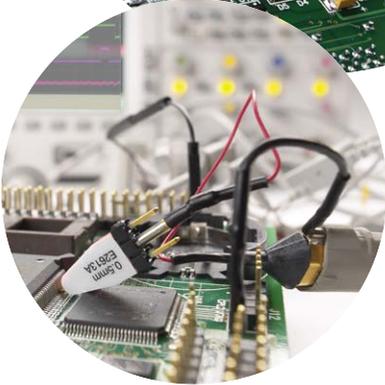


Agilent Oscilloscope Probes and Accessories

Selection Guide

To get the most out of your oscilloscope, you need the right probes and accessories for your particular applications. Whether you need the high bandwidth and low loading of an active probe, an easy way to connect to surface mount ICs or a passive probe to measure high voltages, there's a wide selection of high-quality probes and accessories for your Agilent oscilloscope.



How to select a probe



Selecting the correct probe for your oscilloscope measurement should not be difficult. This brochure provides suggestions on how to make the best decision. Following is a list of probe parameters you need to consider when you select a probe for a given measurement.

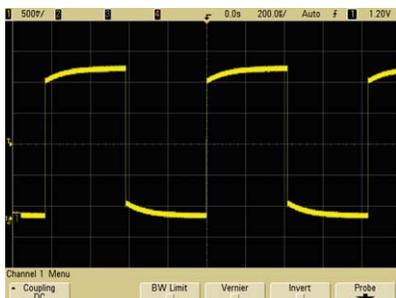
Attenuation

Choose the attenuation ratio of the probe (1:1, 10:1, 100:1, 1000:1) to match the test signal amplitude to the oscilloscope's vertical sensitivity range.

Bandwidth (BW)

The probe's rated bandwidth should match the oscilloscope and be adequate for the test signal. However, at higher frequencies, grounded lead inductance and input capacitance often influence system performance more than probe bandwidth does.

The effects of passive probe compensation:



Under-compensated

Input resistance (Rin)

The probe's input resistance must match the oscilloscope's input impedance to avoid a characteristic impedance mismatch. It also must be appropriate to the test signal to avoid excessive loading.

Input capacitance (Cin)

Excessive input capacitance (sometimes called tip capacitance) will slow down the system's pulse response. Usually the least input capacitance possible is best.

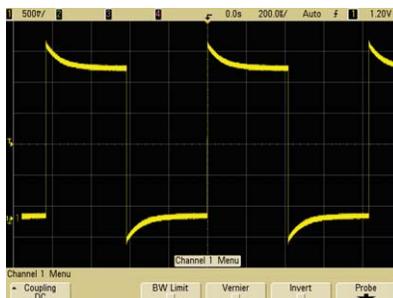
Maximum input voltage (Vmax)

To ensure user safety, help protect the oscilloscope input from destructive voltage, and avoid damage to the probe, select a probe that is rated for a higher voltage than the signal you intend to test.

Probe compensation range

Most passive probes have a specification that lists the oscilloscope input capacitance range over which they can be used. When choosing a passive probe, be sure that the oscilloscope's input capacitance lies within the probe's compensation range or you will not be able to adjust the probe to achieve a correctly compensated square wave signal.

Most oscilloscopes have 1 MΩ input resistance. This input



Over-compensated

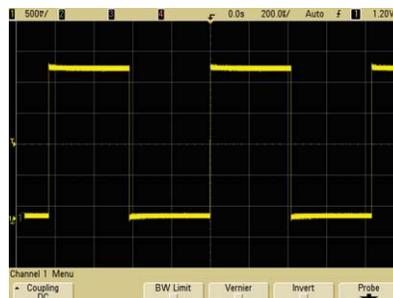
resistance is in parallel with the input (shunt) capacitance. Normally, high-frequency probes with attenuation factors greater than 1:1 have adjustable compensation networks built into them. Adjusting this compensation network provides the best possible frequency linearity over the oscilloscope's designed frequency range. Operating instructions provided with the probe explain how to adjust the compensation network to obtain best signal fidelity.

Probe Interface

Most Agilent oscilloscope probes offer either BNC type of probe interface or the AutoProbe interface. The AutoProbe interface is an intelligent communication and power link between compatible probe and the Infiniium or InfiniiVision 5000/6000/7000 Series oscilloscopes. The AutoProbe identifies the type of probe attached and sets up the proper input impedance, attenuation ratio, probe power and offset range as needed.

