

Keysight Technologies

N2790A 100 MHz, N2791A 25 MHz
and N2891A 70 MHz High-voltage
Differential Probes

Data Sheet



Unlocking Measurement Insights

Introduction

Oscilloscope users often need to make floating measurements where neither point of the measurement is at earth ground. Use the N2790A, N2791A or N2891A high-voltage differential probe to make safe and accurate floating measurements with an oscilloscope. The N2790A, N2791A and N2891A high-voltage differential probes allow conventional earth-grounded Keysight Technologies, Inc. oscilloscopes to be used for floating signal measurements.



With a differential amplifier in the probe head, the N2790A is rated to measure differential voltage up to 1,400 VDC + peak AC with high CMRR (common mode rejection ratio) of >50 dB at 1 MHz. The N2791A and N2891A can measure differential voltage up to 700 V and 7 kV differential or common mode respectively. The N2790A, N2791A and N2891A differential probe offers sufficient dynamic range and bandwidth for your application to make the floating measurements found in power electronics circuits safely and accurately.

The N2790A, N2791A and N2891A differential probe offers user selectable attenuation settings that make it highly versatile, allowing it to be used for a broad range of applications. The probe comes with probe tip accessories for use with both small or large components in tight places. The N2790A and N2891A also have an overrange indicator which alerts the user when the probe input exceeds the dynamic range of the probe.

The N2791A and N2891A are compatible with any oscilloscope with 1 Mohm BNC input. The N2791A and N2891A probe's power is supplied by included 4x AA batteries or USB host port of the scope or PC via a supplied USB power cable. The N2790A is compatible with the Keysight Technologies, Inc. AutoProbe interface where the probe's power is supplied by the Keysight oscilloscope's probe interface.



Figure 2. N2791A 25-MHz high-voltage differential probe with standard accessories



Figure 3. N2891A 70-MHz high-voltage differential probe with standard accessories

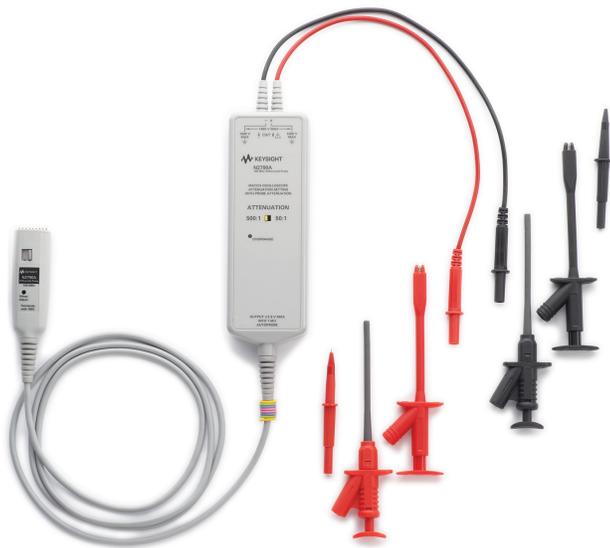


Figure 1. N2790A high voltage differential probe with standard accessories

Keysight oscilloscope compatibility	Max number of N2790A probes supported by oscilloscope
InfiniiVision 5000, 6000 (except 100 MHz), and 7000 Series with version 5.26.0001 software	4
InfiniiVision 3000 X- and 4000 X-Series	4
Infiniiium 8000, 54830 Series with version 5.7 software	4
Infiniiium 9000 Series with version 2.0 software	4

