

# PS00xxA Optically Isolated Differential Probes and Accessories

Streamline safe, isolated insights

## Introduction

Galvanically isolated voltage probes separate the device under test (DUT) from the oscilloscope and earth ground, enabling safer and more accurate measurements. This isolation effectively rejects common-mode signals, minimizes noise interference, and eliminates ground loops in high-voltage environments. A high common-mode rejection ratio (CMRR) is essential for capturing small signals accurately, even in the presence of large common-mode voltages at floating nodes. The CMRR of an isolated probe can be over 100 million times greater than that of a standard differential voltage probe referenced to earth ground.



Beyond high CMRR and enhanced safety, isolated probes offer additional advantages over standard differential probes. Their isolation makes them less susceptible to electromagnetic interference (EMI), reducing signal distortion. Additionally, Keysight's isolated probes support higher offset voltages and wider differential voltage ranges at higher bandwidths, ensuring precise measurements of fast-switching signals and transients in noisy, high-common-mode environments.

**Note:** This probe is not designed as a handheld probe due to safety and performance concerns.



# Applications

Isolated probes offer significant benefits across multiple industries and applications. Most commonly used in power electronic full-bridge and half-bridge architectures, they enhance efficiency and performance testing of fast-switching devices such as wide bandgap GaN and SiC semiconductors. With support for high-voltage differential measurements up to  $\pm 2,500$  V and the ability to reject common-mode signals up to  $\pm 60,000$  V, isolated probes play a critical role in applications like automotive electric vehicle (EV) testing and photovoltaic solar power conversion. Other key applications include:

## Semiconductor

- Developing power semiconductors, including MOSFETs, IGBTs, and wide bandgap SiC/GaN transistors.
- Testing power converters, inverters, motor drives, and associated evaluation boards.
- Evaluating power management ICs for DC-DC converters, voltage regulators, and battery management systems (BMS).

## Automotive

- Testing electric vehicle (EV) powertrains, BMS, and other high-voltage automotive components, including inverters, on-board chargers, and DC-DC converters.

## Aerospace and Defense

- Analyzing high-voltage systems in aircraft and spacecraft, such as power distribution for avionics.

## Power Electronics

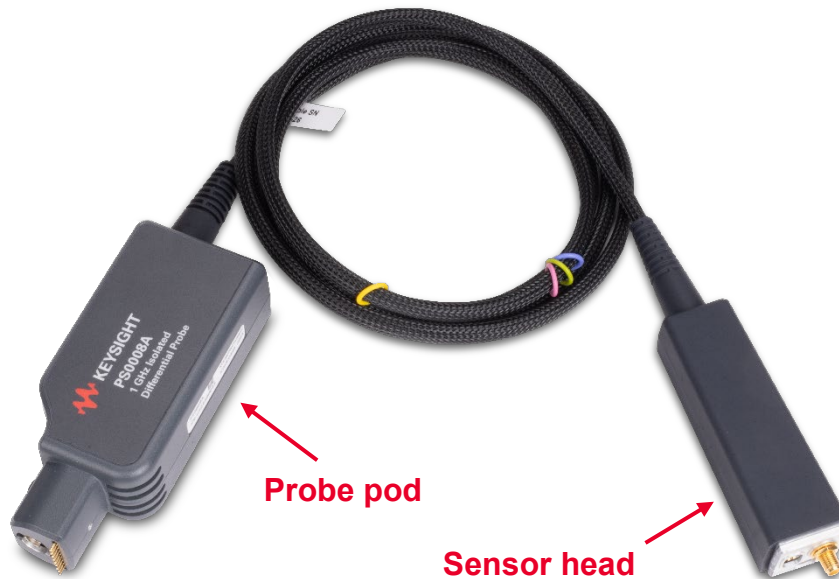
- Debugging power electronic systems like variable frequency drives (VFDs) and motor controllers used in automation, robotics, and HVAC systems.
- Verifying products against safety and regulatory standards, such as IEC 61010, UL, or other EMC requirements for isolated measurements.

