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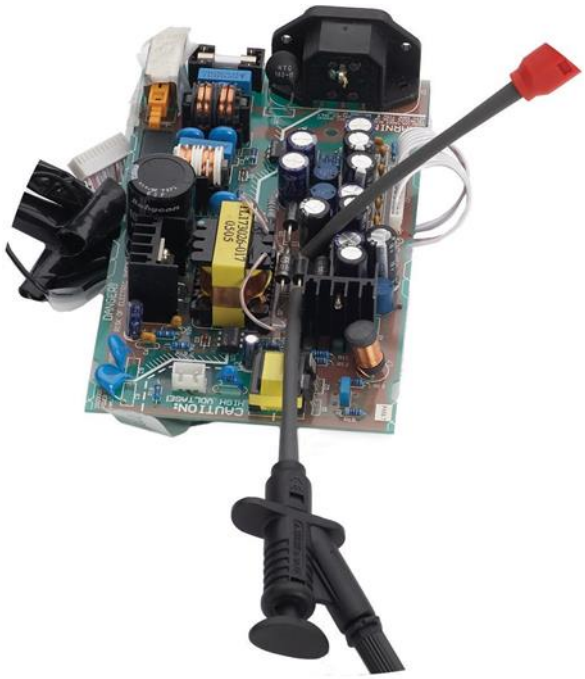
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DATA SHEET

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

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.





KEYSIGHT TECHNOLOGIES

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 1. N2790A high voltage differential probe with standard accessories.



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



Figure 3. N2891A 70-MHz 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
Infiniium 8000, 54830 Series with version 5.7 software	4
Infiniium 9000 Series with version 2.0 software	4

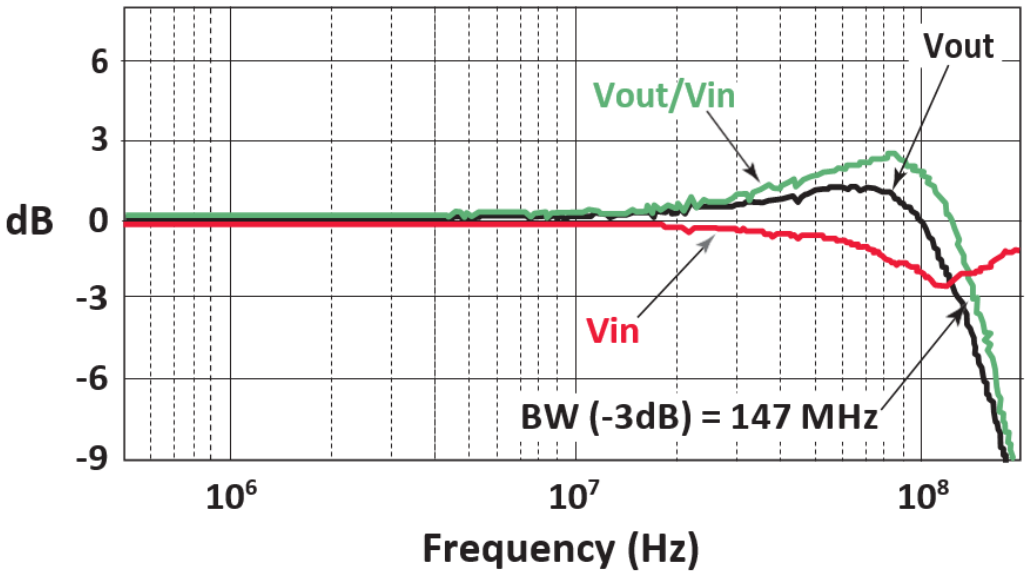


Figure 4. Vout/Vin vs. frequency response of N2790A.

