

# MX0023A InfiniiMax 25 GHz RC Probe and Accessories

Extending RC probe bandwidth to unprecedented 25 GHz

## Signal Fidelity Probing Solution

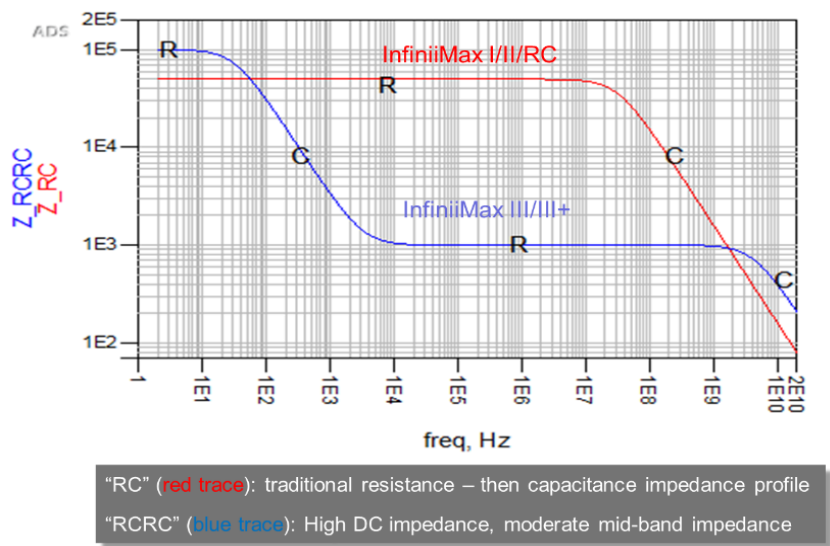
As data rates of mobile bus system increase, the edge speed of the signal gets faster, thus requiring higher bandwidth probe solutions. At the same time, many systems deploy a continuously variable termination mechanism, switching the termination impedance back and forth between low and high impedance, in order to save the power consumption in devices. This requires a higher speed probing solution with high input impedance profile over wider frequency range for low probe loading. This is common signal behavior in high-speed mobile communication technologies typically deployed in DDR/LPDDR and MIPI.

The MX0023A InfiniiMax RC probe provides the best of both worlds – high bandwidth and low loading, offering up to 25 GHz bandwidth and RC input impedance profile for extremely low midband loading necessary to address modern high-speed probing requirements. It also provides a wide variety of flexible connectivity solution, covering today's emerging signaling standards such as DDR5/LPDDR5 and other high-speed signal debug and validation test needs.



Figure 1. InfiniiMax MX0023A 25 GHz RC probe amp

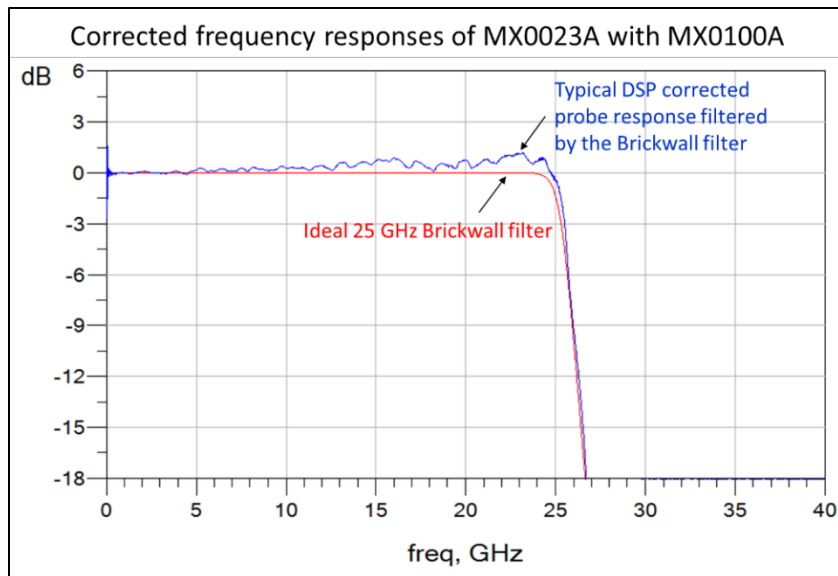
- 25 GHz bandwidth -- when used with MX0100A
- "RC" input impedance architecture – 25 k $\Omega$  SE, 50 k $\Omega$  diff @ DC, 170 fF with MX0100A micro probe head
- Attenuation range: 1:1 or 4:1, auto-switchable
- $\pm 16$  V offset range
- Probe amp specific
- S-parameter correction filter ensures flat frequency response
- Compatible with new probe heads and most of InfiniiMax I/II probe heads
- AutoProbe II interface compatible with Infiniium UXR, 90000X, V, Z, Q series