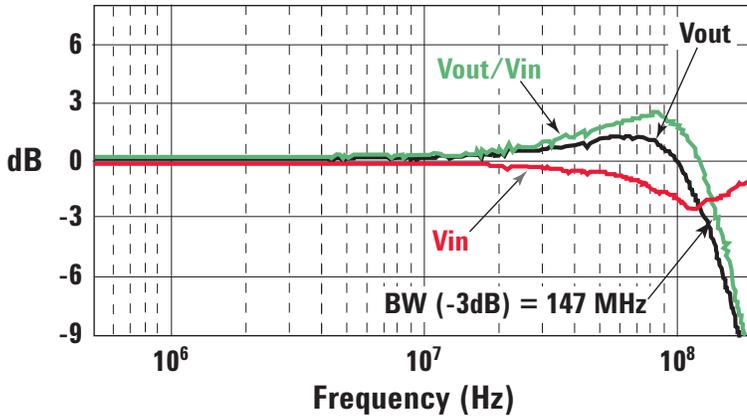


Figure 4. V_{out}/V_{in} vs. frequency response of N2790A

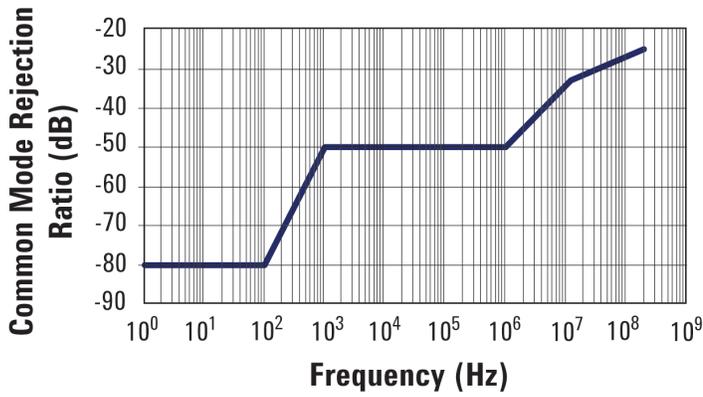


Figure 5. Frequency response (V_{out}/V_{in}) of N2790A when inputs are driven in common (common mode rejection)

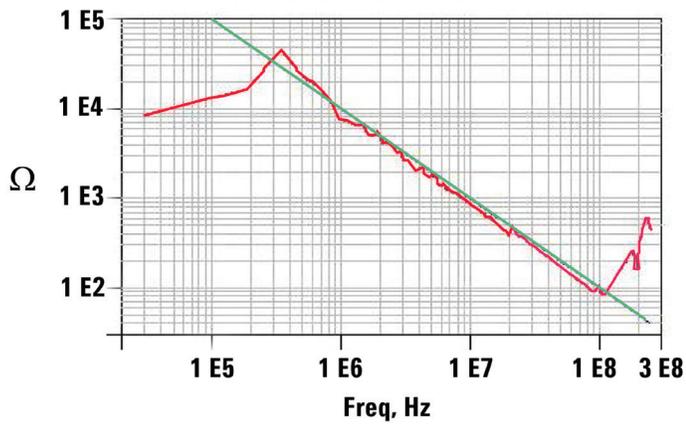


Figure 6. Input impedance vs. frequency of N2790A

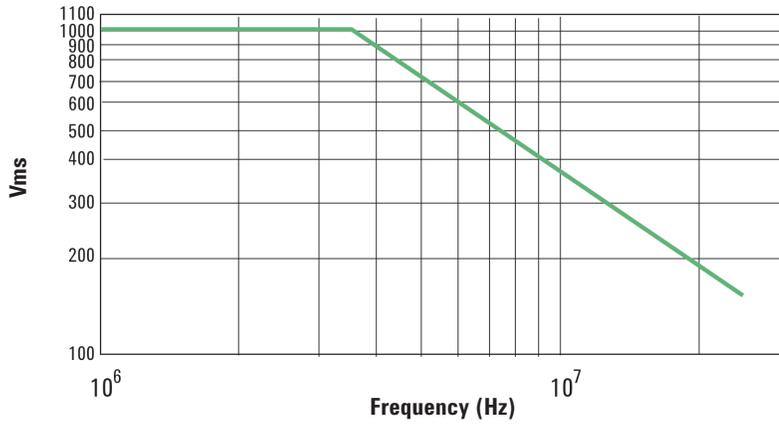


Figure 7. Voltage derating curve of N2790A (voltage between either input and ground)