## Energy

- Validating photovoltaic inverters, wind turbine power systems, and grid-tied energy storage systems.
- Developing and evaluating HVDC converters used in power distribution networks.
- Designing and testing uninterruptible power supplies (UPS) and generators.

# Probes, Tips, and Accessories

The main body of the isolated probe consists of a probe pod and sensor head. The pod contains the AutoProbe 1 interface that connects to the oscilloscope input. A probe tip is required to connect the sensor head to the DUT for measurements. Tips are sold separately and vary in voltage performance and connector type.



**Figure 1.** PS0008A 1 GHz isolated probe consisting of a probe pod and sensor head.



**Figure 2.** MMCX probe tip



**Figure 3.** 0.100" pitch square pin probe tip



**Figure 4.** 0.200" pitch square pin probe tip

Each probe comes standard with a bipod. Use of the bipod is recommended for maximum CMRR performance and for measurement setups with voltages larger than 30 Vrms.



**Figure 5.** Each probe comes with a bipod (PS0013A-64701) for hands-free use.

## Model information

|                    | Model               | Description  |
|--------------------|---------------------|--|
| <b>Probes</b>      | <b>PS0004A</b>      | Optically Isolated Differential Probe, 350 MHz, 2-meter          |
|                    | <b>PS0006A</b>      | Optically Isolated Differential Probe, 700 MHz, 2-meter          |
|                    | <b>PS0008A</b>      | Optically Isolated Differential Probe, 1 GHz, 2-meter            |
| <b>Probe Tips</b>  | <b>PS0017A</b>      | Probe Tip, $\pm 10$ V, MMCX                                      |
|                    | <b>PS0018A</b>      | Probe Tip, $\pm 30$ V, MMCX                                      |
|                    | <b>PS0019A</b>      | Probe Tip, $\pm 250$ V, MMCX                                     |
|                    | <b>PS0022A</b>      | Probe Tip, $\pm 10$ V, 100 mil pitch, 0.025" square pin socket   |
|                    | <b>PS0023A</b>      | Probe Tip, $\pm 100$ V, 100 mil pitch, 0.025" square pin socket  |
|                    | <b>PS0025A</b>      | Probe Tip, $\pm 500$ V, 100 mil pitch, 0.025" square pin socket  |
|                    | <b>PS0027A</b>      | Probe Tip, $\pm 1000$ V, 200 mil pitch, 0.025" square pin socket |
|                    | <b>PS0028A</b>      | Probe Tip, $\pm 2500$ V, 200 mil pitch, 0.025" square pin socket |
| <b>Accessories</b> | <b>PS0013-64701</b> | Bipod (included with each probe)                                 |
|                    | <b>8710-2466</b>    | SMA Wrench (included with each probe)                            |
|                    | <b>PS0010A</b>      | Basic Connectivity Kit   |
|                    | <b>PS0014A</b>      | Isolated Probe Adapter for 3D Probe Positioner (N2787A)          |
|                    | <b>PS0015A</b>      | Probe Deskew and Performance Verification Kit with MMCX          |

The Basic Connectivity Kit (PS0010A) includes the following accessories:

- DP0021-60002 Solder-in Y-lead tip qty. 1
- DP0021-60001 Socketed Y-lead tip qty. 1
- PP0013-60001 MMCX to square pin adapter qty. 1
- 1400-3652 Micro SMD clip qty. 2
- Microcircuit hook test clips qty. 2
- Channel identification rings qty. 12



**Figure 6.** Basic connectivity kit (PS0010A)

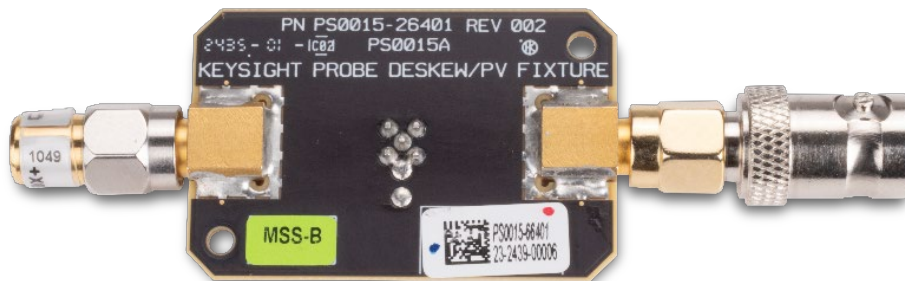
For sturdier positioning and placement, an adapter for Keysight's 3D probe positioner (N2787A) is available. The adapter requires assembly once delivered.