Probe tip form factor

Your probe must make a reliable connection to the test point, and you may want it to grab the test point. Generally, this requires a small and light probe and a tip or grabber that is compatible with the test point. SMT and fine-pitch geometries make this issue especially critical.



Properly compensated

Types of probes

Passive probes

The most widely used type of oscilloscope probe is the “passive probe.” Passive probes are also the most rugged and economical. There are no active components

such as transistors or amplifiers in the probe, and therefore passive probes do not need to be powered.



Passive probes classifications

	1:1 passive probe	10:1 passive probe	100:1 or 1000:1 passive probe	Resistive divider passive probe
Features	A low capacitance coax cable with a BNC connector on one end and a probe on the other	<ul style="list-style-type: none"> The most widely used scope probe type; provided standard with most <1-GHz oscilloscopes Gives lower input capacitance and higher bandwidth than the 1:1 probe 	<ul style="list-style-type: none"> Additional attenuation for use with higher-amplitude signals Large attenuation requires a high-gain amplifier on the scope 	<ul style="list-style-type: none"> Highest-bandwidth passive probe for measuring high-frequency, low-impedance circuit Must be used with an oscilloscope's 50 Ω input
When to use	For viewing small signals (<1 V)	For viewing up to ~300 V	For viewing up to 15 kVdc high voltage	High-frequency, low-impedance (<50 Ω) digital circuit
When not to use	For probing high-frequency signal	For achieving >600 MHz system bandwidth	For making floating (ungrounded) measurement	For probing high-amplitude, high-impedance signal
Typical bandwidth	Up to 25 MHz	Up to 600 MHz	Up to 250 MHz	Up to 6 GHz
Agilent models	10070C, 1162A	10073C, 10074C, 1160/1/3/4/5A, N2862/3A	10076A, N2771A	54006A, 1163A

Passive probe characteristics

Model	Cable Length	Attenuation	Typical probe bandwidth	Compensates oscilloscope input	Max Input Voltage	Recommended oscilloscopes
10070C	1.5 m	1:1	20 MHz	High Z	400 Vpk	3000, 5000, 6000, 7000, 8000, 54600 Series
1162A	1.5 m	1:1	25 MHz	1 MΩ	300 Vpk	54800 or 8000
10073C	1.5 m	10:1	500 MHz	1 MΩ, 6-15 pF	400 Vpk	5000 Series (500 MHz) 6000 Series (300 MHz-1 GHz), 7000, Series 5464x, 54830 and 8000 series
10074C	1.5 m	10:1	150 MHz	1 MΩ, 9-17 pF	400 Vpk	6000 Series (100 MHz), 5462x
1160A	1.5 m	10:1	500 MHz	1 MΩ, 6-9 pF	300 Vpk	54810/15/20/25A
1161A	1.5 m	10:1	500 MHz	1 MΩ, 12-14 pF	300 Vpk	54845A/B, 54846A/B
1163A	1.5 m	10:1	1.5 GHz	50 Ω	10 Vpk	54800, 7000, 8000, 80000 or 90000 Series
1164A	2 m	10:1	500 MHz	1 MΩ, 6-9 pF	300 Vpk	54810/15/20/25A
1165A	1.5 m	10:1	600 MHz	1 MΩ, 12-14 pF	300 Vpk	54830, 6000, 7000 or 8000 Series
N2862A	1.2 m	10:1	150 MHz	1 MΩ, 5-30 pF	300 Vpk	3000 Series
N2863A	1.2 m	10:1	300 MHz	1 MΩ, 5-30 pF	300 Vpk	3000, 5000 Series (100, 300 MHz)
54006A	1.2 m	10:1 (50 Ω) or 20:1 (1 kΩ)	6 GHz	50 Ω	20 Vpk	80000, 90000, 5484x, 5485x
10076A	1.5 m	100:1	250 MHz	1 MΩ, 7-20 pF	4 kV CAT I 1 kV CAT II	3000, 5000, 6000, 7000, 8000 Series
N2771A	2 m	1000:1	50 MHz	1 MΩ, 6-20 pF	DC: 15 kV,	3000, 5000, 6000, 7000, 8000 Series AC: 10 kVms, Peak 30 kV

Types of probes (continued)

Single-ended active probes

Active probes contain a small, active amplifier built into the probe body near the probe tip. This arrangement makes it possible to keep the probe input capacitance very low, usually less than 2 pF. This low capacitance results in high input impedance on high frequencies. It has the best

overall combination of resistive and capacitive loading. With such low loading, active probes can be used on high-impedance circuits that would be seriously loaded by passive probes. Active probes are the least intrusive of all the probes.



