

# Differential Probes

► TDP1500 • TDP3500



## 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

## ► Features & Benefits

- Outstanding Electrical Performance
  - 3.5 GHz & 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 Oscilloscopes 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

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### ► Characteristics

|                                                            |                                                                       |
|------------------------------------------------------------|-----------------------------------------------------------------------|
| 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>±2V (TDP3500)     |
| CMRR                                                       | >60 dB @ 1 MHz (TDP1500, TDP3500); > 25 dB @ 1 GHz (TDP1500, TDP3500) |
| Input Offset Range                                         | ±7 V (10X or 1X) (TDP1500)<br>±1 V (TDP3500)                          |
| Operation Voltage Input Range<br>(Common Mode Input Range) | ±7 V (X1) (TDP1500)<br>±7 V (X10) (TDP1500)<br>+5 V to -4V (TDP3500)  |
| Noise                                                      | <50 nV/root Hz (TDP1500)<br>≈35 nV/root Hz (TDP3500)                  |
| Max Input Voltage (Non-destruct)                           | ±25 V (DC+pkAC) (TDP1500)<br>±25V (DC+pkAC) (TDP3500)                 |
| Propagation Delay                                          | 5.3 ns typical, (TDP3500); 5.4 ns typical (TDP1500)                   |

### ► Physical Characteristics

| Dimensions     | mm        | in.        |
|----------------|-----------|------------|
| Cable Length*1 | 1200      | 48         |
| <b>Weight</b>  | <b>kg</b> | <b>oz.</b> |
| 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 TDP 3500 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: Printed User Manual (English 071-2209-XX; Japanese 071-2210-XX; Simplified Chinese 071-2211-XX) and a CD containing (Technical Reference Manual PDF English 071-2296-xx) | 1 each Kit    | 020-2866-00 (English w/Standard)<br>020-2891-00 (Japanese w/Opt L5)<br>020-2892-00 (Simplified Chinese w/Opt L7) | 1 each<br>1 each<br>1 each |
| Certificate of Traceability                                                                                                                                                                                   | 1 each        | Standard w/Probe                                                                                                 | 1 each                     |
| Accessory Kit TDP1500<br>(see contents listed below 0 thru 10)                                                                                                                                                | 1 each        | 020-2702-XX                                                                                                      | 1 each                     |
| 0) Plastic Accessory Box                                                                                                                                                                                      | 1 each        | 006-7164-00                                                                                                      |                            |
| 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) MicroCKT 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 and Reorder Sheet                                                                                                                                                           | 1 each        | 001-1412-XX                                                                                                      | 1 each                     |

► **TDP3500-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 TDP3500- Includes:<br>Printed User Manual (English<br>071-2212-XX; Japanese 071-2213-XX;<br>Simplified Chinese 071-2214-XX) and<br>a CD containing (Technical Reference<br>Manual PDF English 071-2297-xx) | 1 each Kit     | 020-2867-00 (English w/Standard)             | 1 each         |
|                                                                                                                                                                                                                              |                | 020-2893-00 (Japanese w/Opt L5)              | 1 each         |
|                                                                                                                                                                                                                              |                | 020-2894-00 (Simplified<br>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 0 through 7)                                                                                                                                                             | 1 each         | 020-2883-XX                                  | 1 each         |
| 0) Plastic Accessory Box                                                                                                                                                                                                     | 1 each         | 006-7164-00                                  | 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) MicroCKT 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 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**

| Description              | TDP1500 | TDP3500 | Ordering Part Number (Qty) |
|--------------------------|---------|---------|----------------------------|
| BNC to Probe Tip Adapter | X       | -       | 679-4094-xx (set of 1)     |
| TwinFoot™ Adapter        | X       | X       | 016-1785-xx (set of 4)     |
| TwinTip™ Adapter         | X       | -       | 016-1786-xx (set of 4)     |
| VariTip™ Adapter         | X       | -       | 016-1890-xx (set of 8)     |
| IC Micro Grabber         | X       | X       | 013-0309-xx (set of 2)     |
| Micro KlipChip™ Adapter  | X       | -       | SMK-4 (set of 4)           |
| IEEE 1394 Adapter        | X       | -       | 679-5027-xx (set of 1)     |
| Short Ground Contact     | X       | -       | 016-1783-xx (set of 10)    |
| Spring Loaded Ground     | X       | -       | 016-1782-xx (set of 6)     |

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### ► Manual Options

|                |                                            |
|----------------|--------------------------------------------|
| <b>Opt. L0</b> | English user instruction manual (Standard) |
| <b>Opt. L5</b> | Japanese user instruction manual           |
| <b>Opt. L7</b> | Simplified Chinese instruction manual      |

### ► Service Options

|                 |                                                                                                       |
|-----------------|-------------------------------------------------------------------------------------------------------|
| <b>Opt. C3</b>  | Calibration Service 3 years                                                                           |
| <b>Opt. C5</b>  | Calibration Service 5 years                                                                           |
| <b>Opt. D1</b>  | Calibration Data Report                                                                               |
| <b>Opt. D3</b>  | Calibration Data Report 3 years (with Opt. C3)                                                        |
| <b>Opt. D5</b>  | Calibration Data Report 5 years (with Opt. C5)                                                        |
| <b>Opt. R3</b>  | Repair Service 3 years                                                                                |
| <b>Opt. R5</b>  | Repair Service 5 years                                                                                |
| <b>Opt. CA1</b> | Single calibration event, or coverage for the designated calibration interval, whichever comes first. |

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