

# InfiniiMax Ultra Series

## Probes and Accessories

### Get Closer to the Truth with the Highest Accuracy Probes

For high-speed digital designers, the InfiniiMax Ultra Series Probes are the most accurate and easiest to use probes. They have the lowest noise and lowest loading for the lowest impact to your circuit. Combined with the super flexible micro probe head, they are the best solution to accurately probe small devices.

### See the Truest Representation of Your Signal

When you use a probe to connect your signal to your scope, your probe becomes part of the circuit affecting your test. Your probe may be hiding signal details, loading down your signal, or distorting it. The InfiniiMax Ultra Series Probes have the lowest loading for the lowest impact to your circuit. Boost test margins, make better design decisions, and gain confidence with the unprecedented accuracy. Ensure your entire measurement system is helping you see the truest representation of your signal.



### Highlights

#### Ultra Performance

- Lowest noise to see your signal more clearly
- More breadth with 5 models ranging from 10 to 25 GHz of bandwidth
- Highest input impedance in midband frequencies, crucial for probing high impedance modes

#### Ultra Accuracy

- Highest accuracy across the widest frequency range to see the truest representation of your signal
- Lowest loading for least impact to your circuit
- Boost test margins with the least signal distortion from your probe

#### Ultra Usability

- Easily probe small devices with the super flexible micro probe head
- Compatible with your existing InfiniiMax RC probe heads and accessories
- Measure differential, single-ended, and common mode signals with a single probe tip (InfiniiMode)

## Model Overview

Model	Description
MX0020A	10 GHz probe amplifier with AP2 interface
MX0021A	13 GHz probe amplifier with AP2 interface
MX0022A	16 GHz probe amplifier with AP2 interface
MX0024A	20 GHz probe amplifier with AP2 interface
MX0025A	25 GHz probe amplifier with AP2 interface

Note: AP2 interface connects to UXR (3.5 mm models), V, Z, Q, and 9000X Series Oscilloscopes and UXR (1 mm and 1.85 mm models) with the use of the N2852A adapter.

Note: MX0023A is not in the Ultra Series. It is considered an RC probe. For more information, please see the [InfiniiMax RC Probe Datasheet](#).

## Lower Probe Loading Means Better Accuracy

An ideal probe would simply provide an exact replica of the signal being probed. But, in the real world, the probe becomes part of the circuit under test because the probe introduces loading to the circuit. The probe impedance, thus probe loading changes with frequency. To get the most accurate measurements, you want the biggest probe resistance and the smallest probe capacitance across the widest frequency range. The conventional way to model probe loading is to measure the impedance of the probe in a graph of input impedance vs frequency (Figure 1).