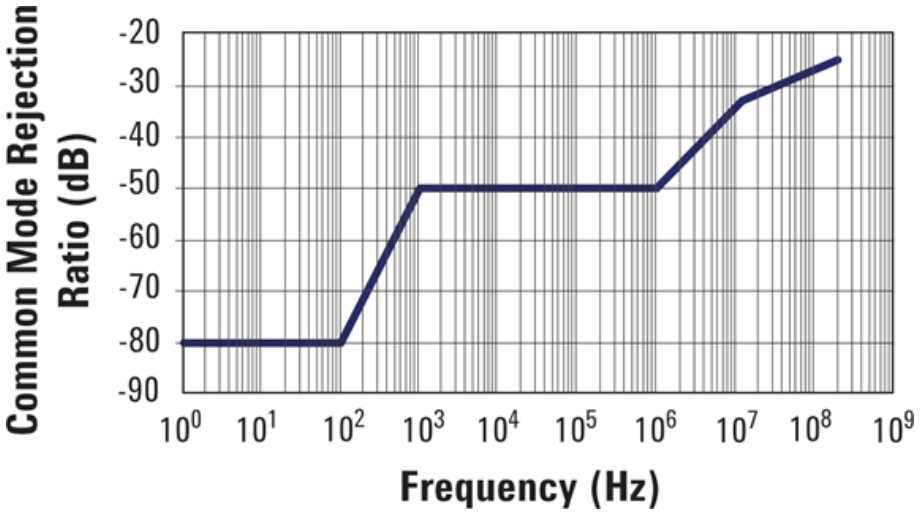


Figure 5. Frequency response (Vout/Vin) of N2790A when inputs are driven in common (common mode rejection).

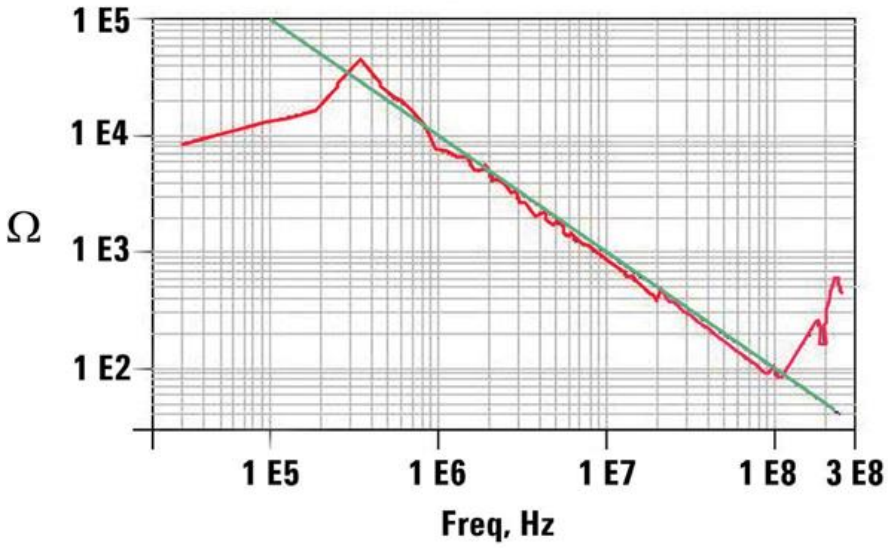


Figure 6. Input impedance vs. frequency of N2790A.