**Figure 7.** Adapter for 3D probe positioner disassembled (left) and assembled (right)

The deskew and performance verification kit (PS0015A) for the isolated probes is designed for use with the MMCX connector-style tips. The PS0015A PV fixture is meant only for deskew and performance verification of the probe. It is not designed for any other testing purpose. This fixture is safely rated to the maximum of 30 Vrms / 42 Vpk / 60 V<sub>DC</sub>. Do not use it on voltages higher than this rating. The PV fixture kit includes one of each of the following:

- Deskew fixture with MMCX connector
- SMA (male) to SMA (male) adapter
- SMA (male) to BNC (female) adapter
- BNC (male) to SMA (male) adapter
- 50  $\Omega$  SMA terminator



**Figure 8.** Deskew and performance verification fixture (PS0015A) with SMA and BNC adapters

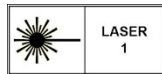
# Electrical Specifications and Characteristics

## Probe pods and sensor heads

The electrical ratings below are for probe pods and sensor heads without a probe tip. Each isolated probe requires the use of a probe tip, and therefore, the lower electrical rating of the two is applicable when used in combination.

|  | PS0004A                  | PS0006A     | PS0008A     |
|--|--------------------------|-------------|-------------|
| Bandwidth (-3 dB) <sup>1</sup>                                       | 350 MHz                  | 700 MHz     | 1 GHz       |
| Probe interface  | AutoProbe 1              | AutoProbe 1 | AutoProbe 1 |
| Cable length   | 2 m                      | 2 m         | 2 m         |
| Cable type   | Optical fiber bundle     |             |             |
| Overvoltage and measurement category per IEC -61010-031 <sup>2</sup> | Non-CAT (mains isolated) |             |             |
| Safety certification   | UL-certified             |             |             |
| Output drive   | 50 $\Omega$              |             |             |

## Laser certification



These probes are Class 1 laser systems under “Normal Use” conditions and comply with IEC 60825-1:2014 standards for laser systems.

View the User Guide for additional certifications.


<sup>1</sup> Denotes a warranted specification using the PS0008A 1 GHz isolated probe with the PS0017A 10 V MMCX probe tip. All other measurements are typical.

<sup>2</sup> IEC Measurement Category MAINS ISOLATED is for measurements performed on circuits not directly connected to mains.

## Probe tips

The electrical ratings given below are for probe tips only. Each isolated probe requires the use of a probe tip, and therefore, the lower electrical rating of the two is applicable when used in combination.

Specifications represent warranted (as noted) and typical performance after the recommended 30-minute warm-up period.

