

# Differential Probes

## TDP1500 • TDP3500 Data Sheet



### Features & Benefits

- Outstanding Electrical Performance
  - 3.5 GHz and 1.5 GHz Bandwidth Models – Accurate Measurements for Serial and Digital Applications
  - Excellent Common Mode Rejection – Reduces Measurement Errors in Higher Common Environments
  - Low Capacitive and Resistive Loading – Maintains Signal Fidelity and Reduces DC Biasing Interactions
- Versatile Mechanical Performance
  - Compact Probe Head Size for Probing Small Geometry Circuit Elements
  - DUT Attachment Accessories Enable Connection to Fine-spaced SMDs
  - Robust Design for Reliability

- Easy to Use
  - Connects Directly to DPO7000, DPO4000, and MSO4000 Series Oscilloscopes Using TekVPI Probe Interface
  - Provides Automatic Units Scaling and Readout on the Oscilloscope Display
  - Easy Access to Probe Comp Box Controls or Oscilloscope Probe Menu Display for Probe Status, Setup Control, and Diagnostic Information
- Integrated Scope/Probe System
  - Direct Connection to and Powered from TekVPI™ Oscilloscope Interface (Connects directly to TekVPI scopes without the need of an external power supply, like many competitors require)
  - Single-button Oscilloscope Probe Menu Access
  - Setup and Control from Probe Comp Box or Oscilloscope User Interface
  - AutoZero - Zeros Out Output Offset
  - Remote GPIB/USB Probe Control Through the Oscilloscope (Requires TEK-USB-488 Adapter for GPIB control on DPO4000 and MSO4000)

### Applications

- Design, Validation, Debugging, and Characterization of Common High-speed Serial Bus Designs:
  - I<sup>2</sup>C
  - CAN/LIN
  - SPI
  - Serial ATA
  - Ethernet (GbE)
  - USB 2.0
  - FireWire (1394b)
- Signal Integrity, Jitter, and Timing Analysis
- Manufacturing Engineering and Test

## Differential Probes - A Better Measurement Tool

Differential active probes provide truer signal reproduction and fidelity for high-frequency measurements. With ultra-low input capacitance and versatile device-under-test connection capabilities, the TDP1500 and TDP3500 Differential-ended Active probes provide excellent high-speed electrical and mechanical performance required for today's digital system designs.

Specifically designed for use and direct connection to the TekVPI™ probe interface used on the DPO7000, DPO4000, and MSO4000 Series oscilloscopes, the TDP1500 and TDP3500 Differential probes achieve high-speed signal acquisition and measurement fidelity by solving three traditional problems:

- DUT loading effects - Are reduced by lower input capacitance and high input resistance
- DUT connectivity - A variety of accessories exist for attaching to small SMDs, some come standard or recommended
- Maximizing of system (oscilloscope and probe) bandwidth - probing solutions for all measurements for TekVPI interface oscilloscope models up to 3.5 GHz

## Characteristics

| Characteristic  | Description  |
|---|--|
| Bandwidth (Probe only)                                  | ≥1.5 GHz warranted (TDP1500)<br>≥3.5 GHz warranted (TDP3500)             |
| Attenuation (Probe only)                                | 1x/10x (TDP1500)<br>5x (TDP3500)   |
| Rise Time (Probe only)                                  | ≤265 ps typical (TDP1500)<br>≤110 ps typical (TDP3500)                   |
| Differential Input Capacitance                          | ≤1 pF (TDP1500)<br>≤0.3 pF (TDP3500)                                     |
| Differential Input Resistance                           | 200 kΩ (TDP1500)<br>100 kΩ (TDP3500)                                     |
| Differential Input Dynamic Range                        | ±8.5 V (10x) (TDP1500)<br>±850 mV (1x) (TDP1500)<br>±2 V (TDP3500)       |
| CMRR  | >60 dB at 1 MHz (TDP1500, TDP3500)<br>>25 dB at 1 GHz (TDP1500, TDP3500) |
| Input Offset Range                                      | ±7 V (10x or 1x) (TDP1500)<br>±1 V displayed (TDP3500)                   |
| Operation Voltage Input Range (Common Mode Input Range) | ±7 V (1x) (TDP1500)<br>±7 V (10x) (TDP1500)<br>+5 V to -4V (TDP3500)     |
| Noise   | <50 nV/root Hz (TDP1500)<br>≈35 nV/root Hz (TDP3500)                     |
| Max Input Voltage (Nondestruct)                         | ±25 V (DC + pk AC) (TDP1500)<br>±25 V (DC + pk AC) (TDP3500)             |
| Propagation Delay                                       | 5.3 ns typical (TDP3500)<br>5.4 ns typical (TDP1500)                     |

## Physical Characteristics

| Dimensions     | mm   | in. |
|----------------|------|-----|
| Cable Length*1 | 1200 | 48  |
| Weight         | g    | oz. |
| Probe Only*1   | 160  | 5.4 |

\*1 Typical for TDP1500.