**Figure 2.** Input impedance vs frequency response plot of RC probes and RCRC probes

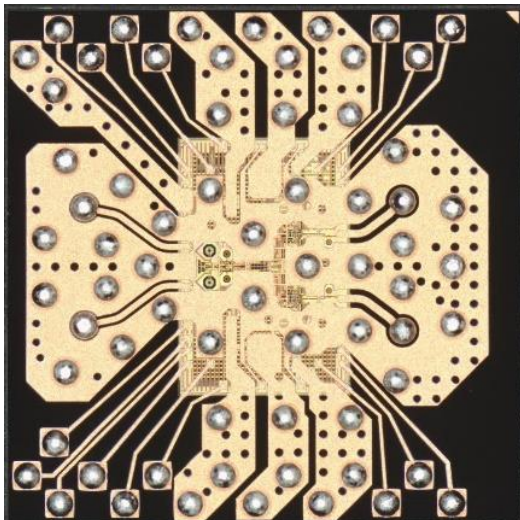
## Higher accuracy and lower noise

Each individual InfiniiMax RC probe amplifier contains its own frequency response data. As with the InfiniiMax III and III+ probe amp, the unique s-parameters of the InfiniiMax RC probe amp are stored in the probe amp and are used with the s-parameters of the various probe heads to further flatten the magnitude and phase response of the probe for high accuracy measurements.



**Figure 3.** The unique s-parameters of the probe amp are used to flatten the magnitude and phase response of the probe for high accuracy measurements.

A proprietary ASIC technology is utilized for the InfiniiMax RC probe to accommodate the highest performance needs and is unmatched by any product in the market. The technology enables an auto-switchable 1:1 and 4:1 attenuation ratio of the probe for superior noise performance, while maintaining the maximum 25 GHz bandwidth. At 1:1 attenuation ratio, the probe provides  $25 \text{ nV}/\sqrt{\text{Hz}}$  of excellent spectral noise density referred to the input of the probe, which is comparable to the InfiniiMax II 1169B/68B probes.



**Figure 4.** A proprietary ASIC technology is utilized for the InfiniiMax RC probe to accommodate the highest performance needs.

## Extensive line-up of probe heads and accessories

Keysight's InfiniiMax RC probe supports a wide variety of high-speed probing applications with an extensive line-up of probe heads and accessories. Continuing the probe head topology pioneered by Keysight in the InfiniiMax I and II probe systems, three new probe heads are provided to accommodate multiple use models. The MX0100A and MX0106A offer an exceptionally wide operating temperature range of -55 °C to +155 °C, making them ideal for environmental testing of a wide variety of high-speed devices.

### MX0100A micro probe head

The MX0100A is a solder-in head for use with InfiniiMax I/II/RC probe amps designed to access small geometry target devices. The probe head is made out of flex printed circuit, making it light, flexible, small yet highly usable. It provides up to 25 GHz of full probe amp bandwidth when used with the MX0023A and excellent probe loading characteristic (170 fF). Gold plated nickel tip lead is replaceable and user trimmable.

The probe head offers wide operating temp 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.



Figure 5. MX0100A micro probe head

### MX0105A and N5380B differential SMA probe head

The MX0105A is a differential SMA probe head that provides 21 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 that would be 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 N5380B is a 12 GHz version of the SMA head.



Figure 6. MX0105A differential SMA probe head

## MX0106A differential solder-in head

The MX0106A is a solder-in head allowing a soldered connection into the target for 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.



**Figure 7.** MX0106A differential solder-in head

## N2839A differential browser head

The N2839A differential browser head brings the measurement fidelity of a solder-in probe head to hand-held browsing. When used with the InfiniiMax MX0023A probe amplifier, the N2839A gives users 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.



**Figure 8.** N2839A differential browser head

## N5381B differential solder-in head

The N5381B allows a soldered connection into a system for a reliable hands-free connection. 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.