Single-ended active probe characteristics

Model	Attenuation	Probe bandwidth	Input dynamic range	Applications and use	Oscilloscope compatibility
1144A	10:1	800 MHz	0 to ± 7 V	Requires 1142A power supply	50 Ω BNC input
1145A	10:1	750 MHz, 2 channels	0 to ± 6 V	<ul style="list-style-type: none"> Probing surface-mount devices¹ Requires 1142A power supply 	50 Ω BNC input
1155A ²	10:1	750 MHz, 2 channels	0 to ± 6 V	Probing surface-mount devices ¹	50 Ω AutoProbe interface input
1156A	10:1	1.5 GHz	5 V p-p	Measuring fast transitions on low-voltage signals	50 Ω AutoProbe interface input
1157A	10:1	2.5 GHz	5 V p-p		
1158A	10:1	4 GHz	5 V p-p		

¹ See pages 9 and 10 for available SMT probing solutions

² Not compatible with 5000, 6000 or 7000 Series

Single-ended active probe advantages

Timing and voltage measurements are more accurate at high bandwidths.

Active probes are the least intrusive to circuits under test.

Limitations

Active probes are more expensive than general-purpose passive probes.

Active probes have lower dynamic range, lower maximum voltage and are less rugged than passive probes.



1144A 800 MHz active probe

1145A 750 MHz low-mass active probe



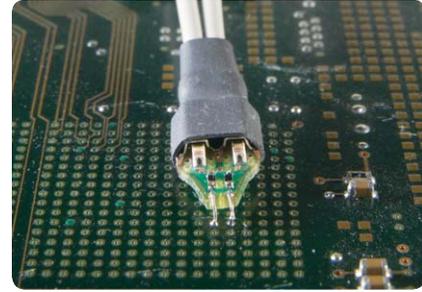
1156A/57A/58A 1.5/2.5/4 GHz active probe

Types of probes (continued)

Differential active probes

A “differential” probe is an active probe that has two inputs, one positive and one negative, as well as a separate ground lead; it drives a single-terminated 50-Ω cable to transmit its output to one oscilloscope channel. The output signal is proportional to the difference between the voltages

appearing at the two inputs. A differential probe is used to look at signals that are referenced to each other instead of earth ground and to look at small signals in the presence of large DC offsets or other common mode signals such as power line noise.



Differential active probe characteristics

Model	Attenuation	Probe bandwidth	Input dynamic range	Applications and use	Oscilloscope compatibility
N2772A	20:1 or 200:1	20 MHz	Max input: 600 V CAT III, 1000 V CAT II (single-ended) or 1000 Vdc, 1000 Vrms, 1200 V DC +AC peak (differential)	<ul style="list-style-type: none"> For high-voltage circuits, motor control, power supply design Requires N2773A power supply or 9-V battery 	High-impedance BNC input
1141A	1:1	200 MHz	±300 mV (1:1) ; ±3 V (10:1) ; ±30 V (100:1) with attenuation	<ul style="list-style-type: none"> Surface-mount devices Requires 1142A power supply 	50-Ω BNC input
1153A ¹	1:1	200 MHz	±300 mV (1:1) ; ±3 V (10:1) ; ±30 V (100:1) with attenuation	Surface-mount devices	50-Ω AutoProbe interface input