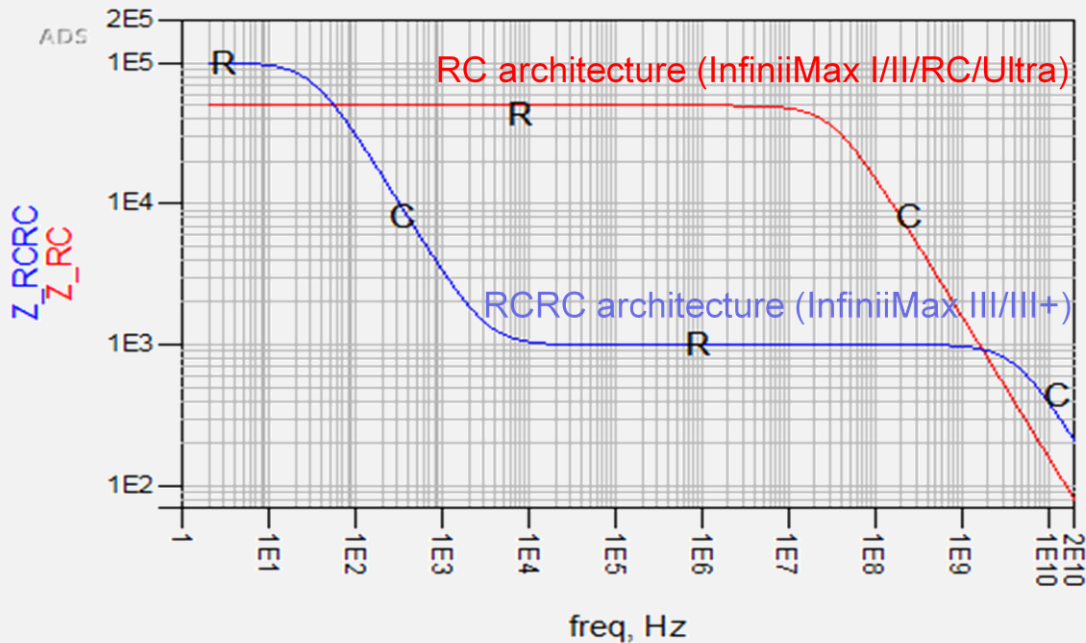


Figure 1. Input impedance profile of two common probe architectures: RC and RCRC

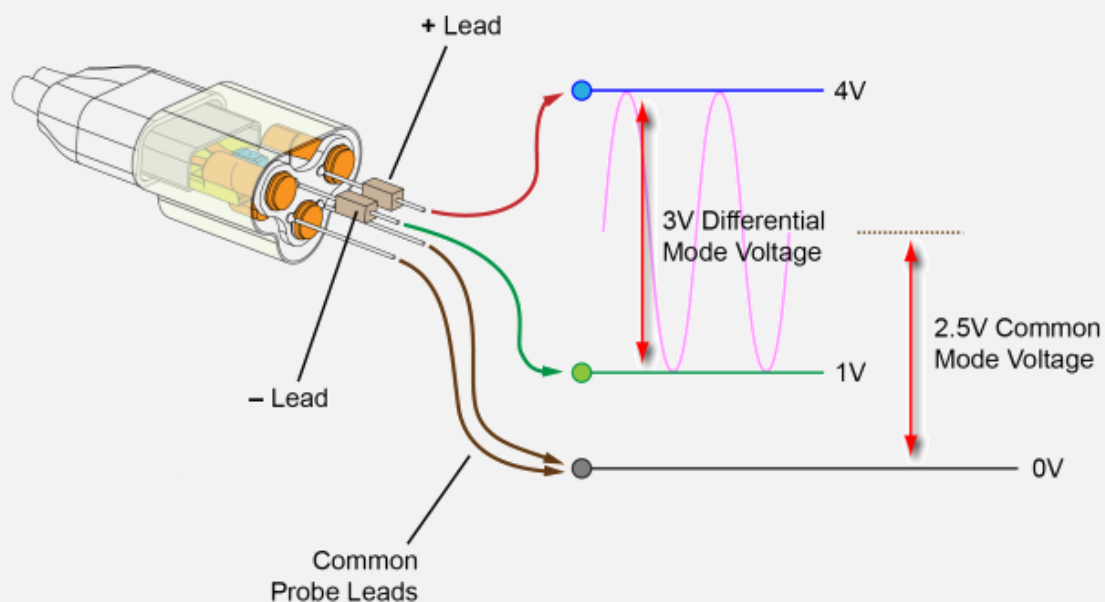
The InfiniiMax Ultra Series has an RC input impedance architecture, which has the lowest loading and least signal distortion across the widest frequency range. RC architecture is best for measuring signals that transition to low power (high impedance) modes such as those found in the latest DDR and MIPI standards. The RCRC architecture, found in other probes, is best when higher bandwidth is necessary, or for signals that have low source impedance.