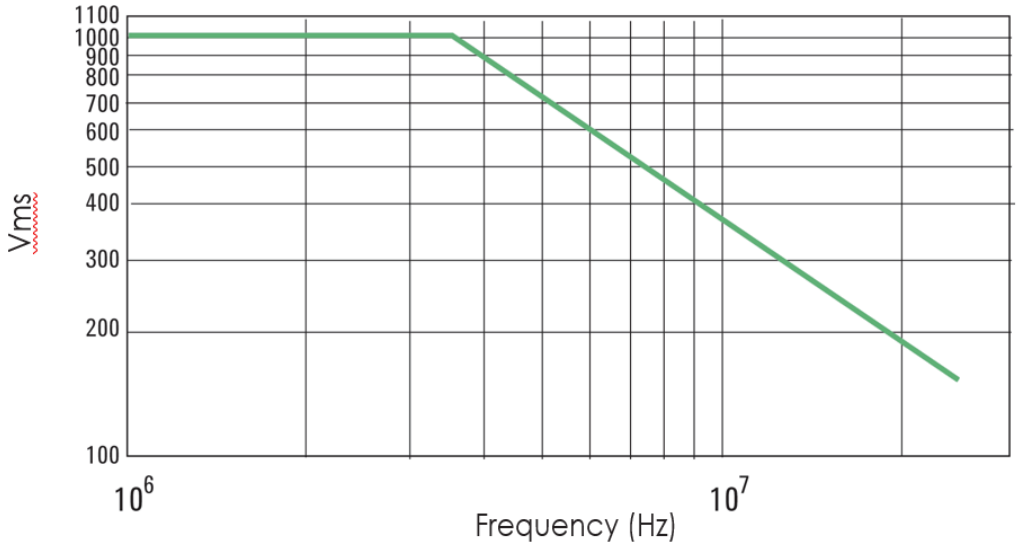


Figure 7. Voltage derating curve of N2790A (voltage between either input and ground).

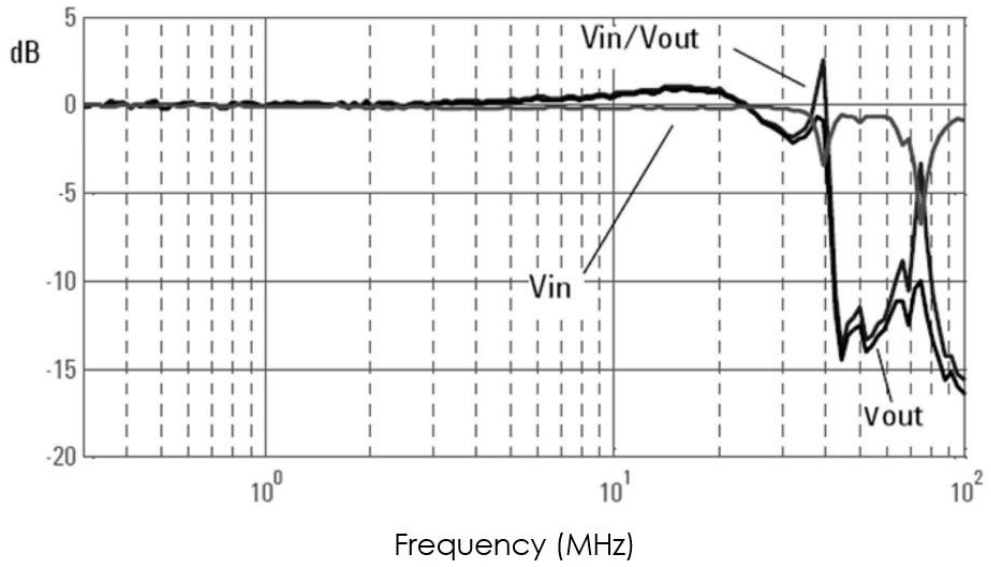


Figure 8. Vout/Vin vs. frequency response of N2791A.