|  | PS0017A   | PS0018A  | PS0019A  | PS0022A                         | PS0023A  | PS0025A  | PS0027A                         | PS0028A  |
|--|---|----------|----------|---------------------------------|----------|----------|---------------------------------|----------|
| <b>Max bandwidth<sup>3</sup></b>   | 1 GHz   |          |          |                                 |          |          |                                 |          |
| <b>Rise time (10-90%)</b>  | 427 ps  | 430 ps   | 365 ps   | 401 ps                          | 349 ps   | 336 ps   | 299 ps                          | 323 ps   |
| <b>Max measurable differential signal</b> <br>( $V_{AC,peak} + V_{DC} - V_{offset}$ ) <sup>4a,b</sup> | ±10 V   | ±30 V    | ±250 V   | ±10 V                           | ±100 V   | ±500 V   | ±1,000 V                        | ±2,500 V |
| <b>Max measurable AC differential signal</b><br>( $V_{AC,peak}$ ) <sup>3a,b</sup>  | ±10 V   | ±30 V    | ±250 V   | ±10 V                           | ±100 V   | ±500 V   | ±1,000 V                        | ±2,500 V |
| <b>Max non-destructive differential voltage</b><br>( $V_{AC,peak} + V_{DC}$ ) <sup>3a,b</sup>  | ±250 V  | ±250 V   | ±250 V   | ±500 V                          | ±500 V   | ±500 V   | ±2,500 V                        | ±2,500 V |
| <b>Max offset (V)<sup>3b</sup></b>   | ±250 V  | ±250 V   | ±250 V   | ±250 V                          | ±500 V   | ±500 V   | ±2,500 V                        | ±2,500 V |
| <b>Offset error</b>  | ±0.5% after calibration, ±2% within 2°C of calibration temperature of pod or sensor |          |          |                                 |          |          |                                 |          |
| <b>Differential DC gain accuracy</b>   | ±1% after calibration, ±1.5% within 2°C of calibration temperature of pod or sensor |          |          |                                 |          |          |                                 |          |
| <b>Max common-mode voltage range</b>   | ±60,000 V   |          |          |                                 |          |          |                                 |          |
| <b>Common mode rejection ratio (CMRR)</b>  |   |          |          |                                 |          |          |                                 |          |
| DC <sup>5</sup>  | > 180 dB  | > 180 dB | > 180 dB | > 180 dB                        | > 180 dB | > 180 dB | > 180 dB                        | > 180 dB |
| 100 kHz  | 118 dB  | 102 dB   | 95 dB    | 102 dB                          | 102 dB   | 87 dB    | 83 dB                           | 74 dB    |
| 1 MHz  | 103 dB  | 103 dB   | 92 dB    | 101 dB                          | 97 dB    | 84 dB    | 79 dB                           | 72 dB    |
| 10 MHz   | 93 dB   | 93 dB    | 89 dB    | 87 dB                           | 84 dB    | 84 dB    | 79 dB                           | 75 dB    |
| 100 MHz  | 65 dB   | 63 dB    | 54 dB    | 51 dB                           | 48 dB    | 52 dB    | 63 dB                           | 49 dB    |
| 500 MHz  | 55 dB   | 57 dB    | 43 dB    | 27 dB                           | 24 dB    | 23 dB    | 15 dB                           | 13 dB    |
| 1 GHz  | 54 dB   | 43 dB    | 25 dB    | 22 dB                           | 16 dB    | 14 dB    | 9 dB                            | 5 dB     |
| <b>Input impedance<sup>1</sup></b>   | 10 MΩ // 3 pF   |          |          | 10 MΩ // 3.5 pF                 |          |          | 40 MΩ // 3.5 pF                 |          |
| <b>Connector type<sup>6</sup></b>  | MMCX  |          |          | 0.100" pitch, 0.025" square pin |          |          | 0.200" pitch, 0.025" square pin |          |
| <b>System Noise (rms)</b>  |   |          |          |                                 |          |          |                                 |          |
| PS0004A (350 MHz)  | 20 mV   | 60 mV    | 504 mV   | 20 mV                           | 201 mV   | 1.00 V   | 2.07 V                          | 5.20 V   |
| PS0006A (700 MHz)  | 25 mV   | 76 mV    | 637 mV   | 25 mV                           | 254 mV   | 1.27 V   | 2.62 V                          | 6.58 V   |
| PS0008A (1 GHz)  | 32 mV   | 96 mV    | 802 mV   | 32 mV                           | 320 mV   | 1.60 V   | 3.30 V                          | 8.29 V   |