## Other Easy-to-Use Features

### InfiniiMode

InfiniiMode allows convenient measurement of differential, single-ended, and common mode signals with a single probe tip without reconnecting the probe from its connection point. Benefits include:

- Save setup and connection time
- Use only 1 scope channel
- Reduce errors



### Auto-Selected Input Attenuation Ranges

The InfiniiMax Ultra probes have 3 attenuation ranges, 1:1, 4:1, and 8:1 giving you superior noise performance and large voltage ranges all while maintaining maximum bandwidth. Input range is automatically configured depending on the size of the input signal and the vertical scale of the scope. You have three flexible input dynamic ranges to choose from: 600 mV<sub>pp</sub> @ 1:1, 2.5 V<sub>pp</sub> @ 4:1, and 5 V<sub>pp</sub> @ 8:1.

## Two Methods for Correcting Probe Response

In the industry, there have been two ideas on what a probed signal should display on a scope:

1. A probe should measure and display a signal at the probe tip as loaded by the probe ( $V_{in}$ ).
2. A probe should display the estimated unloaded signal as if the probe wasn't there ( $V_{source}$ ).

With the InfiniiMax Ultra Series, we propose two new terminologies characterizing the two distinct probe responses: True View ( $V_{out}/V_{in}$ ) and Source Estimate ( $V_{out}/V_{source}$ ).

1. **True View ( $V_{out}/V_{in}$ )** – Shows the voltage at the tip of probe as loaded by the probe
2. **Source Estimate ( $V_{out}/V_{source}$ )** – Estimates the voltage at the probe point as if the probe is not there (assumes 25 ohm source impedance)

Most Keysight probes use one method for correcting probe response without additional software, but now you can natively choose which method you want: True View ( $V_{out}/V_{in}$ ) or Source Estimate ( $V_{out}/V_{source}$ ).

Both methods are technically correct. Keysight has traditionally used True View on its InfiniiMax probes (Source Estimate is available in PrecisionProbe software). Now with the Ultra Series, you can toggle between both methods with just a push of a button.

Below is a summary of the advantages and disadvantages of each method, for complete details on the two methods, please read this application note: [What's the Difference Between True View and Source Estimate Mode?](#)

	True View ( $V_{out}/V_{in}$ )	Source Estimate ( $V_{out}/V_{source}$ )
Pros	<ul style="list-style-type: none"> <li>• More accurate representation of the signal that currently exists, as it is being probed</li> <li>• Better for receiver sensitivity because you must measure what is actually there</li> <li>• Doesn't hide the fact that the probe loaded the signal</li> </ul>	<ul style="list-style-type: none"> <li>• More accurate when system source impedance is known</li> <li>• Better for transmitter testing because you are estimating the signal coming out of the transmitter</li> <li>• Can use to correlate with other vendor platforms</li> </ul>
Cons	<ul style="list-style-type: none"> <li>• Doesn't estimate signal that was there before being probed</li> <li>• Shows probe loading and so can appear to have slower rise times</li> </ul>	<ul style="list-style-type: none"> <li>• Error in receiver testing because doesn't show the signal that is actually there while being probed</li> <li>• Hides the effect that probe loading has on the signal being probed, which could hide if probe loading caused your signal to lose some timing or amplitude margin</li> </ul>

## Unique S-parameter DSP correction

InfiniiMax Ultra probe amps store its unique S parameters in on board memory for the scope to read out when the probe amp is connected to the scope. Unique S-parameters, as opposed to nominal, means each individual probe amp contains its own frequency response data to further flatten the magnitude and phase response of the probe for high accuracy measurements. When a probe is connected to a scope channel and the proper probe head is selected, the scope calculates a DSP correction filter that includes the probe head, probe amplifier, and scope channel. This provides the maximum measurement accuracy for the complete probe and scope channel system.

## Probe Heads and Accessories for Every Situation

Keysight's InfiniiMax Ultra probe amplifiers support a wide variety of high-speed probing applications with an extensive line-up of probe heads and accessories. The InfiniiMax Ultra probes are compatible with all existing InfiniiMax RC probe heads, but we especially recommend the following probe heads.