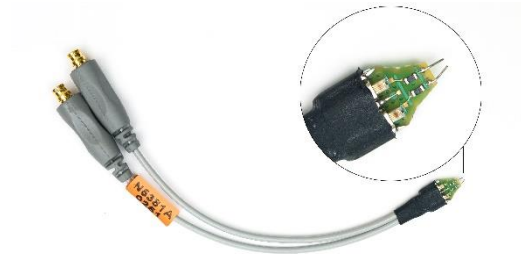


Figure 9. N5381B differential solder-in head

## N5425B/26A/51A differential ZIF head/tip

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.

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 these probe tips.

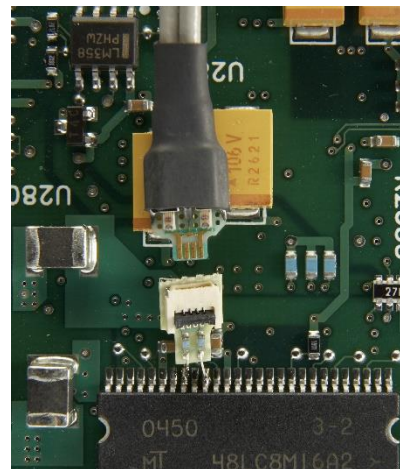


Figure 10. N5425B/26A differential ZIF head and ZIF tip

## MX0104A 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.

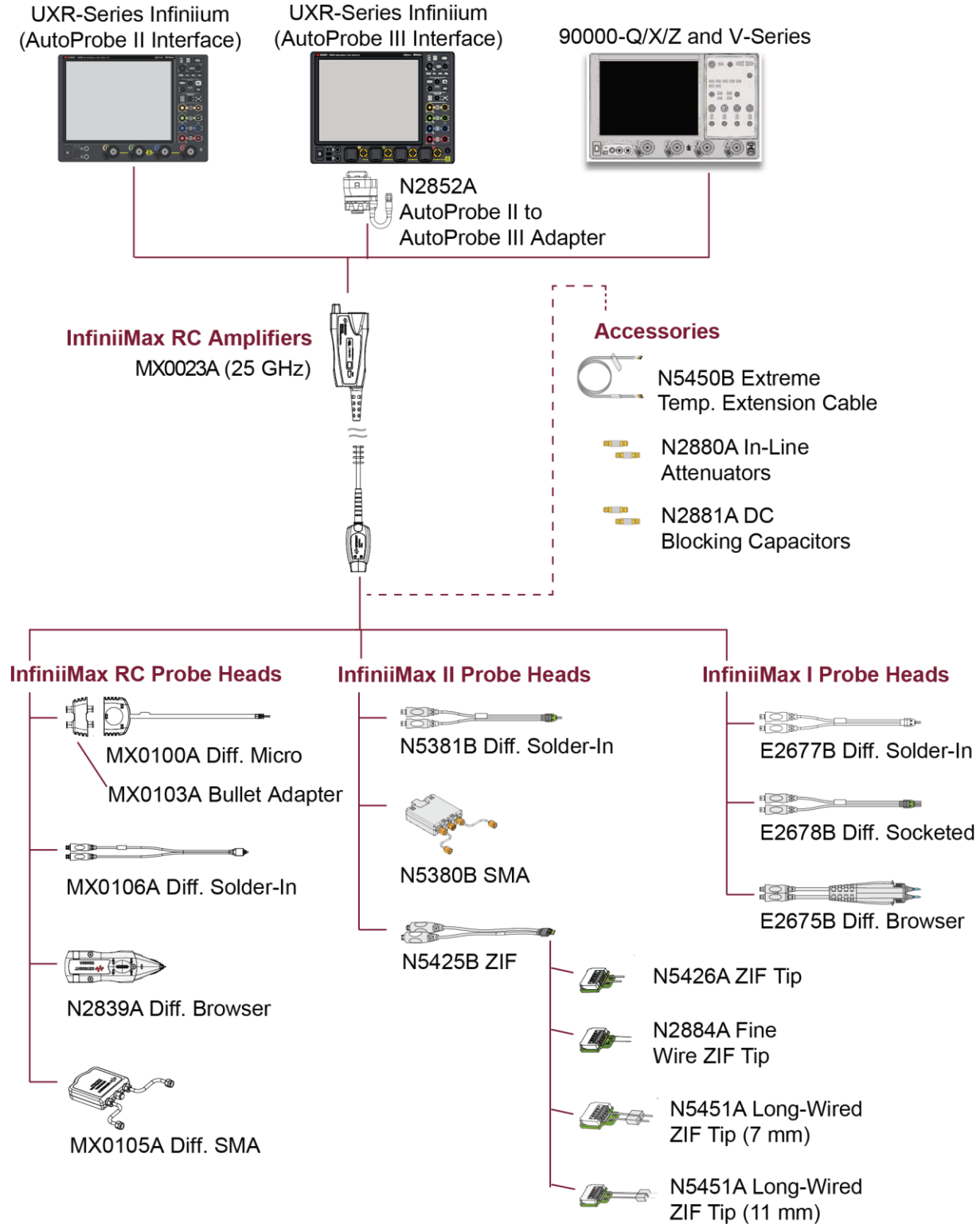
The MX0104A comes with the 50  $\Omega$  through fixture only. You have an option to choose the Option 001 plastic stand or the option N2787A 3D probe positioner which will help you properly position the probe amplifier.