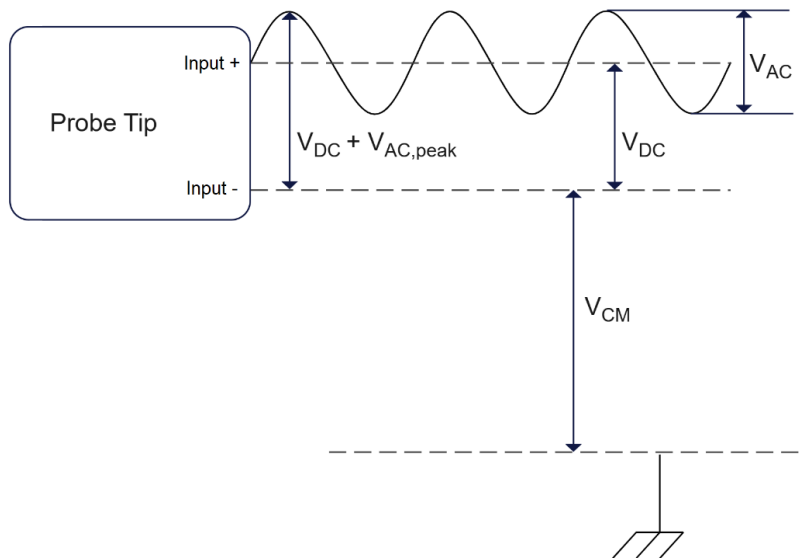
<sup>3</sup> Denotes a warranted specification using the PS0008A 1 GHz isolated probe with the PS0017A 10 V MMCX probe tip as per the performance verification procedure outlined in the User Guide. All other measurements are typical.

<sup>4</sup> (a) Derated with frequency. See voltage derating curves. (b) View the diagram in Figure 9 to compare input voltage ranges.

<sup>5</sup> If an optically isolated probe is held with a non-conducting probe holder that has virtually no DC leakage to the surrounding environment (i.e. very high resistance) then the DC CMRR becomes unmeasurable in practice and is considered nearly infinite.

<sup>6</sup> View the User Guide for connector dimensions.





**Figure 9.** Depiction of the isolated probe input voltage ranges.

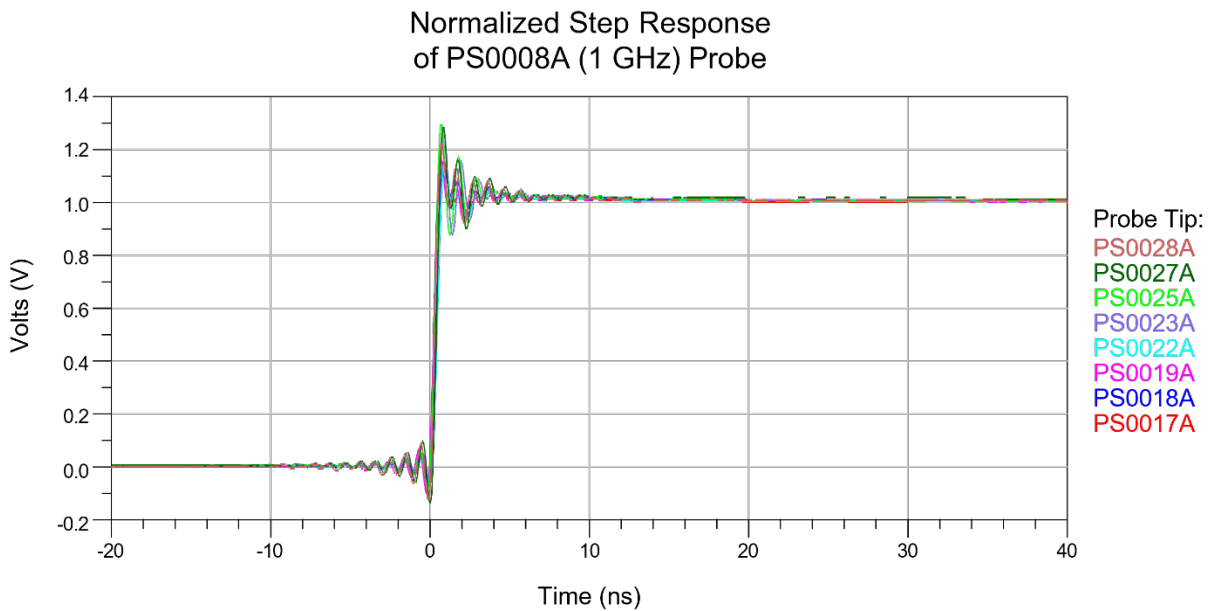
## Mechanical and Environmental Characteristics