### Best for Probing Small Devices - MX0100A 25 GHz Micro Probe Head

The MX0100A is a solder-in head designed to access small geometry target devices. The probe head is made out of flex printed circuit, making it light, flexible, and small yet highly usable. It provides up to 25 GHz of full probe amp bandwidth and excellent probe loading characteristics (170 fF). The gold-plated nickel tip lead is replaceable and user trimmable. The probe head offers wide operating temperature range of -55 to +150 °C (per JEDEC JESD22-A104 revision E spec), making it ideal for environmental chamber testing with the probe head soldered to the DUT inside the chamber. The MX0100A supports InfiniiMode, offering a way to measure differential, single-ended, and common mode signals without reconnecting the probe.



MX0100A 25 GHz Micro Probe Head

### Best for One Channel - MX0105A 20 GHz Differential SMA Probe Head

The MX0105A is a differential SMA probe head that provides 20 GHz of bandwidth and allows you to connect two SMA cables to make differential measurements on an oscilloscope channel. The SMA head allows for termination to a common DC voltage ( $\pm 4$  V) rather than a ground, which is required for signal standards such as HDMI and MIPI Mphy. The termination voltage is applied externally using the supplied cable and a DC power supply. The MX0105A supports InfiniiMode, offering a way to measure differential, single-ended, and common mode signals without reconnecting the probe.



MX0105A 20 GHz Differential SMA Probe Head

### Best Hands-Free Connection - MX0106A 23 GHz and N5381B 12 GHz Differential Solder-in Head

The MX0106A is a solder-in head allowing a soldered connection into the target for a reliable hands-free connection. This probe configuration provides 23 GHz bandwidth and low capacitive loading for measuring both single-ended and differential signals. It utilizes strong 7 mil (or optional 4 mil) diameter nickel wires, which allow connection to very small, fine pitch targets, and the lead wires are replaceable. The solder-in head allows for wide operating temperature of  $-55$  to  $+150$  °C. The MX0106A supports InfiniiMode, offering a way to measure differential, single-ended, and common mode signals without reconnecting the probe.



MX0106A 23 GHz Differential Solder-in Head

The N5381B is a 12 GHz version of the differential solder-in head. This probe configuration provides the bandwidth up to 12 GHz and low capacitive loading of 0.21 pF for measuring both single-ended and differential signals. It utilizes strong 7 mil (or optional 5 mil) diameter nickel wires, which allow reliable connection to small, fine pitch targets.

### Best for Quick Measurements - N2839A 21 GHz Differential Browser Head

The N2839A differential browser head brings the measurement fidelity of a solder-in probe head to hand-held browsing. The N2839A gives users up to 21 GHz of bandwidth, making this the most usable hand-held browser solution for measuring high-speed differential or single-ended signals in the market. The probe tips of the N2839A ensure a secure connection to the DUT. The probe tips can be adjusted to accommodate targets from 0 mm to 3 mm apart using the thumbwheel and can be easily and quickly replaced if accidental damage occurs. The low-inductance ground spring ensures that the probe's frequency response remains constant regardless of the span range setting.



N2839A 21 GHz Differential Browser Head

### Best for Multiple Signals on Active ICs - N5425B 18 GHz Differential ZIF Head

For probing signals with multiple test points in a tight space such as DDR memory system, the N5425B ZIF probe head with the ZIF tip may be the right solution for you. ZIF (zero-insertion-force) probe heads and tips can reduce probe costs significantly when many measurement points are needed. The ZIF probe head requires ZIF tips that can be soldered down to various places on a circuit board. The ZIF probe head can then be shuttled between these tips to make measurements.