## Power Requirements

TDP1500 and TDP3500 are powered directly by the DPO7000, DPO4000, and MSO4000 Series Oscilloscopes with TekVPI probe interface.

## Recommended Oscilloscopes

DPO7000, DPO4000, MSO4000 Series Oscilloscopes with TekVPI probe interface.

## Minimum System Requirements / Instrument Compatibility

The TDP3500 is fully supported on DPO7000, DPO4000, and MSO4000. The TDP1500 is fully supported on the DPO4000 and MSO4000. TDP1500 functions properly with DPO7000 Series firmware version 4.0.0 and above, but does not provide range control on the oscilloscope menu.

## Ordering Information

### TDP1500

1.5 GHz Differential Probe with TekVPI Interface, Certificate of Traceable Calibration Standard.

### TDP3500

3.5 GHz Differential Probe with TekVPI Interface, Certificate of Traceable Calibration Standard.

### TDP1500 – Standard Accessories Included

| Description   | QTY Shipped   | Reorder Part No.                              | Reorder QTY   |
|---|---------------|---|---------------|
| Pouch, Nylon Carrying Case with Inserts   | 1 each        | 016-1952-xx                                   | 1 each        |
| Documentation Kit TDP1500, Includes:<br>Printed User Manual<br>(English 071-2209-xx;<br>Japanese 071-2210-xx;<br>Simplified Chinese 071-2211-xx) and a<br>CD containing (Technical Reference<br>Manual PDF English 071-2296-xx) | 1 each Kit    | 020-2866-xx (English w/ Standard)             | 1 each        |
|   |               | 020-2891-xx (Japanese w/ Opt L5)              | 1 each        |
|   |               | 020-2892-xx<br>(Simplified Chinese w/ Opt L7) | 1 each        |
| Certificate of Traceability   | 1 each        | Standard w/ Probe                             | 1 each        |
| Accessory Kit TDP1500 (see contents<br>listed below, 0 through 10)  | 1 each        | 020-2702-xx                                   | 1 each        |
| 0) Plastic Accessory Box  | 1 each        | 006-7164-xx                                   |               |
| 1) Straight Pins  | 8 each        | 016-1891-xx                                   | Pkg of 8 each |
| 2) Longhorn VIA Adapter   | Pkg of 5 each | 016-1780-xx                                   | Pkg of 5 each |
| 3) 1-inch Solder Down   | 1 each        | 196-3504-xx                                   | 1 each        |
| 4) 3-inch Solder Down   | 1 each        | 196-3505-xx                                   | 1 each        |
| 5) Y-Lead Adapter   | 2 each        | 196-3434-xx                                   | 1 each        |
| 6) Micro CKT Test Tip   | 3 each        | 206-0569-xx                                   | 1 each        |
| 7) Tip Saver  | 2 each        | 016-1781-xx                                   | 2 each        |
| 8) 3-inch Ground Lead   | 2 each        | 196-3437-xx                                   | Pkg of 2 each |
| 9) Marker Band Set (2 each of 5 colors)   | 1 each        | 016-1315-xx                                   | 1 each        |
| 10) Accessory Performance Summary<br>and Reorder Sheet  | 1 each        | 001-1412-xx                                   | 1 each        |