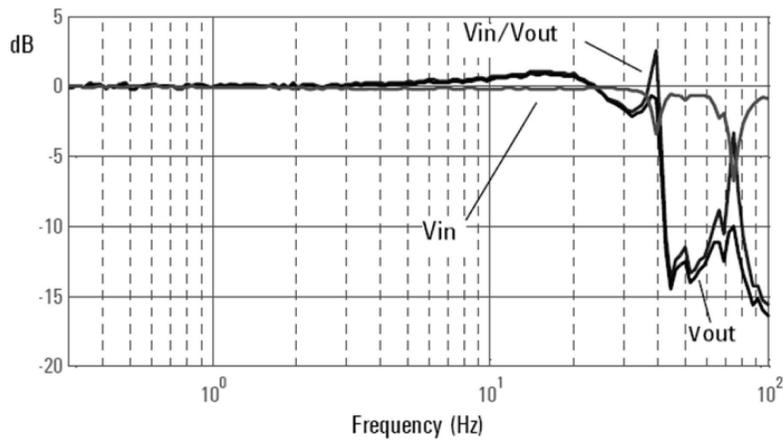


Figure 8. V_{out}/V_{in} vs. frequency response of N2791A

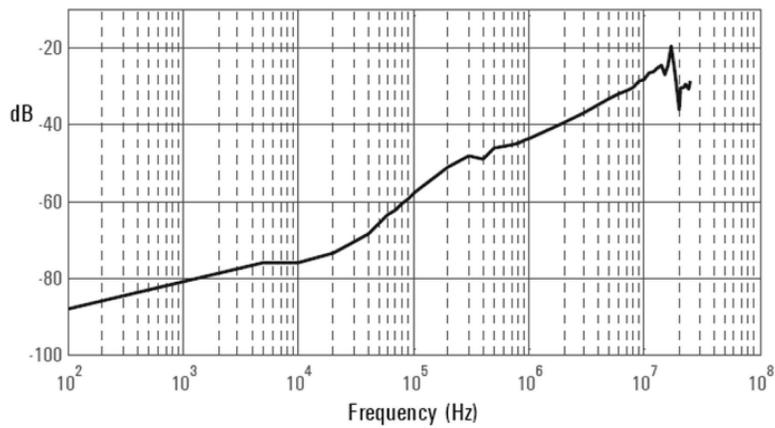


Figure 9. Frequency response (V_{out}/V_{in}) of N2791A when inputs are driven in common (common mode rejection)