¹ Not compatible with 5000, 6000, and 7000 Series

InfiniiMax single-ended and differential probes characteristics

Model	Attenuation	Probe bandwidth	Input dynamic range	Applications and use	Recommended oscilloscopes
1130A ¹	10:1	1.5 GHz	5 V single ended, ±2.5 V differential	<ul style="list-style-type: none"> Measure fast transitions on low-voltage differential or single-ended signals Full-bandwidth probing system for 6000/8000/80000/90000 Series 	6000 (300 MHz-1 GHz), 7000, 8000 Series
1131A ¹	10:1	3.5 GHz	5 V single ended, ±2.5 V differential		DSO80204B, 80304B, 90254A
1132A ¹	10:1	5 GHz	5 V single ended, ±2.5 V differential	<ul style="list-style-type: none"> Requires one or more probe head accessory per amplifier 	DSO80404B, 90404A
1134A ¹	10:1	7 GHz	5 V single ended, ±2.5 V differential		DSO80604B, 90604A
1168A ^{1,2}	3.45:1	10 GHz	3.3 V single ended, ±1.65 V differential		DSO80804B, 81004B, 90804A
1169A ^{1,2}	3.45:1	12 GHz (13 GHz typical)	3.3 V single ended, ±1.65 V differential		DSO81204B, 81304B, 91204A 91304A

¹ Order one or more probe heads. See page 10 for available InfiniiMax probe heads and accessories.

² Not compatible with 5000, 6000 and 7000 Series oscilloscopes.

Types of probes (continued)

Differential active probes (continued)

Active differential probe advantages

View small signals in the presence of DC or other common mode signals

N2772A probes high-differential signals with low-thermal drift

1153A/1141A probes both low- and high-voltage differential signals with low-thermal drift

1130A/31A/32A/34A and 1168A/69A InfiniiMax probe probes both single-ended and differential signals up to 12 GHz bandwidth

Limitations

- More expensive than general-purpose passive probes
- Less dynamic range than using two passive probes

20 MHz bandwidth

200 MHz bandwidth

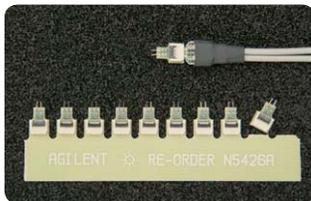
Lower dynamic range and maximum input voltage (but has ultra low input capacitance)



1153A 200 MHz differential probe



N2772A 20 MHz differential probe



N5426A high bandwidth ZIF solder-in probe head for InfiniiMax probes



1130A/31A/32A/34A InfiniiMax high-bandwidth differential probe and its probe head configurations

Types of probes (continued)

Current probes

Current probes sense the current flowing through a conductor and convert it to a voltage that can be viewed and measured on an oscilloscope. Agilent current probes use a hybrid technology that includes a Hall-effect sensor, which senses the DC current, and a current transformer, which

senses the AC current. Using split core construction, the current probe easily clips on and off of a conductor, making it unnecessary to make an electrical connection to the circuit. Measurement bandwidths from DC to 100 MHz are available.



Current probe characteristics

Model	Probe type	Probe bandwidth	Max input current	Applications and use	Oscilloscope compatibility ¹
1146A	AC/DC current, 0.1 V/A (0-10 A peak) or 0.01 V/A (0-100 A peak)	100 kHz	100 A peak	<ul style="list-style-type: none"> AC line, motors, automotive current measurement Requires 9-Vdc battery 	High-impedance BNC input
1147A	AC/DC current, 0.1 V/A	50 MHz	15 A rms continuous 30 A peak non-continuous	Motors, switching power supplies, magnetic-device current measurements	High-impedance AutoProbe input
N2774A	AC/DC current, 0.1 V/A	50 MHz	15 A rms continuous 30 A peak non-continuous	<ul style="list-style-type: none"> Motors, switching power supplies, magnetic device current measurements Requires N2775A 2-channel power supply 	High-impedance BNC input
N2780A ²	AC/DC current, 0.01 V/A	2 MHz	500 A rms continuous 700 A peak non-continuous	Motors, switching power supplies, line currents	High-impedance BNC input
N2781A ²	AC/DC current, 0.01 V/A	10 MHz	150 A rms continuous 300 A peak non-continuous	Motors, switching power supplies, transformers	High-impedance BNC input
N2782A ²	AC/DC current, 0.1 V/A	50 MHz	30 A rms continuous 50 A peak non-continuous	Switching power supplies, amplifiers, magnetic devices	High-impedance BNC input
N2783A ²	AC/DC current, 0.1 V/A	100 MHz	30 A rms continuous 50 A peak non-continuous	Switching power supplies, low current measurements	High-impedance BNC input

¹ To use the 1146A, N2774A or N2780A Series current probe with Infiniium 80000, 90000 or 5485xA Series scope, order E2697A 1 MΩ high-impedance adapter.