**Figure 11.** MX0104A performance verification and deskew fixture with Option 001



# InfiniiMax RC probing system family diagram





# Performance Characteristics (of MX0023A with Each Probe Head)

## InfiniiMax MX0023A RC probe warranted specifications

Key specifications	Probe amp	Bandwidth	DC input resistance
MX0100A micro probe head	MX0023A	25 GHz	Rdiff=50 kΩ ±2%, Rse=25 kΩ ±2%

## InfiniiMax RC 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 MX0023A probe amp.

Refer to the MX0023A user's guide for more details.

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 Rdiff=50 kΩ; Rse=25 kΩ	25 GHz/17.4 pS/12.3 pS
MX0106A solder-in probe head	Cdiff=170 fF; Cse=290 fF Rdiff=50 kΩ; Rse=25 kΩ	23 GHz/18.9 pS/13.4 pS
N2839A browser	Cdiff=205 fF; Cse=340 fF Rdiff=50 kΩ; Rse=25 kΩ	21 GHz/20.7 pS/14.7 pS
MX0105A SMA probe head	N/A 50 Ω to V <sub>term</sub>	21 GHz/21.8 pS/15.4 pS
N5425B ZIF head with N5426A ZIF tip	Cdiff=330 fF; Cse=530 fF Rdiff=50 kΩ; Rse=25 kΩ	18 GHz/24.1 pS/17.1 pS
N5380B SMA head	N/A 50 Ω to V <sub>term</sub>	12 GHz/36.3 pS/25.7 pS
N5381B solder-in head	Cdiff=210 fF; Cse=350 fF Rdiff=50 kΩ; Rse=25 kΩ	12 GHz/36.3 pS/25.7 pS

## InfiniiMax RC probe amp characteristics

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

	With 25 k $\Omega$ probe heads	With MX0105A SMA probe head
DC input resistance	R <sub>se</sub> = 25 k $\Omega$ $\pm$ 2% each input to ground, R <sub>diff</sub> = 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) 2.5 V <sub>pp</sub> , $\pm$ 1.25 V (@ 4:1)	0.38 V <sub>pp</sub> , $\pm$ 0.19 V (@ 1:1.56) 1.54 V <sub>pp</sub> , $\pm$ 0.77 V (@ 2.57:1)
Input common mode range	$\pm$ 8 V (DC to 100 Hz) $\pm$ 0.5 V @ 1:1, $\pm$ 4 V @ 4:1	$\pm$ (4.3 V – V <sub>cm_term</sub> x 0.29) (DC to 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 40 V/ns when probing a differential signal	16 V/ns when probing a SE signal 26 V/ns when probing a differential signal
DC attenuation ratio	1:1 or 4:1, automatically selected based on volts/division setting	1:1.56 or 2.57:1 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 39.7 nV/ $\sqrt{\text{Hz}}$ @ 4:1	16 nV/ $\sqrt{\text{Hz}}$ @ 1:1.56 25.5 nV/ $\sqrt{\text{Hz}}$ @ 2.57:1
Input referred noise, in mVrms	3.95 mVrms @ 1:1 & 25 GHz 6.28 mVrms @ 4:1 & 25 GHz	2.26 mVrms @ 1:1.56 & 20 GHz 3.61 mVrms @ 2.57:1 & 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 $\leq$ 33 GHz models, requires N2852A with UXR $\geq$ 40 GHz models	
Oscilloscope compatibility	Infiniium UXR, 90000X, V, Z, Q series with software <ul style="list-style-type: none"> <li>Ver 6.55 or later (for 90000X, V, Z, Q models)</li> <li>Ver 10.25 or later (for UXR models)</li> </ul>	