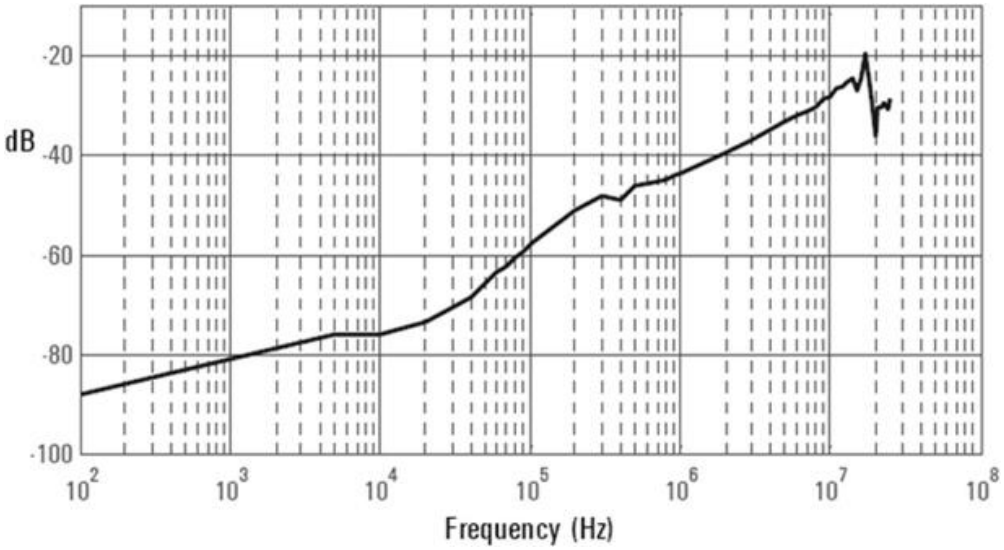


Figure 9. Frequency response (Vout/Vin) of N2791A when inputs are driven in common (common mode rejection).

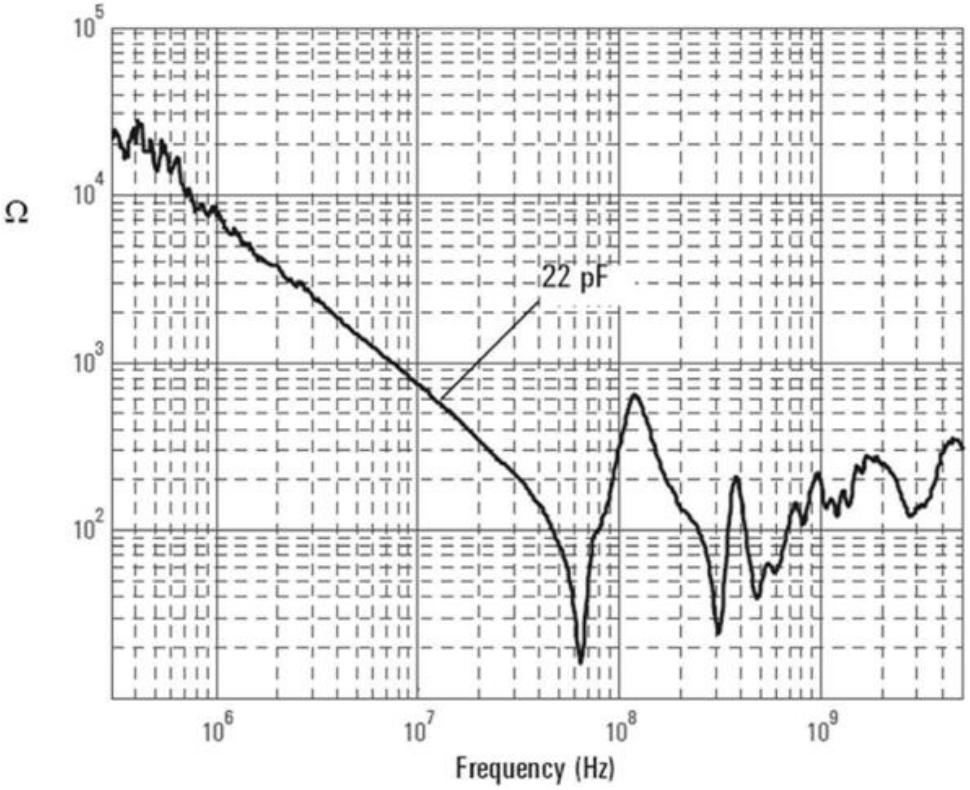


Figure 10. Input impedance vs. frequency of N2791A.