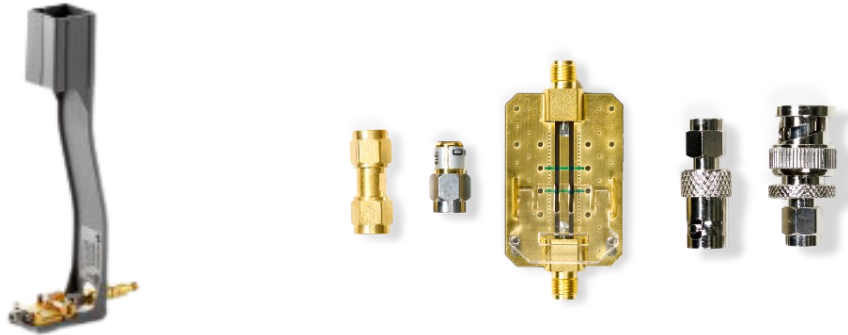


N5425B 18 GHz Differential ZIF Head

The N5425B/26A has a flat frequency response all the way to > 18 GHz and is the one of most economical solder-in probe solutions available on the market today. The probe head does not include any ZIF probe tips. Either the N5426A ZIF tips or N5451A long-wired ZIF tips should be ordered with the probe head.

## Best to Verify Performance - MX0104A 40 GHz and E2655C 13 GHz Performance Verification and Deskew Fixture

The MX0104A performance verification and deskew fixture is a 50 ohm through fixture, enabling you to calibrate and deskew your InfiniiMax probe or to verify the performance of the probe using a VNA. The fixture has good signal integrity up to 40 GHz. The MX0104A is a replacement of the N5443A. Use the E2655C for InfiniiMax with < 13 GHz of bandwidth. The MX0104A comes with the 50 Ω through fixture only. You have an option to choose the option 001 plastic stand or the option N2787A 3D probe positioner which will help you properly position the probe amplifier.



MX0104A 40 GHz and E2655C 13 GHz Performance Verification and Deskew Fixture

## Complete List of All Compatible Probe Heads and Accessories with the InfiniiMax Ultra Series

Model	Bandwidth	Description
E2655C	13 GHz	Probe deskew and performance verification kit
E2668B	N/A	InfiniiMax I connectivity kit for single-ended measurements (E2676B/77B/78B)
E2669B	N/A	InfiniiMax I connectivity kit for diff/single-ended measurements (E2675B/77B/78B)
E2675B	6 GHz	Differential browser head
E2676B	6 GHz	Single-ended browser probe head
E2677B	12 GHz	Differential solder-in head
E2678B	12 GHz	Differential/single-ended socketed probe head
E2679B	6 GHz	Single-ended solder-in probe head
MX0100A-001	25 GHz	Micro probe head (set of 5), supports InfiniiMode
MX0100A-002	25 GHz	Micro probe head (set of 25), supports InfiniiMode
MX0100A-003	25 GHz	Micro probe head (set of 50), supports InfiniiMode
MX0102A	N/A	Soldering Tool Kit



MX0103A	25 GHz	Bullet adapter
MX0104A	40 GHz	Performance verification and deskew fixture
MX0105A	20 GHz	SMA probe head, supports InfiniiMode
MX0106A	23 GHz	Solder-in probe head, supports InfiniiMode
N2787A	N/A	3D probe positioner
N2823A	40 GHz	2.92 mm phase-matched cable pair (1 m)
N2833A	N/A	InfiniiMax II differential connectivity kit (N2839A, N5381B, N5425B/26A, N2851A/49A)
N2837A	21 GHz	Browser head replace tip kit (set of 40)
N2839A	21 GHz	Browser head
N2849A	13 GHz	QuickTip probe head tips
N2851A	13 GHz	QuickTip probe head
N2852A	N/A	AutoProbe II to AutoProbe III interface adapter (for use with UXR 1- and 1.85-mm models)
N2880A	N/A	Coaxial attenuator Kit (pairs of 6, 12, and 20 dB attenuators)
N2881A	N/A	DC blocking caps (set of 2 30-VDC block caps)
N2884A	12 GHz	ZIF fine wire tips for wafer probing
N2887B	4 GHz	Soft touch pro probe interface adapter
N2888A	4 GHz	Soft touch half-channel probe interface adapter
N5380B	12 GHz	SMA probe head
N5381B	12 GHz	Solder-in probe head
N5425B	18 GHz	ZIF probe head
N5426A	18 GHz	ZIF tip (set of 10)
N5442A	N/A	AutoProbe I to AutoProbe II interface adapter (3.5 mm to precision BNC adapter)
N5448B	40 GHz	2.92 mm phase-matched cable pair (25 cm)
N5450B	N/A	Extreme temperature extension cable, 1 m long
N5451A	5 and 9.9 GHz	Long-wired ZIF tip kit (7 and 11 mm)