| Characteristic                      | Probe pod  | Sensor head  | Probe tip   |
|-------------------------------------|--|--|---|
| <b>Dimensions</b>                   | 124 x 36 x 53 mm   | 99 x 30 x 25 mm  | 232 x 35 x 29 mm (MMCX)<br>238 x 35 x 29 mm (100 mil)<br>257 x 35 x 29 mm (200 mil) |
| <b>Combined probe + tip length</b>  | MMCX: 2,432 mm $\pm$ 30 mm<br>100 mil: 2,438 mm $\pm$ 30 mm<br>200 mil: 2,457 mm $\pm$ 30 mm |  |   |
| <b>Approximate weight</b>           | 375 g (probe pod + sensor head)  |  | 40 g  |
| <b>Oscilloscope interface</b>       | AutoProbe 1  |  |   |
| <b>Temperature</b>                  |  |  |   |
| Operating                           | 5°C to +40°C   | 0°C to +55°C   | -40°C to +85°C  |
| Non-operating                       | -40°C to +70°C   | -40°C to +70°C   | -40°C to +85°C  |
| <b>Altitude</b>                     |  |  |   |
| Operating <sup>7</sup>              | 3,100 m (10,171 ft)  | 3,100 m (10,171 ft)  | 3,100 m (10,171 ft)   |
| Non-operating                       | 4,600 m (15,092 ft)  | 4,600 m (15,092 ft)  | 4,600 m (15,092 ft)   |
| <b>Humidity</b>                     |  |  |   |
| Operating                           | Up to 80% RH at 40 °C, non-condensing  | Up to 85% RH at 55 °C, non-condensing  | Up to 85% RH at 85 °C, non-condensing   |
| Non-operating                       | +40 °C, 95% RH ( $\leq$ 39.0 °C Dew Point) derated linearly to 25% RH at 70 °C               | +40 °C, 95% RH ( $\leq$ 39.0 °C Dew Point) derated linearly to 25% RH at 70 °C | +40 °C, 95% RH ( $\leq$ 39.0 °C Dew Point) derated linearly to 25% RH at 70 °C      |
| <b>Pollution degree<sup>8</sup></b> | 2 (rated for indoor use only)  |  |   |

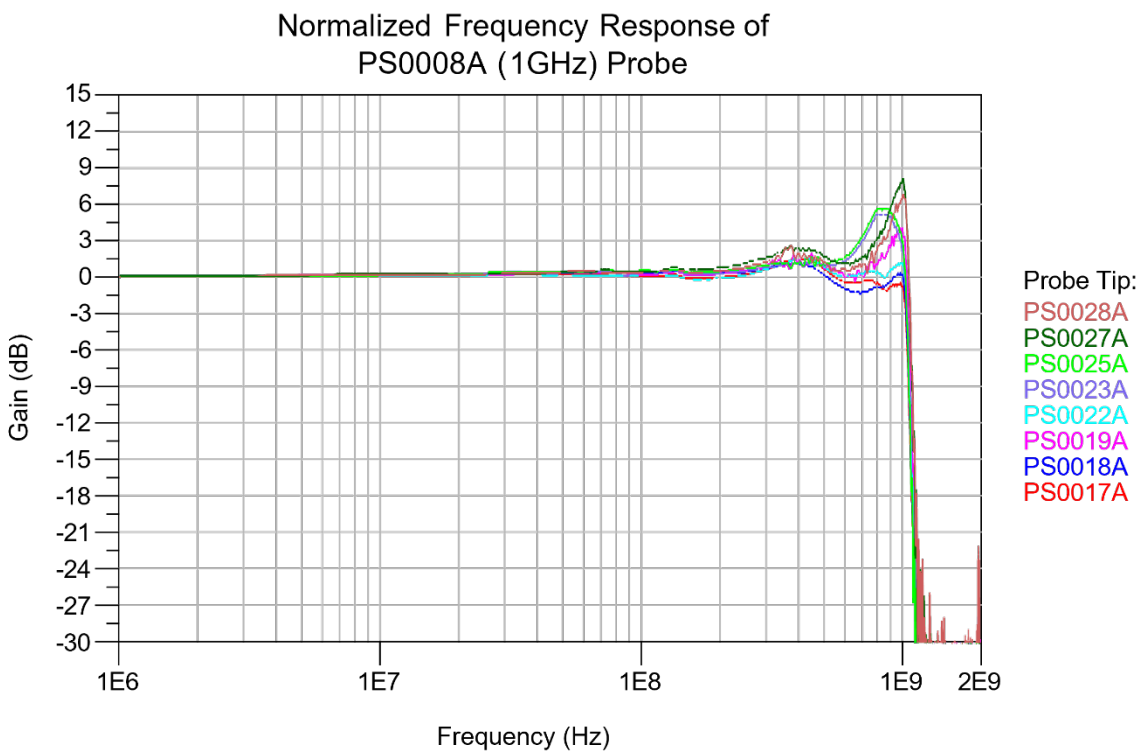
<sup>7</sup> Qualified for 140 hours of continuous use.