## Environmental characteristics

Environmental conditions	Operating	Non-operating
Temperature	0 °C to +55 °C	–40 °C to +70 °C
Humidity	Up to 95% relative humidity (non-condensing) at +40 °C	Up to 90% relative humidity at
Altitude	Up to 4,600 meters	Up to 15,300 meters
Weight	Net 0.8 kg	
Dimensions	Refer to the MX0023A user's guide	
Pollution degree 2	Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.	

## Ordering Information

### InfiniiMax RC probe amplifier

Model number	Description
MX0023A	25 GHz InfiniiMax RC probe amplifier

### InfiniiMax RC differential probe heads compatible with MX0023A

Model number	Description	Replacement accessories
MX0100A	InfiniiMax micro probe head	Option 001 comes with 5 probe heads, 1 bullet adapter and 1 replacement wire spool.
		Option 002 comes with 25 probe heads, 5 bullet adapters and 5 replacement wire spools.
		Option 003 comes with 50 probe heads, 10 bullet adapters and 25 replacement wire spools.
		Order MX0102A soldering tool kit for soldering tools.
		Order MX0103A for extra bullet adapter.
MX0105A	InfiniiMax SMA probe head	
MX0106A	InfiniiMax solder-in probe head	
N2839A	InfiniiMax browser head	N2837A replacement tip kit

Note: InfiniiMax III/III+ probe heads are not compatible with InfiniiMax RC probe amp.

## InfiniiMax II differential probe heads compatible with MX0023A

Model number	Description	Notes
N5381B	InfiniiMax solder-in probe head	
N5425B	InfiniiMax ZIF probe head	Order N5426A ZIF tip or N5451A long-wired ZIF tip kit
N5380B	InfiniiMax SMA head	

## InfiniiMax I differential probe heads compatible with MX0023A

Model number	Description	Notes
E2675B	InfiniiMax browser	
E2677B	InfiniiMax solder-in head	
E2678B	InfiniiMax socketed head	

## Other recommended accessories

Model number	Description	Notes
MX0104A	Performance verification and deskew fixture	Order option 001 plastic stand or option N2787A 3D probe positioner
N2852A	AutoProbe II to AutoProbe III interface adapter	For use with Infiniium UXR $\geq 40$ GHz models
N2880A	In-line attenuator	
N2881A	DC blocking cap	
N2878A	3D probe positioner	For hands-free probing
N5450B	Extreme temperature extension cable	1 m long
N5448B	Phase matched cable pair, 25 cm, 2.92 mm (m) to 2.92 mm (m)	$> 40$ GHz bandwidth. Skew error matched to $< 5$ psec
N2823A	Phase matched cable pair, 1 m, 2.92 mm (m) to 2.92 mm (m)	

## Probe and accessory bundle models

Model number	Description	Containing
N8880A	InfiniiMax MX0023AA mobile probing bundle	MX0023AA (qty.1), MX0106A (qty.1), MX0100A (qty.2), MX0102A (qty.1), N2839A (qty.1), N5425B (qty.1), N5426A (qty.1)
N8881A	InfiniiMax MX0023AA display probing bundle	MX0023AA (qty.1), MX0106A (qty.2), MX0105A (qty.1), MX0100A (qty.1), MX0102A (qty.1)
N8882A	InfiniiMax MX0023AA solder head bundle	MX0023AA (qty.1), MX0106A (qty.1), MX0100A (qty.4), MX0102A (qty.1), MX0103A (qty.2)
N8883A	InfiniiMax MX0023AA general purpose probing bundle	MX0023AA (qty.1), MX0106A (qty.1), MX0100A (qty.2), MX0102A (qty.2), N2839A (qty.1), E2678B (qty.1)



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