² Requires N2779A 3-channel power supply.

Types of probes (continued)

Current probes (continued)

Current probe advantages

- 1146A low-cost model measures AC and DC current to 100 Arms without breaking into the circuit
- Probe power is provided by the battery, so there's no need for an external power supply

Limitations

100 kHz bandwidth

N2780A Series and N2774A measure AC and DC current up to 500 A (N2780A) or 100 MHz (N2783A) without breaking into the circuit

Requires an external power supply

- 1147A measures AC and DC current up to 50 MHz
- AutoProbe interface completely configures the oscilloscope for the probe

Maximum 15 A rms



1146A 100 kHz current probe



N2774A 50 MHz current probe with N2775A power supply



1147A 50 MHz current probe



N2780A Series current probes with N2779A power supply



Other oscilloscope accessories

Probing accessories

Mixed signal oscilloscope logic probe

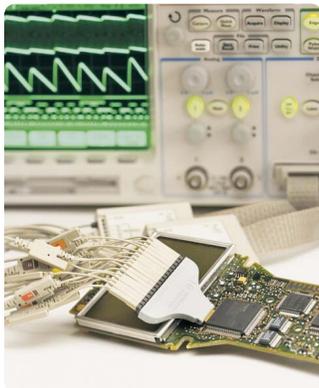
54620-68701	Logic probe with 2x8 flying leads (shipped with 6000/7000 Series MSOs)	Compatible with 6000/7000/54600 Series MSOs
10085-68701 ¹	40-pin logic probe and termination adapter	Compatible with 6000/7000/54600 Series MSOs
54826-68701	Logic probe kit for Infiniium MSOs (shipped with 8000 Series MSOs)	Compatible with 8000/54830 Series MSOs
E5396A	16-channel Soft Touch connectorless logic probe	Compatible with 6000/8000/54830 Series MSOs

¹ With the addition of a 40-pin logic cable, the Agilent MSO accepts numerous logic analyzer accessories such as Mictor, Samtec, flying leads, or Soft touch connectorless probe.

Wedge probe adapter

- Easy connection to 0.5 mm or 0.65 mm TQFP and PQFP packages
- Reliable contact with little chance of shorting to adjacent pins
- 3, 8 and 16-signal versions

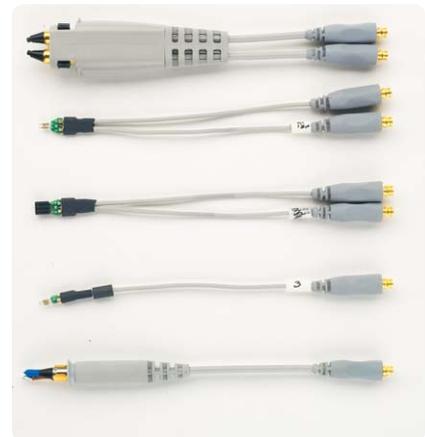
E2613A	IC pin spacing: 0.5 mm, 3-signal, qty 1	<ul style="list-style-type: none"> • Connects easily to most oscilloscopes or logic analyzers with appropriate accessories • Connects directly to 1145A/1155A active probes and the dual-lead adapter provided with the 116xA passive probe family
E2613B	IC pin spacing: 0.5 mm, 3-signal, qty 2	
E2614A	IC pin spacing: 0.5 mm, 8-signal, qty 1	
E2615A	IC pin spacing: 0.65 mm, 3-signal, qty 1	
E2615B	IC pin spacing: 0.65 mm, 3-signal, qty 2	
E2616A	IC pin spacing: 0.65 mm, 8-signal, qty 1	
E2643A	IC pin spacing: 0.5 mm, 16-signal, qty 1	
E2644A	IC pin spacing: 0.65 mm, 16-signal, qty 1	



16-pin wedge adapter



E5396A half-size Soft Touch connectorless probe



Types of InfiniiMax probe heads

Other oscilloscope accessories (continued)

Probing accessories (continued)