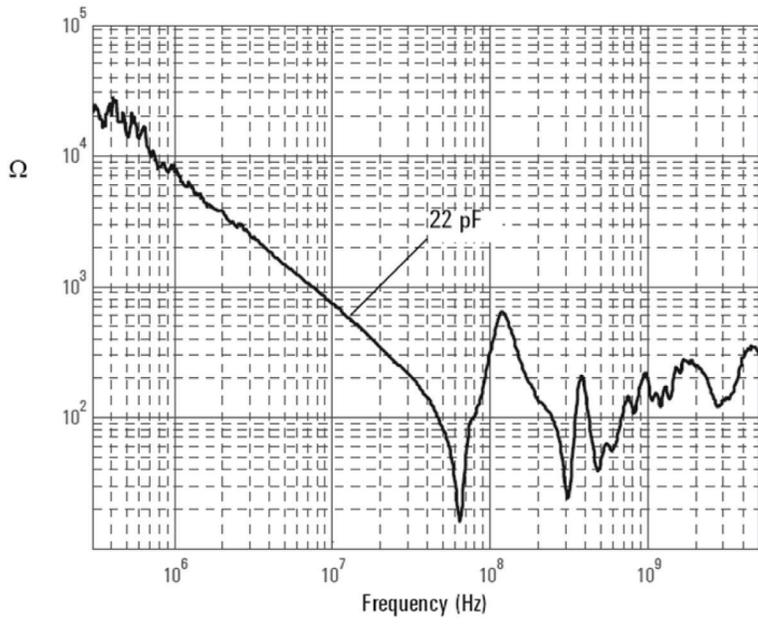


Figure 10. Input impedance vs. frequency of N2791A

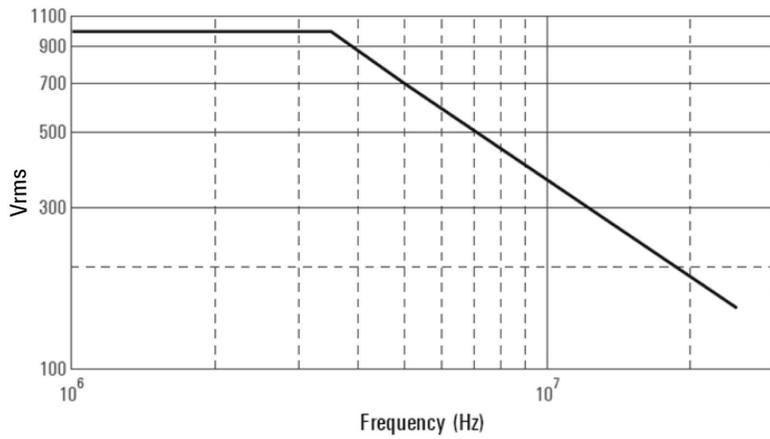


Figure 11. Voltage derating curve of N2791A (voltage between either input and ground)

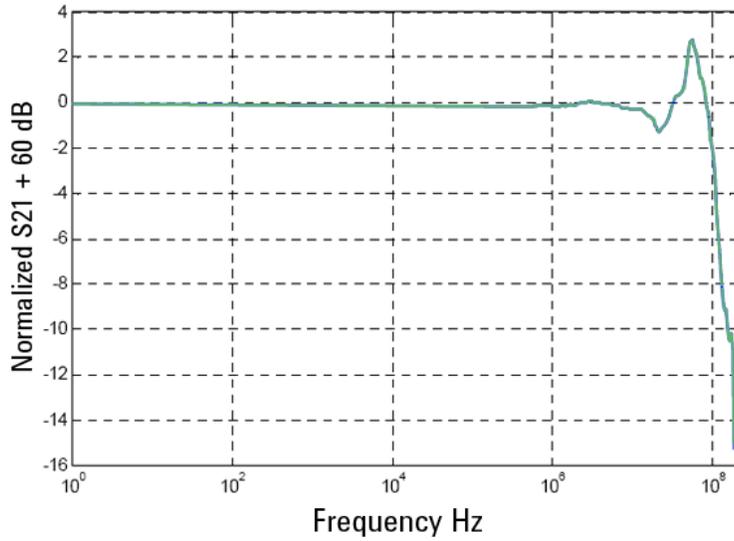


Figure 12. V_{out}/V_{in} vs. Frequency response of N2891A at 1000:1 attenuation

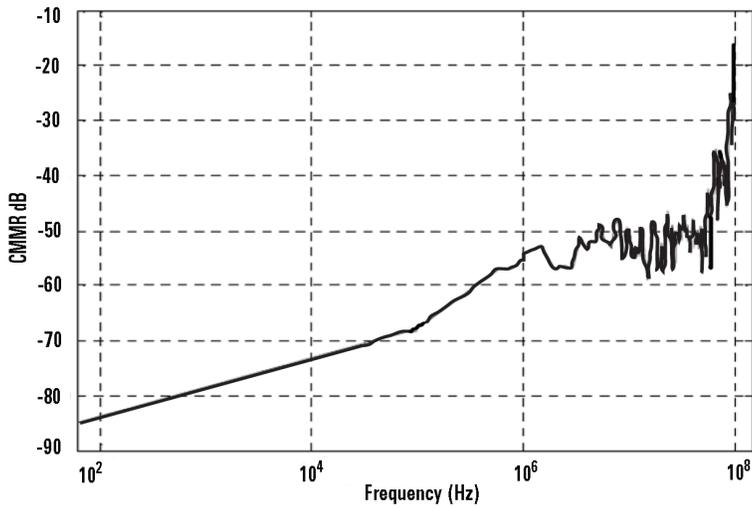


Figure 13. Frequency response (V_{out}/V_{in}) of N2891A when inputs are driven in common (common mode rejection)

