

Active Power Rail Probes

TPR1000 • TPR4000 Datasheet



The TPR1000 and TPR4000 probes provide a low noise, large offset range solution for measurement of ripple on DC power rails ranging from –60 to +60 VDC. Tektronix's power rail probes offer industry leading low noise and high offset range required to measure AC ripple between 200 $\mu\text{V}_{\text{p-p}}$ and 800 $\text{mV}_{\text{p-p}}$ at up to 4 GHz.

Key performance specifications

- Compatible with the 6 series MSO, 5 series MSO, MSO/DPO3000, MDO/DPO4000, MSO/DPO5000, DPO7000, and DPO70000 ¹ oscilloscopes
- Bandwidth: ^{2 3}
 - DC coupling mode:
 - TPR1000: DC to 1 GHz
 - TPR4000: DC to 4 GHz
 - DC reject mode:
 - TPR1000: 10 kHz to 1 GHz
 - TPR4000: 10 kHz to 4 GHz
- Linear dynamic range: Up to 60 V DC, 1 $\text{V}_{\text{p-p}}$ to bandwidth ⁴
- Attenuation: 1.25x²

¹ DPO70000 oscilloscopes require the optional TCA-VPI50 adapter.

² Frequency response optimized for <1 Ω source impedance.

³ Through SMA-to-SMA cable or Solder Micro-Coax tip.

⁴ Max AC RMS of 1 V.

⁵ Comp box and oscilloscope temperature range limited to 0 to +55 °C.

- Measurement accuracy:
 - DC linearity: <0.1%
 - Step response long-term aberrations: $\pm 1\%$
- Noise:
 - <300 $\mu\text{V}_{\text{p-p}}$ noise on 6 Series MSO (20 MHz BW Limit)
 - <1 $\text{mV}_{\text{p-p}}$ noise on 6 Series MSO (Full Bandwidth)
- Input impedance:
 - 50 k Ω DC to 10 kHz
 - 50 Ω AC > 100 kHz
- Temperature range at tip: ⁵
 - –40 to +85 °C (standard accessories)
 - –40 to +155 °C (high temperature cable option)
- Offset:
 - ± 60 V offset range
 - Offset setting error: ± 2 mV max, ± 0.4 μV typical

Applications

- Probing chipsets for power rail voltage supply and control in automotive, industrial and consumer markets
- Probing digital power management, memory and Ethernet connectivity
- Probing noise sources on high-frequency power rails

Why use a power-rail probe?

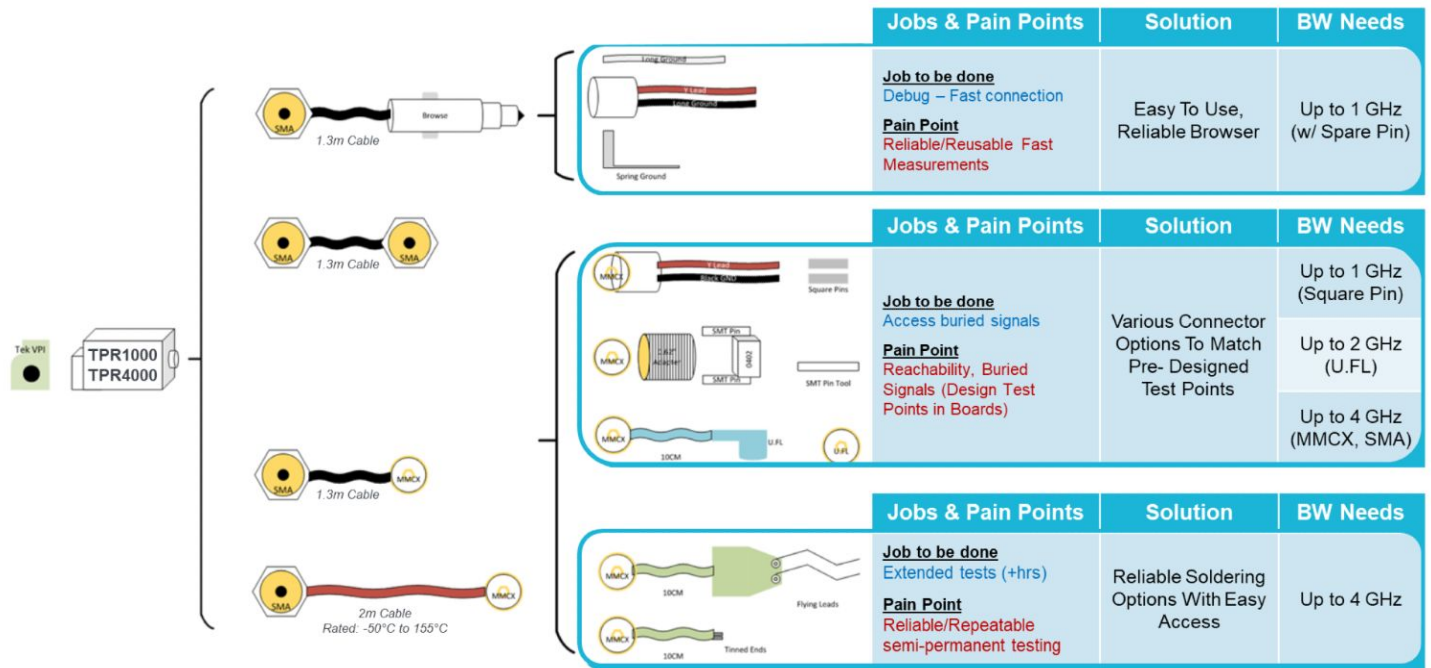
The added functionality, higher density, and faster switching speeds of modern electronic products drive the need for lower supply voltages. Designers need to zoom-in on power rails to look for high-frequency intruder signals, measure ripple and analyze coupling effects with tighter tolerances. Oscilloscopes often don't have enough offset to shift the noise and ripple on DC rails to the center of the screen to make the needed measurements.