<sup>8</sup> Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

# Performance Plots (Typical)



**Figure 10.** Normalized step response of each probe tip using the PS0008A 1 GHz isolated probe with each probe tip. View the probe tip electrical specifications for 10-90% rise times.



**Figure 11.** Normalized  $V_{out}/V_{in}$  maximally frequency response of PS0008A 1 GHz isolated probe with ach probe tip.

# Oscilloscope Compatibility

The PS00xxA isolated probes contain Keysight's AutoProbe 1 interface and are compatible with the Infiniium EXR and MXR-Series Oscilloscopes with software version 11.70 or higher.

## Ordering Information

| Product description                                      | Model number | Services  |
|--|--------------|---|
| Optically Isolated Differential Probe, 350 MHz, 2-meter* | PS0004A      | 1-year warranty and calibration with the option to extend to 3 and 5 years. |
| Optically Isolated Differential Probe, 700 MHz, 2-meter* | PS0006A      |   |
| Optically Isolated Differential Probe, 1 GHz, 2-meter*   | PS0008A      |   |
| Probe Tip, $\pm 10$ V, MMCX                              | PS0017A      | 1-year warranty   |
| Probe Tip, $\pm 30$ V, MMCX                              | PS0018A      |   |
| Probe Tip, $\pm 250$ V, MMCX                             | PS0019A      |   |
| Probe Tip, $\pm 10$ V, 100 mil square pin socket         | PS0022A      |   |
| Probe Tip, $\pm 100$ V, 100 mil square pin socket        | PS0023A      |   |
| Probe Tip, $\pm 500$ V, 100 mil square pin socket        | PS0025A      |   |
| Probe Tip, $\pm 1000$ V, 200 mil square pin socket       | PS0027A      |   |
| Probe Tip, $\pm 2500$ V, 200 mil square pin socket       | PS0028A      |   |
| Basic Connectivity Kit                                   | PS0010A      |   |
| Isolated Probe Adapter for 3D Probe Positioner (N2787A)  | PS0014A      |   |
| Probe Deskew and Performance Verification Kit with MMCX  | PS0015A      | 90-day warranty   |

\* Bipod and SMA wrench included

## Related Literature

| Literature description   |
|--|
| <a href="#">PS0004A/6A/8A Optically Isolated Differential Probes User Guide</a>      |
| <a href="#">Differential Probe vs Single-Ended Probe Comparison Application Note</a> |
| <a href="#">Understanding Oscilloscope Probe Specifications Application Note</a>     |
| <a href="#">Infiniium EXR-Series Oscilloscopes Data Sheet</a>                        |
| <a href="#">Infiniium MXR B-Series Oscilloscopes Data Sheet</a>                      |
| <a href="#">Infiniium Oscilloscope Probes and Accessories Data Sheet</a>             |

Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at [www.keysight.com](http://www.keysight.com).



This information is subject to change without notice. © Keysight Technologies, 2025, Published in USA, March 11, 2025, 3125-1132.EN