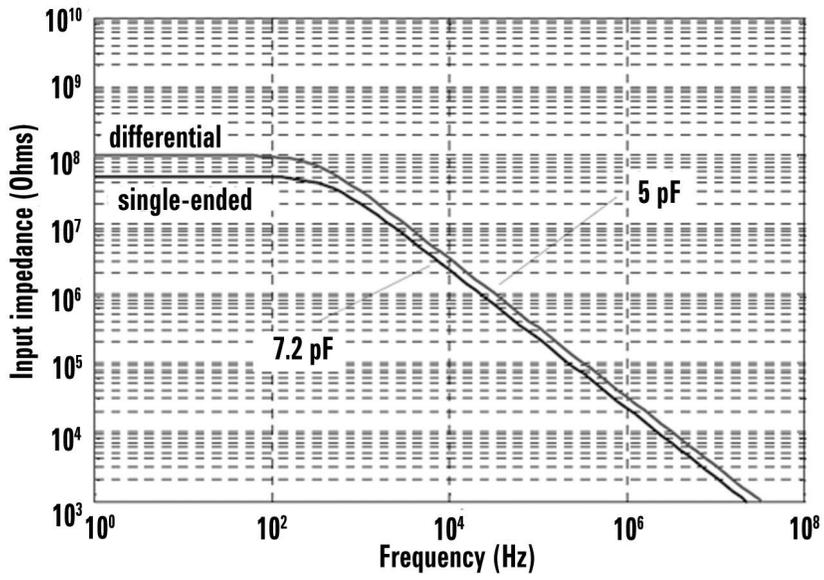


Figure 14. Input impedance vs. Frequency of N2891A

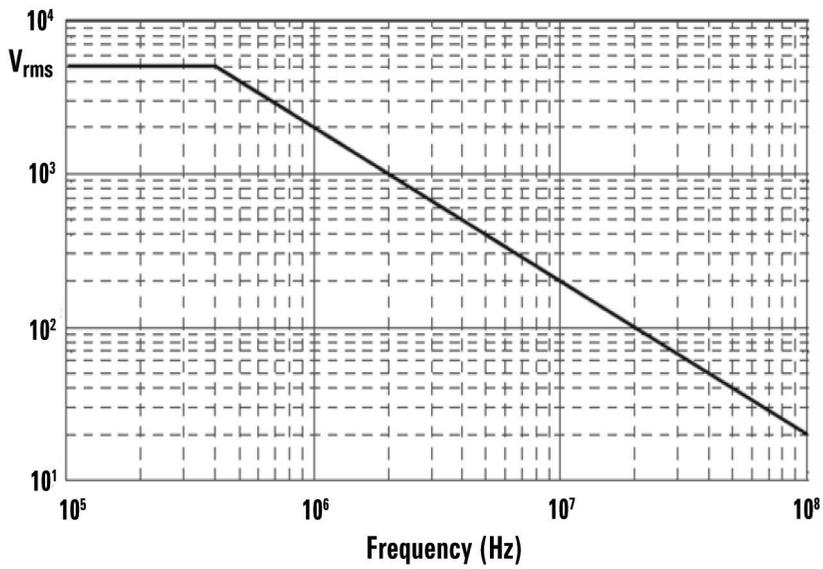


Figure 15. Voltage derating curve of N2891A (voltage between either input and ground)