The TPR1000 and TPR4000 probes provide a low-noise measurement solution (oscilloscope and probe), which is critical to not confuse the noise of the oscilloscope and probe with the noise and ripple of the DC supply being measured. The higher input impedance in the probes minimize the oscilloscope loading effect on DC rails (50 kΩ at DC). The probes provide higher bandwidth to see more signal content (harmonics, faster ripples, etc.) on DC rails that could affect data signals, clocks, etc.

The TPR1000 and TPR4000 provide a best-in-class integrity solution for power integrity and validation engineers in the high speed (μP), low power (mobile) and switched-mode power supply markets. The probes are designed to offer the lowest noise with high bandwidth at 60 V offset, flexible connectivity options to cover customers challenges, and software packages to cover the digital power management market.

Connectivity using probe accessories

The available probe accessories provide solutions for reliable and repeatable power rail measurements.



Probe accessories to enable connectivity

Specifications

All specifications are guaranteed unless noted otherwise. All specifications apply to all models unless noted otherwise.

Bandwidth	TPR1000: 1 GHz TPR4000: 4 GHz
Offset voltage range	±60 V
Dynamic range	±1 V
Input resistance	50 kΩ DC 50 Ω AC
Input coupling	DC, LF reject
Accuracy	1 mV
System noise	<300 μV _{P-P} (with 20 MHz bandwidth limit) ⁶ <1.3 mV _{P-P} (at full bandwidth of oscilloscope) ⁶
Attenuation	1.25x ⁷
Connectivity and accessories	New browser, solder-in and snap-on

⁶ Using 6 Series MSO oscilloscopes. With grounded input and maximum sensitivity set to 1.3 mV/Div.

⁷ Frequency response optimized for <1 Ω source impedance.








Ordering information










Models

TPR1000	1 GHz, Single-Ended TekVPI® Power-Rail Probe; includes one TPR4KIT accessory kit
TPR4000	4 GHz, Single-Ended TekVPI® Power-Rail Probe; includes one TPR4KIT accessory kit



Accessory kits

Accessory kits provide flexible and modular connectivity options. Each of the kits are orderable separately.

Description		TPR4KIT (std. accessory)	TPR4KITHT (high temp.)	TPRBRWSR1G (1 GHz browser)	TPR4SIAFLEX (flex tips)	TPR4SIACOAX (micro-coax tips)
1.3 m cable, SMA male-to-MMCX male, 50 Ω		✓				
1.3 m cable, SMA male-to-SMA male, 50 Ω		✓				
Y-lead adapter, MMCX female-to-0.8 mm sockets		✓				
Adapter cable, MMCX female-to-U.FL female, 50 Ω		✓				
Adapter, MMCX female-to-square pin (0.062 centers)		✓				
DUT interface solder pins, set of 20		✓				
Soldering aide tool, 0.062 solder pins over SMT		✓				

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Probe tip tripod support (with living hinge)		✓				
Marker bands, set of 5 (for probe identification)		✓				
Wire card, solderable enameled self-fluxing copper wire (for use with the solder-in tips)		✓				
Solder-in cable adapter, MMCX female-to-solder micro-coax tip, 50 Ω, set of 3		✓	✓			✓
Solder-in cable adapter, MMCX female-to-solder flex-paddle tip, 50 Ω, set of 3		✓	✓		✓	
2 m high-temperature cable, SMA male-to-MMCX male, 50 Ω			✓			
1 GHz browser				✓		
Ground leads (blade, 0.5 mm spring, 15 cm alligator)				✓		
Y-lead adapter, browser tip-to-0.8 mm sockets				✓		

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Micro-SMD clip				✓		
Replacement 0.5 mm browser tips (2 solid tips, 2 spring tips)				✓		



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.



Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

ASEAN / Australasia (65) 6356 3900
Belgium 00800 2255 4835*
Central East Europe and the Baltics +41 52 675 3777
Finland +41 52 675 3777
Hong Kong 400 820 5835
Japan 81 (3) 6714 3086
Middle East, Asia, and North Africa +41 52 675 3777
People's Republic of China 400 820 5835
Republic of Korea +822 6917 5084, 822 6917 5080
Spain 00800 2255 4835*
Taiwan 886 (2) 2656 6688

Austria 00800 2255 4835*
Brazil +55 (11) 3759 7627
Central Europe & Greece +41 52 675 3777
France 00800 2255 4835*
India 000 800 650 1835
Luxembourg +41 52 675 3777
The Netherlands 00800 2255 4835*
Poland +41 52 675 3777
Russia & CIS +7 (495) 6647564
Sweden 00800 2255 4835*
United Kingdom & Ireland 00800 2255 4835*

Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777
Canada 1 800 833 9200
Denmark +45 80 88 1401
Germany 00800 2255 4835*
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Mexico, Central/South America & Caribbean 52 (55) 56 04 50 90
Norway 800 16098
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South Africa +41 52 675 3777
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* European toll-free number. If not accessible, call: +41 52 675 3777

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CalPlus GmbH
 Zentrale Berlin
 Heerstraße 32 • 14052 Berlin
 Tel.: 030 214982-0 • Fax: 030 214982-50
office@calplus.de • www.calplus.de

CalPlus GmbH
 Niederlassung ScopeShop
 Normannenweg 30 • 20537 Hamburg
 Tel.: 040 3039595-0 • Fax: 040 3039595-50
scopeshop@calplus.de • www.calplus.de