## Performance Specifications and Characteristics

### InfiniiMax Ultra probe warranted specifications

Probe Head	Probe Amplifier	Bandwidth	DC input resistance
MX0100A Micro probe head	MX0025A	25 GHz	Rdiff=50 kΩ ± 2%, Rse=25 kΩ ± 2%

### InfiniiMax Ultra probe head characteristics

These are characteristics that are mainly determined by the probe head. Bandwidth and rise time numbers listed are: -3 dB bandwidth/10-90% transition time/20-80% transition time. Performance listed below is with the MX0025A probe amp. Refer to the InfiniiMax Ultra Series user's guide for more details. Performance with lower bandwidth amplifiers is the lower of the: Probe Head BW, AmpBW, (.435/AmpBW), or (.308/AmpBW).

MX0025A 25 GHz Probe Amplifier with Various Probe Heads	Input Capacitance DC input resistance	Bandwidth and rise time (AmpBW/(.435/AmpBW)/(.308/AmpBW))
MX0100A micro probe head	Cdiff=170 fF; Cse=260 fF	25 GHz/17.4 pS/12.3 pS
	Rdiff=50 kΩ; Rse=25 kΩ	
MX0106A solder-in probe head	Cdiff=170 fF; Cse=290 fF	23 GHz/18.9 pS/13.4 pS
	Rdiff=50 kΩ; Rse=25 kΩ	
N2839A browser	Cdiff=205 fF; Cse=340 fF	21 GHz/20.7 pS/14.7 pS
	Rdiff=50 kΩ; Rse=25 kΩ	
MX0105A SMA probe head	N/A	20 GHz/21.8 pS/15.4 pS
	50 Ω to V <sub>term</sub>	
N5425B ZIF head with N5426A ZIF tip	Cdiff=330 fF; Cse=530 fF	18 GHz/24.1 pS/17.1 pS
	Rdiff=50 kΩ; Rse=25 kΩ	
N5380B SMA head	N/A	12 GHz/36.3 pS/25.7 pS
	50 Ω to V <sub>term</sub>	
N5381B solder-in head	Cdiff=210 fF; Cse=350 fF	12 GHz/36.3 pS/25.7 pS
	Rdiff=50 kΩ; Rse=25 kΩ	
N2851A QuickTip head with N2849A tip	Cdiff=720 fF; Cse=710 fF	12 GHz/36.3 pS/25.7 pS
	Rdiff=50 kΩ; Rse=25 kΩ	

## InfiniiMax Ultra probe amplifier characteristics

These are characteristics that are mainly determined by the probe amplifier.