Performance characteristics

Product number	N2790A	N2791A	N2891A
Bandwidth (-3dB)	≥100 MHz probe bandwidth*	≥ 25 MHz probe bandwidth	≥ 70 MHz
Rise time (calculated)	≤ 3.5 ns	≤ 14 ns	≤ 5 nsec
Attenuation	50:1 / 500:1	10:1 / 100:1	100:1 / 1000:1
Gain accuracy (% of reading)	± 2% at 20-30°C, ± 4% at 0-20°C and 30-50°C*		
DC CMRR	-70 dB at 500 VDC		
AC CMRR	-80 dB at 50/60 Hz -50 dB at 1 kHz -50 dB at 1 MHz	-80 dB at 50/60 Hz -40 dB at 1MHz	-80 dB at 50/60 Hz -60 dB at 20 kHz
Propagation delay	14 nsec at 50:1, 12.8 nsec at 500:1		
Input R//C (each input to ground)	4 Mohm // 7 pF	4 Mohm // 10 pF	50 Mohm // 7 pF
Input R//C (between inputs)	8 Mohm // 3.5 pF	8 Mohm // 8 pF	100 Mohm //5 pF
Max differential operating voltage (DC+PeakAC)	±1400 V at 500:1 ±140 V at 50:1	±700 V at 100:1 ±70 V at 10:1	±7000 V at 1000:1 ±700 V at 100:1
Max common mode operating voltage (RMS or DC+PeakAC)	±1000 V (CAT II) ±600 V (CAT III)	±700 V at 100:1 ±700 V at 10:1	±7000 V at 1000:1 ±7000 V at 100:1
Max nondestructive voltage	±1500 VDC + Peak AC differential mode ±1300 Vrms (CAT II) common mode	±1000 Vrms (CAT II) differential and common mode	±7000 V (DC + Peak AC), ±2500 Vrms @ 1:100 & 1:1000 in common mode or ±5000 Vrms @ 1:100 & 1:1000 in differential mode (CAT 1)
Output maximum voltage range	±2.8V into 1 Mohm (500:1)	7V into 1 Mohm (100:1)	7V into 1 Mohm (1000:1)
Scope's input impedance	1 Mohm AutoProbe interface	1 Mohm BNC interface	1 Mohm BNC interface
Output offset	Adjustable	± 7.5 mV (typical)	±5 mV (typical)
Noise referenced to input	< 300 mVrms at 500:1 < 50 mVrms at 50:1		
Temperature - operating	-10 to 50°C	-10 to 40°C	-10 to 40°C
Temperature - non-operating	-51 to 71°C	-30 to 71°C	-30 to 71°C
Humidity - operating	80% RH at 40°C	25-85% RH	25-85% RH
Humidity - non-operating	90% RH at 65°C	25-85% RH	25-85% RH
Operating altitude	2,000 m	3,000 m	3,000 m
Nonoperating altitude	15,300 m	15,300 m	15,300 m
Vibration	Keysight class GP and MIL-PRF-28800F class 3 random		
Shock	Tip end: 400g 1/2 sine wave AutoProbe BNC End: 50g 1/2 sine wave Probe circuit box: Keysight class B1 and MIL-PRF-28800F class 3		
Standard accessories	- 2 each browser tips (black and red) - 2 each alligator plunger clips (black and red) - 2 each pincer clips (black and red) - 2 each of 4 colored ID tags - DC offset adjustment tool - manual	- 2 each alligator clips (black and red) - 2 each hook clips (black and red) - USB power cord (2m) - 4 AA batteries - manual	- 2 each high-voltage alligator clips (black and red) - 2 each safety hook adapters (black and red) - USB power cord (2m) - 4 AA batteries - manual
Safety specifications	IEC61010-031	IEC61010-031	IEC61010-031

* Denotes warranted specification after 20 minute warm-up, all others are typical

When probing differential signals inside of environmental chambers at extreme temperatures, Keysight offers the N7013A extreme temperature extension kit shown in Figure 16. The N7013A is compatible with the N2790A and N2791A differential probes at de-rated bandwidths. The 70 cm long differential cable set and accessories can operate in temperatures ranging from -40 degrees to +85 degree Celsius. Although the N7013A is also mechanically compatible with the N2891A differential probe, de-rated bandwidths are not available and specifications are not guaranteed.