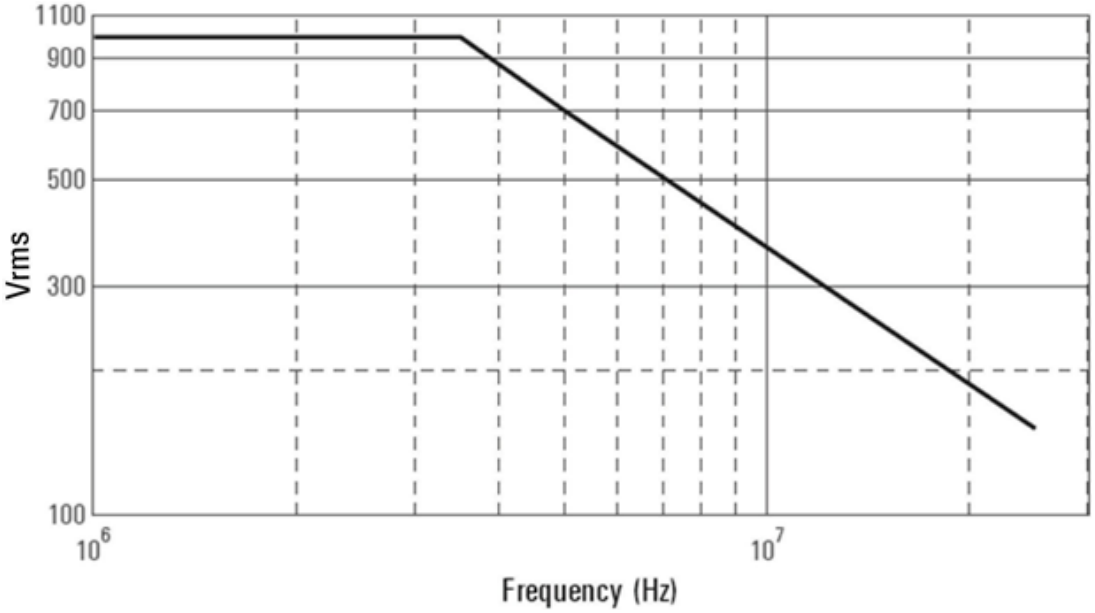


Figure 11. Voltage derating curve of N2791A (voltage between either input and ground).

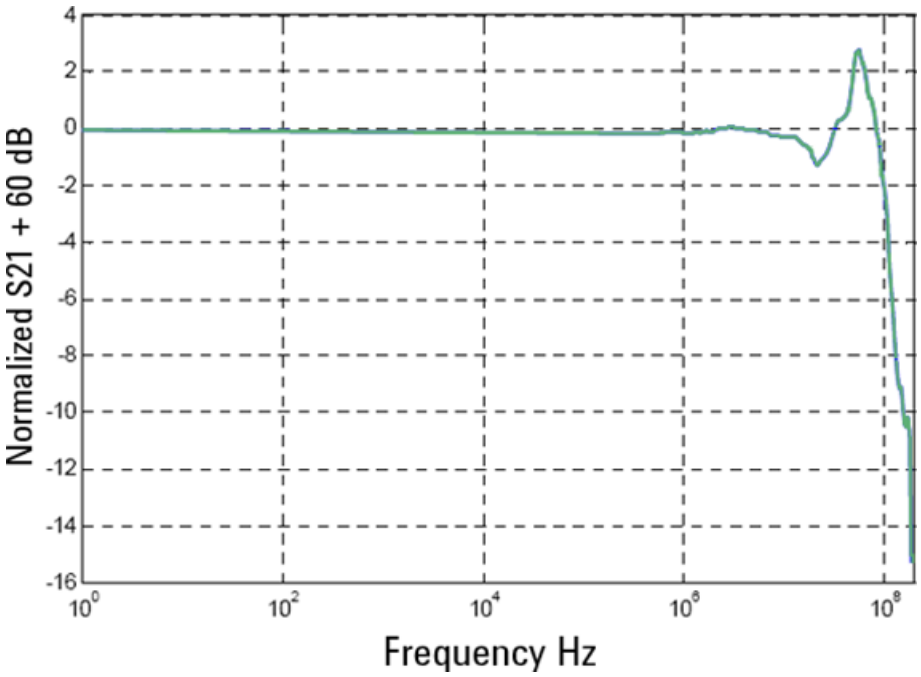


Figure 12. Vout/Vin vs. Frequency response of N2891A at 1000:1 attenuation.