InfiniiMax 1130A/31A/32A/34A and InfiniiMax II 1168A/69A probe accessories

Unrivaled InfiniiMax and InfiniiMax II probing accessories support browsing, solder-in, socket and SMA use models at the maximum performance available

E2669A	InfiniiMax connectivity kit for differential/single-ended measurements	Fully compatible with 1130/31/32/34A InfiniiMax probe amplifier and compatible 1168A/69A InfiniiMax II probe amplifier with limitations
E2668A	InfiniiMax connectivity kit for single-ended measurements	
E2675A	InfiniiMax differential browser probe head and accessories (6 GHz BW)	
E2676A	InfiniiMax single-ended browser probe head and accessories (6 GHz BW)	
E2677A	InfiniiMax differential solder-in probe head and accessories (12 GHz BW)	
E2678A	InfiniiMax single-ended/differential socketed probe head and accessories (12 GHz BW)	
E2679A	InfiniiMax single-ended solder-in probe head and accessories (6 GHz BW)	
E2695A	Differential SMA probe head (8 GHz BW)	
N5425A/N5426A	12 GHz differential ZIF solder-in probe head and ZIF probe tips	
N5451A	InfiniiMax long-wire ZIF probe tips (for use with N5425A ZIF probe head)	
N5450A	InfiniiMax extreme temperature extension cable (allows for probing in temperatures ranging from -55 to 150 degrees C)	
N5380A	InfiniiMax II differential SMA adapter (12 GHz BW)	Recommended for use with InfiniiMax II 1168A/69A probe amplifier
N5381A	InfiniiMax II differential solder-in probe head and accessories (12 GHz BW)	
N5382A	InfiniiMax II differential browser (12 GHz BW)	

IC clip kit

10075A	0.5 mm IC clip kit	For 10070 Series passive probes
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Probe accessory kit

10072A	SMT probe accessory kit	For 10070 Series passive probes
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PC board mini-probe socket

N2766A	Horizontal mini-probe socket, qty 25	Compatible with 116x Series passive probes
N2768A	Vertical mini-probe socket, qty 25	Compatible with 116x Series passive probes

High-impedance adapter

E2697A	1 M Ω high-impedance adapter (includes one 10073C 500 MHz passive probe)	Compatible with Infiniium oscilloscope's 50 Ω input
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Other oscilloscope accessories (continued)

Miscellaneous accessories

Test mobiles

1180CZ	Testmobile for 6000 Series	Compatible with 6000 Series
N2919A	Testmobile bracket for 1180CZ and 6000 Series	Compatible with 6000 Series
1181BZ	Testmobile system cart for Infiniium 8000/80000/90000 Series	Compatible with 54800/8000/80000/90000 Series

Carrying case

N2917B	Carrying case for 5000/6000 Series	Compatible with 5000/6000 Series
N2760A	Soft carrying case for 5000 Series	Compatible with 5000 Series only
N2733A	Soft carrying case for 7000 Series	Compatible with 7000 Series

Rackmount kit

N2864A	Rackmount kit for 3000 Series	Compatible with 3000 Series
N2916B	Rackmount kit for 5000/6000 Series	Compatible with 5000/6000 Series
N2732A	Rackmount Kit for 7000 Series	Compatible with 7000 Series
E2609B	Rackmount kit for 8000/80000 Series	Compatible with 54800/8000/80000 Series

Connectivity module

N2861A	For 3000 Series oscilloscopes	Provides GPIB and RS232 connectivity and pass/fail output for automatic testing
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Oscilloscope evaluation kit

N2918A	For 6000/7000 Series oscilloscopes	Provides various test signals to help you experience the power of 6000 Series
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Mini keyboard

E2610A	Infiniium oscilloscope mini keyboard	(included with Infiniium oscilloscope)
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VoiceControl

E2682A	Option for Infiniium 8000 Series	
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Related literature

Publication title	Publication type	Publication number
<i>Infiniium Oscilloscope Probes, Accessories and Options</i>	Data sheet	5968-7141EN
<i>Agilent Technologies 5000, 6000 and 7000 Series InfiniiVision Oscilloscope Probes and Accessories</i>	Data sheet	5968-8153EN

Product Web site

For the most up-to-date and complete application and product information, please visit our product Web site at:
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