	With 25 k $\Omega$ probe heads	With MX0105A SMA probe head
DC input resistance	Rse = 25 k $\Omega$ $\pm$ 2% each input to ground, Rdiff = 50 k $\Omega$ $\pm$ 2%	50 $\Omega$ (to V <sub>term</sub> )
Maximum input power	N/A	100 mW or 2.28 V <sub>rms</sub> (V <sub>in</sub> -V <sub>cm_term</sub> ) into 50 $\Omega$
Input voltage range (differential or single-ended)	0.6 V <sub>pp</sub> , $\pm$ 0.3 V @ 1:1	0.38 V <sub>pp</sub> , $\pm$ 0.19 V @ 1:1.56
	2.5 V <sub>pp</sub> , $\pm$ 1.25 V @ 4:1	1.54 V <sub>pp</sub> , $\pm$ 0.77 V @ 2.57:1
	5.0 V <sub>pp</sub> , $\pm$ 2.5 V @ 7.6:1	3.2 V <sub>pp</sub> , $\pm$ 1.6 V @ 4.87:1
Input common mode range	$\pm$ 8 V (DC to 100 Hz)	$\pm$ (4.3 V – V <sub>cm_term</sub> x 0.29) (DC to 100 Hz)
	$\pm$ 0.5 V @ 1:1, $\pm$ 4 V @ 4:1 (> 100 Hz)	$\pm$ 0.19 V @ 1:1.57, $\pm$ 0.77 V @ 2.57:1 (> 100 Hz)
Maximum signal slew rate	25 V/ns when probing a SE signal	16 V/ns when probing a SE signal
	40 V/ns when probing a differential signal	26 V/ns when probing a differential signal
DC attenuation ratio	1:1, 4:1, or 7.6:1 automatically selected based on volts/division setting	1:1.56, 2.57:1, or 4.87:1 automatically selected based on volts/division setting
Offset range (for probing a single-ended signal)	$\pm$ 16 V	
Offset accuracy	< 3 %	
Zero offset error referred to input	< 2 mV x DC attenuation	< 2 mV
Input referred noise, in spectral density	25.0 nV/ $\sqrt{\text{Hz}}$ @ 1:1	16.0 nV/ $\sqrt{\text{Hz}}$ @ 1:1.56
	39.7 nV/ $\sqrt{\text{Hz}}$ @ 4:1	25.5 nV/ $\sqrt{\text{Hz}}$ @ 2.57:1
	45.0 nV/ $\sqrt{\text{Hz}}$ @ 7.6:1	29.0 nV/ $\sqrt{\text{Hz}}$ @ 4.87:1
Input referred noise, in mV <sub>rms</sub>	3.95 mV <sub>rms</sub> @ 1:1 and 25 GHz	2.26 mV <sub>rms</sub> @ 1:1.56 and 20 GHz
	6.28 mV <sub>rms</sub> @ 4:1 and 25 GHz	3.61 mV <sub>rms</sub> @ 2.57:1 and 20 GHz
	7.10 mV <sub>rms</sub> @ 7.6 and 25 GHz	4.55 mV <sub>rms</sub> @ 4.87:1 and 20 GHz
Propagation delay	~6.1 nsec	~6.1 nsec
Maximum non-destructive input voltage	30 V peak (mains isolated)	
Probe interface	AutoProbe II interface – direct connection to Infiniium 90000X, V, Z, Q, UXR (3.5 mm models), requires N2852A adapter with UXR (1 and 1.85 mm models)	
Oscilloscope compatibility	Infiniium UXR, 90000X, V, Z, Q series with software <ul style="list-style-type: none"> <li>• Ver 6.70 or later (for 90000X, V, Z, Q models)</li> <li>• Ver 11.20 or later (for UXR models)</li> </ul>	

## Environmental Characteristics

Environmental conditions	Operating	Non-operating
Temperature	+5 °C to +40 °C	–40 °C to +70 °C
Humidity	Up to 95% relative humidity (non-condensing) at +40 °C	Up to 90% relative humidity at +65 °C
Altitude	Up to 4,600 meters	Up to 15,300 meters
Weight	Net 0.8 kg	
Dimensions	Refer to the InfiniiMax Ultra Series user's guide	
Pollution degree 2	Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.	

## More Information

Thank you for your interest in the InfiniiMax Ultra Series Probes, the most accurate and easiest to use probes for high-speed digital designs. The five probes ranging from 10 to 25 GHz have the lowest noise and lowest loading for the lowest impact to your circuit. Boost test margins, make better design decisions, and gain confidence. For more information, check out the following:

- [Keysight Probe Resource Center](#)
- [Infiniium Oscilloscope Probes and Accessories Data Sheet](#)
- [Application Note: Demystifying RCRC and RC Probes](#)
- [Application Note: What's the Difference Between True View and Source Estimate Mode?](#)

Learn more at: [www.keysight.com](http://www.keysight.com)

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](http://www.keysight.com/find/contactus)