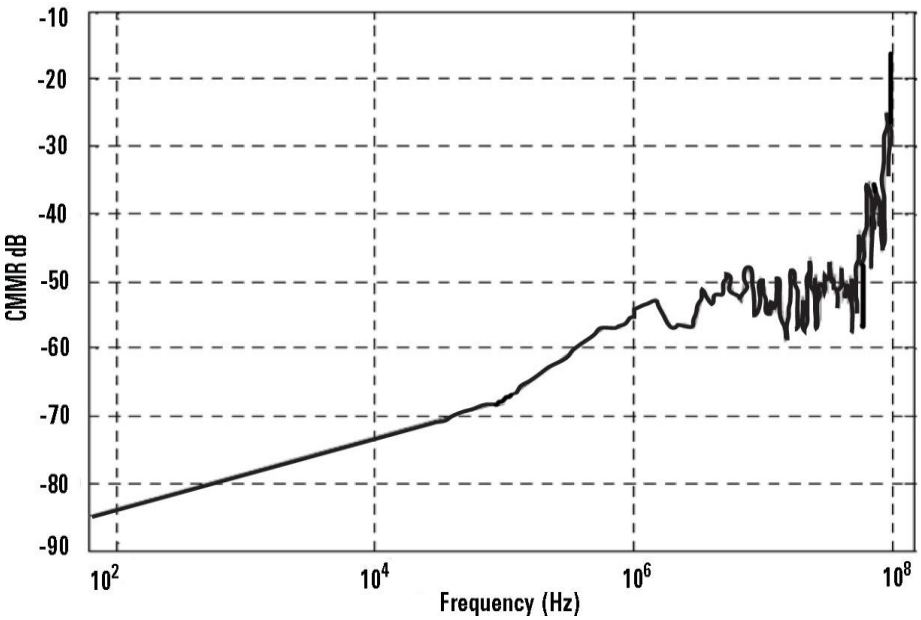


Figure 13. Frequency response (Vout/Vin) of N2891A when inputs are driven in common (common mode rejection).

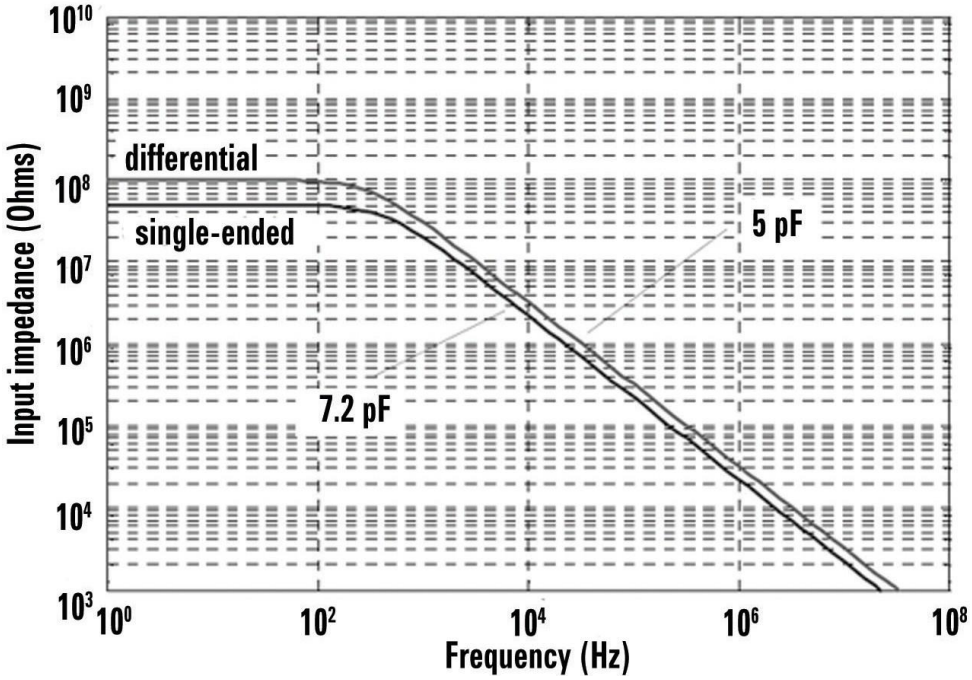


Figure 14. Input impedance vs. Frequency of N2891A.

