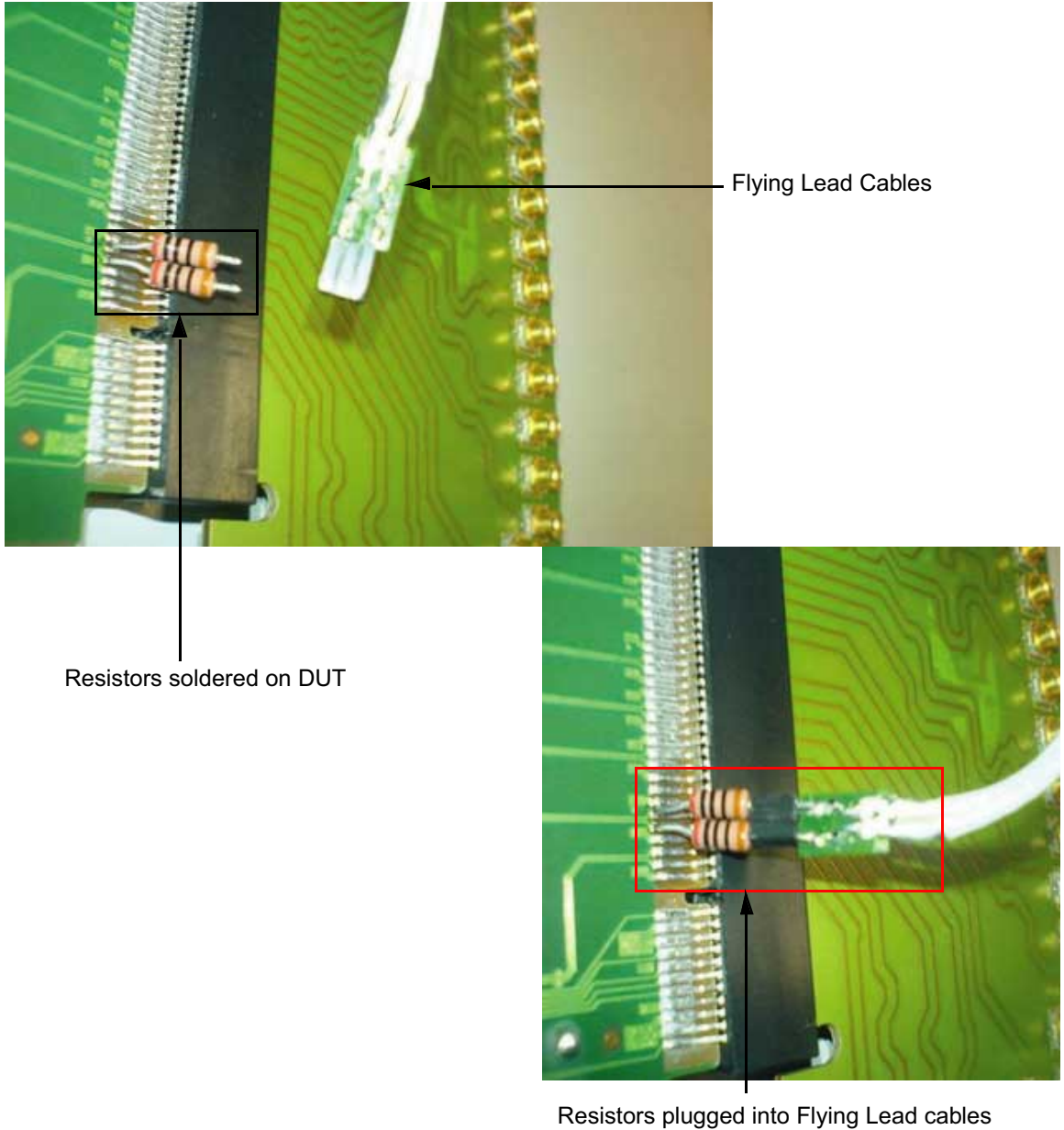


Figure 25 Flying Lead Cables using Resistors to connect with DUT

As shown in the previous figure, the one end of resistors is first soldered onto DUT, and the other end is plugged into the flying lead cables.

The following list provides more information about the N5346A flying lead probe set:

- Its length is 60 inches (152.4 cm), and the length of its flying lead cables is 5.9 inches (15 cm).
- It has input resistance of 297 Ohms.
215 Ohms from internal tip resistor in series with 82 Ohms from external resistor.
- It is supplied with the E5381- 82101 Flying Leads Resistor Kit.
- It allows probing of individual lanes, regardless of where they are routed. This eliminates the need to have signals routed to one probing point.
- It uses solder- on resistors for reference clock connections.
- Probe as close as possible to the receiver on the link.
- When soldering resistors, keep the channel side of the resistor as short as possible, as it will act as a stub and create reflection. However, the length of the probing resistors should match by +/- 1 mm.
- Make sure that all resistors used to probe the channels on one direction of a DigRF v4 interface link are placed in the same relative places. Symmetry between the two paired resistors is very important.