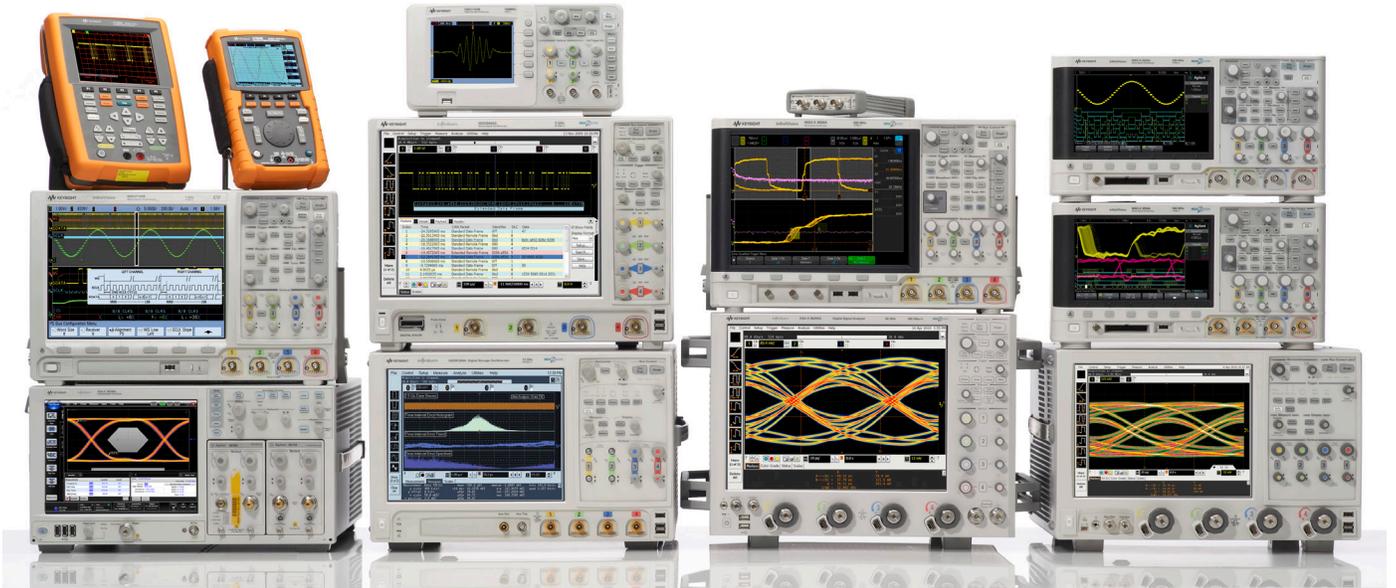
Figure 15. Versatile probe tip accessories allow you to access small or large components in tight places



Figure 16. The N7013A extreme temperature probing kit for differential probes

Ordering information

Product number	Description
N2790A	100 MHz high-voltage differential probe
N2790-68700	Probe tip accessory kit for N2790A including 2 each of browser tips, alligator plunger clips and pincer clips
N2791A	25-MHz high-voltage differential probe
N2791A-68700	Probe tip accessory kit for N2791A including 2 alligator clips and 2 hook clips
N2891A	70-MHz high-voltage differential probe
N2891A-68700	Probe tip accessory kit for N2891A including 2 high-voltage alligator clips and 2 safety hook adapters
0960-2926	CAN/FlexRay DB9 probe head for N2790A/91A/92A differential probe
N7013A	Extreme temperature probe kit for the N2790 and N2791A
N7014A	Banana-to-socketed adapters (1 pair)



Keysight Technologies Oscilloscopes

Multiple form factors from 20 MHz to >90 GHz | Industry leading specs | Powerful applications

myKeysight

myKeysight

www.keysight.com/find/mykeysight

A personalized view into the information most relevant to you.



www.axiestandard.org

AdvancedTCA® Extensions for Instrumentation and Test (AXIe) is an open standard that extends the AdvancedTCA for general purpose and semiconductor test. Keysight is a founding member of the AXIe consortium. ATCA®, AdvancedTCA®, and the ATCA logo are registered US trademarks of the PCI Industrial Computer Manufacturers Group.



www.lxistandard.org

LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Keysight is a founding member of the LXI consortium.



www.pxisa.org

PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.



Three-Year Warranty

www.keysight.com/find/ThreeYearWarranty

Keysight's commitment to superior product quality and lower total cost of ownership. The only test and measurement company with three-year warranty standard on all instruments, worldwide.



Keysight Assurance Plans

www.keysight.com/find/AssurancePlans

Up to five years of protection and no budgetary surprises to ensure your instruments are operating to specification so you can rely on accurate measurements.



www.keysight.com/go/quality

Keysight Technologies, Inc.
DEKRA Certified ISO 9001:2008
Quality Management System

Keysight Infoline

Keysight Infoline

www.keysight.com/find/service

Keysight's insight to best in class information management. Free access to your Keysight equipment company reports and e-library.

Keysight Channel Partners

www.keysight.com/find/channelpartners

Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

www.keysight.com/find/probes

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 11 2626
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus
(BP-04-23-15)