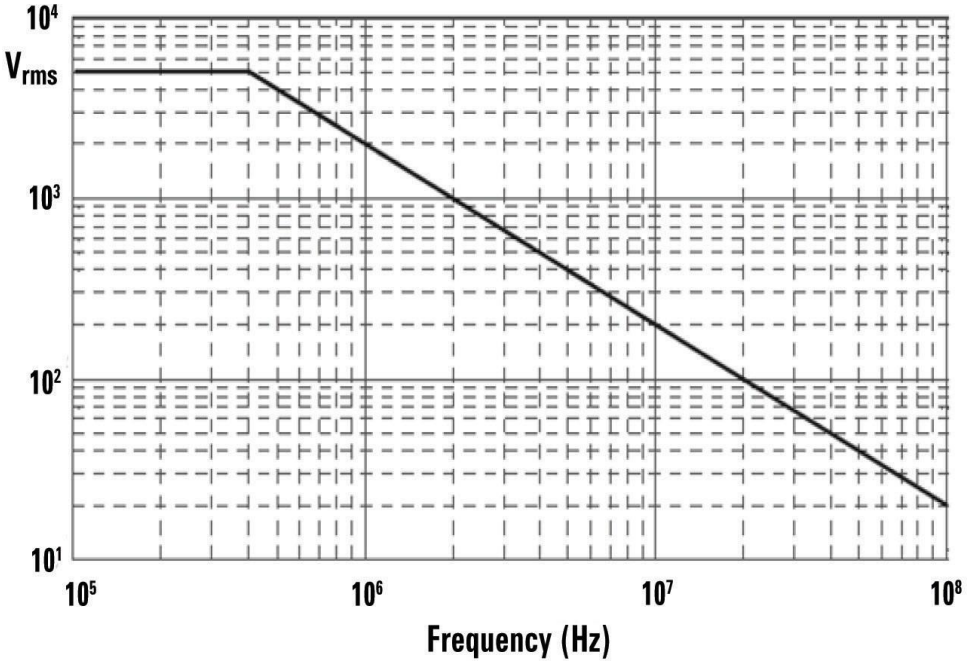


Figure 15. Voltage derating curve of N2891A (voltage between either input and ground).

Performance Characteristics

Product number	N2790A	N2791A	N2891A
Bandwidth (−3 dB)	≥ 100 MHz probe bandwidth [1]	≥ 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 to 30 ºC		
	± 4% at 0 to 20 ºC and 30 to 50 ºC [1]		
DC CMRR	–70 dB at 500 VDC		
AC CMRR	–80 dB at 50/60 Hz	–80 dB at 50/60 Hz	–80 dB at 50/60 Hz
	–50 dB at 1 kHz	–40 dB at 1MHz	–60 dB at 20 kHz
	–50 dB at 1 MHz		
Propagation delay	14 nsec at 50:1		
	2.8 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 or RMS)	± 1400 V at 500:1	± 700 V at 100:1	± 7000 V or 5000 Vrms at 1000:1
	± 140 V at 50:1	± 70 V at 10:1	± 700 V or 700 Vrms at 100:1
Max common mode operating voltage (DC+PeakAC or RMS)	± 1000 V (CAT II)	± 700 V at 100:1	± 7000 V or 5000 Vrms at 1000:1
	± 600 V (CAT III)	± 700 V at 10:1	± 7000 V or 5000 Vrms at 100:1
Max nondestructive voltage	± 1500 VDC + Peak AC differential mode	± 1000 Vrms (CAT II) differential and common mode	± 7000 V (DC + Peak AC)
	± 1300 Vrms (CAT II) common mode		± 5000 Vrms at 1000:1 and 100:1 in differential and common mode (Main Isolated)
Output maximum voltage range	± 2.8 V into 1 Mohm (500:1)	7 V into 1 Mohm (100:1)	7 V 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 ºC	–10 to 40 ºC	–10 to 40 ºC
Temperature - non-operating	–51 to 71 ºC	–30 to 71 ºC	–30 to 71 ºC
Humidity - operating	80% RH at 40 ºC	25 to 85% RH	25 to 85% RH
Humidity - non-operating	90% RH at 65 ºC	25 to 85% RH	25 to 85% RH
Operating altitude	2,000 m	3,000 m	3,000 m
Nonoperating altitude	15,300 m	15,300 m	15,300 m