**TDP3500 – Standard Accessories Included**

| <b>Description</b>  | <b>QTY Shipped</b> | <b>Reorder Part No.</b>                       | <b>Reorder QTY</b> |
|---|--------------------|---|--------------------|
| Pouch, Nylon Carrying Case with Inserts   | 1 each             | 016-1952-xx                                   | 1 each             |
| Documentation Kit TDP3500, Includes:<br>Printed User Manual<br>(English 071-2212-xx;<br>Japanese 071-2213-xx;<br>Simplified Chinese 071-2214-xx) and a<br>CD containing (Technical Reference<br>Manual PDF English 071-2297-xx) | 1 each Kit         | 020-2867-xx (English w/ Standard)             | 1 each             |
|   |                    | 020-2893-xx (Japanese w/ Opt L5)              | 1 each             |
|   |                    | 020-2894-xx<br>(Simplified Chinese w/ Opt L7) | 1 each             |
| Anti-static Wrist Strap   | 1 each             | 006-3415-xx                                   | 1 each             |
| Certificate of Traceability   | 1 each             | Standard w/ Probe                             | 1 each             |
| Accessory Kit TDP3500 (see contents<br>listed below, 1 through 7)   | 1 each             | 020-2883-xx                                   | 1 each             |
| 0) Plastic Accessory Box  | 1 each             | 006-7164-xx                                   | 1 each             |
| 1) Variable Spacing Tip Adapter   | Pkg of 4 each      | 016-1885-xx                                   | Pkg of 4 each      |
| 2) Square Pin Adapter   | Pkg of 4 each      | 016-1884-xx                                   | Pkg of 4 each      |
| 3) Y-Lead Adapter   | 2 each             | 196-3434-xx                                   | 1 each             |
| 4) Micro CKT Test Tip   | 3 each             | 206-0569-xx                                   | 1 each             |
| 5) 3-inch Ground Lead   | 2 each             | 196-3469-xx                                   | Pkg of 2 each      |
| 6) Marker Band Set (2 each of 5 colors)   | 1 each             | 016-1315-xx                                   | 1 each             |
| 7) Accessory Performance Summary<br>and Reorder Sheet   | 1 each             | 001-1435-xx                                   | 1 each             |
| Accessory Kit; Solder-In Differential<br>Probes TDP3500, P6330, P7330, P7350  | 1 each             | 020-2505-xx                                   | 1 each             |
| 1) Adapter, Resistor / Wire   | Pkg of 2 each      | 016-1926-xx                                   | Pkg of 2 each      |
| 2) Wire Assembly w/ 0.02 dia  | Pkg of 10 each     | 016-1930-xx                                   | Pkg of 10 each     |
| 3) Wire Assembly w/ 0.008 dia   | Pkg of 10 each     | 016-1931-xx                                   | Pkg of 10 each     |
| 4) 10 $\Omega$ Resistor w/ 0.02 dia Wire  | Pkg of 10 each     | 016-1927-xx                                   | Pkg of 10 each     |
| 5) 10 $\Omega$ Resistor w/ 0.008 dia Wire   | Pkg of 10 each     | 016-1933-xx                                   | Pkg of 10 each     |
| 6) 20 $\Omega$ Resistor w/ 0.02 dia Wire  | Pkg of 10 each     | 016-1928-xx                                   | Pkg of 10 each     |
| 7) 20 $\Omega$ Resistor w/ 0.008 dia Wire   | Pkg of 10 each     | 016-1934-xx                                   | Pkg of 10 each     |

**Optional Accessories**

| <b>Description</b>       | <b>TDP1500</b> | <b>TDP3500</b> | <b>Ordering Part Number (Qty)</b> |
|--------------------------|----------------|----------------|-----------------------------------|
| BNC to Probe Tip Adapter | X              | -              | 679-4094-xx (set of 1)            |
| TwinFoot™ Adapter        | X              | X              | 016-1785-xx (set of 4)            |

**Contact Tektronix:**

**ASEAN / Australasia** (65) 6356 3900  
**Austria** 00800 2255 4835\*  
**Balkans, Israel, South Africa and other ISE Countries** +41 52 675 3777  
**Belgium** 00800 2255 4835\*  
**Brazil** +55 (11) 3759 7627  
**Canada** 1 800 833 9200  
**Central East Europe and the Baltics** +41 52 675 3777  
**Central Europe & Greece** +41 52 675 3777  
**Denmark** +45 80 88 1401  
**Finland** +41 52 675 3777  
**France** 00800 2255 4835\*  
**Germany** 00800 2255 4835\*  
**Hong Kong** 400 820 5835  
**India** 000 800 650 1835  
**Italy** 00800 2255 4835\*  
**Japan** 81 (3) 6714 3010  
**Luxembourg** +41 52 675 3777  
**Mexico, Central/South America & Caribbean** 52 (55) 56 04 50 90  
**Middle East, Asia, and North Africa** +41 52 675 3777  
**The Netherlands** 00800 2255 4835\*  
**Norway** 800 16098  
**People's Republic of China** 400 820 5835  
**Poland** +41 52 675 3777  
**Portugal** 80 08 12370  
**Republic of Korea** 001 800 8255 2835  
**Russia & CIS** +7 (495) 7484900  
**South Africa** +41 52 675 3777  
**Spain** 00800 2255 4835\*  
**Sweden** 00800 2255 4835\*  
**Switzerland** 00800 2255 4835\*  
**Taiwan** 886 (2) 2722 9622  
**United Kingdom & Ireland** 00800 2255 4835\*  
**USA** 1 800 833 9200

\* European toll-free number. If not accessible, call: +41 52 675 3777

Updated 10 February 2011

**For Further Information.** Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit [www.tektronix.com](http://www.tektronix.com)



Copyright © Tektronix, Inc. All rights reserved. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specification and price change privileges reserved. TEKTRONIX and TEK are registered trademarks of Tektronix, Inc. All other trade names referenced are the service marks, trademarks, or registered trademarks of their respective companies.

02 Oct 2011

51W-20565-2