WARNING

Do not directly touch any component on the N5346A flying lead cable set. It may be hot.

CAUTION

Components on the N5346A flying lead cable set are sensitive to the static electricity. Therefore, take necessary anti-static precautions, such as wear a grounded wrist strap, to minimize the possibility of electrostatic damage.

- See Also**
- ["Resistor Dimensions"](#) on page 41
 - ["Lane Mapping"](#) on page 43
 - ["Characteristics"](#) on page 43

Resistor Dimensions

The following figure shows the dimensions of the resistors (E5381-82101 Flying Leads Resistor Kit), that come with the flying lead cables.

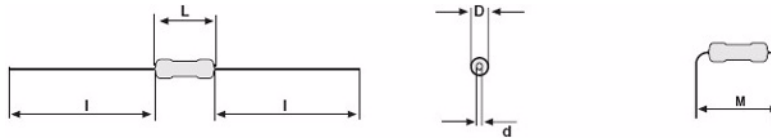


Figure 26 Dimensions of the resistors

NOTE

You can purchase more resistor kits from Agilent Parts Direct using its part number.

The following table provides measurements of the resistor dimensions.

Table 7 Measurements of the resistor dimensions

Dimension Type	Measurement
Dmax.	1.6 mm
Lmax.	3.6 mm
dnom.	0.5 mm
Imin.	29.0 mm
Mmin.	5.0 mm
MASS	125 mg

As given in the table above, the diameter of the resistor ends (dnom.) is 0.5 mm. Therefore, the eye diameter on DUT, to which the one end of the resistor is soldered, should be 0.6 mm to properly hold the resistor. The other end of the resistor, which is plugged into the flying lead cables, should be short enough to avoid it from bending. Additionally, the distance between the eyes on a DUT should be large enough to avoid any contact between adjacently soldered resistors.

The diagram and the highlighted part in the following figure shows how you should be connecting resistors with eyes on DUT and flying lead cables.

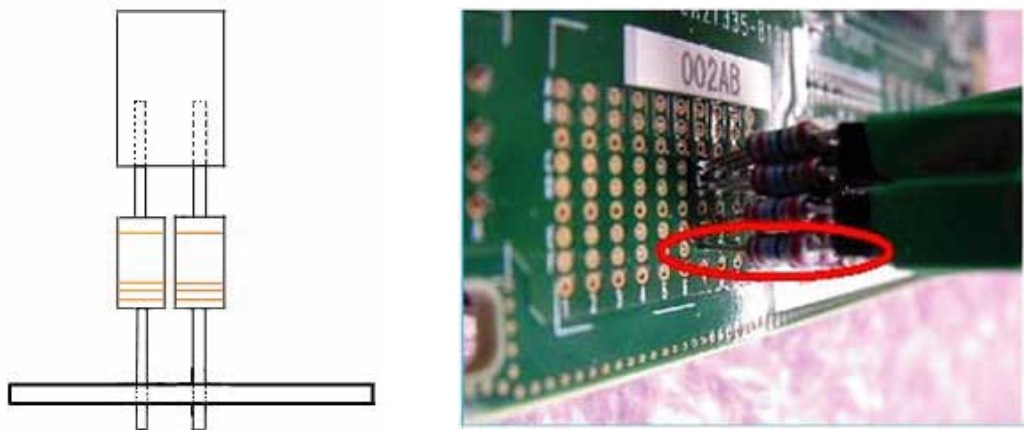


Figure 27 Resistors connecting with eyes and Flying Lead Cables

Lane Mapping

The following table provides the lane mapping information of the flying lead cables.

Table 8 Lane Mapping for N5346A Flying Lead Cables

Probe Label	DigRF Lane	Probe Label	DigRF Lane
A0	V4_LS_RX1	B0	V4_LS_TX1
A1	V4_LS_RX2	B1	V4_LS_TX2
A2	V4_HS_RX1/V3_RX	B2	V4_HS_TX1/V3_TX
A3	V4_HS_RX2	B4	V4_HS_TX2
A4	V3_RX	B5	V3_TX

Note: V4_LS_RX and V4_HS_RX are the same signals required to route more than one pin as mentioned in Table 6. The V4_LS... and V4_HS... names are given to make symbolic representation for the actual uses of these pins.

Characteristics

CAUTION

Carefully read the specifications stated below before setting up the design for N5346A flying lead probe.

6 Analyzer Probing

Probe Inputs:	Input Voltage: 25 V max or 3 V rms into 250 Ohms.
Temperature:	Operating 0 to 40 Deg C with 200 linear feet per minute airflow. Storage -40 to 70 Deg C.
Humidity:	Operating 15% to 95% non condensing.
Altitude:	Operating: to 3000 meters (10000 ft).
Airflow:	For a single probe with no heat sources within 1 inch, 140 linear feet per minute of air flow is required. For two probes, placed side by side with minimum spacing and no other heat sources within 1 inch, 200 linear feet per minute of air flow is required.

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