Product number	N2790A	N2791A	N2891A
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 clips (black and red)	2 each high-voltage alligator clips (black and red)
	2 each alligator plunger clips (black and red)	2 each hook clips (black and red)	2 each safety hook adapters (black and red)
	2 each pincer clips (black and red)	USB power cord (2 m)	USB power cord (2 m)
	2 each of 4 colored ID tags	4 AA batteries	4 AA batteries
	DC offset adjustment tool	Manual	Manual
	Manual		
Safety specifications	IEC61010-031	IEC61010-031	IEC61010-031

1. 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.

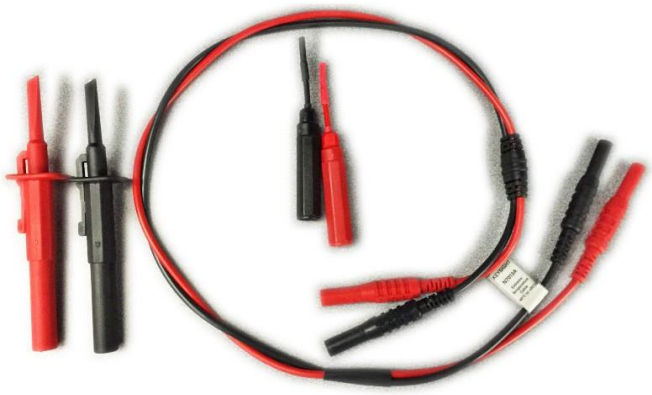
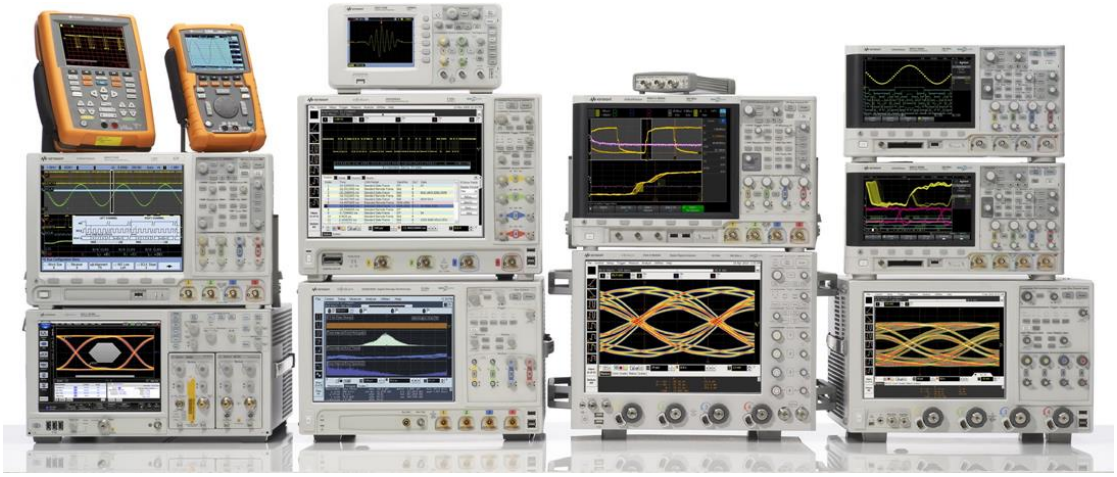


Figure 16. The N7013A extreme temperature probing kit for differential probes.

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
N2791-68700	Probe tip accessory kit for N2791A including 2 alligator clips and 2 hook clips
N2891A	70-MHz high-voltage differential probe
N2891-68700	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)



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