Tektronix®

TriMode™ Probe Family
TDP7000 Series TriMode Probes Datasheet

The TDP7700 Series TriMode probes provide the highest probe fidelity available for real-time oscilloscopes. In addition, with connectivity innovations such as solder down tips with the probe's input buffer mounted only a few millimeters from the end of the tip, the TDP7700 series probes provide unmatched usability for connecting to today's most challenging electronic designs.

Key features

- High bandwidth for signal fidelity
  - 10 GHz TDP7710
  - 8 GHz TDP7708
  - 6 GHz TDP7706
  - 4 GHz TDP7704
- Minimal device impact
  - Thin and flexible solder tips
  - Lightweight and flexible probe cable
  - Active buffer tip design for low probe loading
- Easy to connect TekFlex™ Connector technology
  - Pinch-to-Open accessory connector
  - Versatile Connectivity - solder-down tips, optional browser for handheld or fixtured probing, and coaxial input (SMA adapter)
  - Cross compatibility with P7700 series tip accessories
  - Full Bandwidth to 10 GHz

- Probe cable and solder-down tips operate over an extended temperature range
- Probe and tip specific S-parameters
  - Full AC calibration of the probe and tip's signal path based upon unique s-parameter models
  - Unique DSP filters created for each probe and tip
- FlexChannel® interface for oscilloscope/probe control and usability
  - Direct control via probe buttons or from the oscilloscope's menus
  - Automated control of probe settings via the oscilloscope
  - Automatic recognition of the probe and tip when attached to the oscilloscope

TDP7700 Series TriMode Probes

With TriMode probing one probe setup makes differential, single ended, and common mode measurements accurately. This unique capability allows you to work more effectively and efficiently, switching between differential, single ended and common mode measurements without moving the probe's connection points.
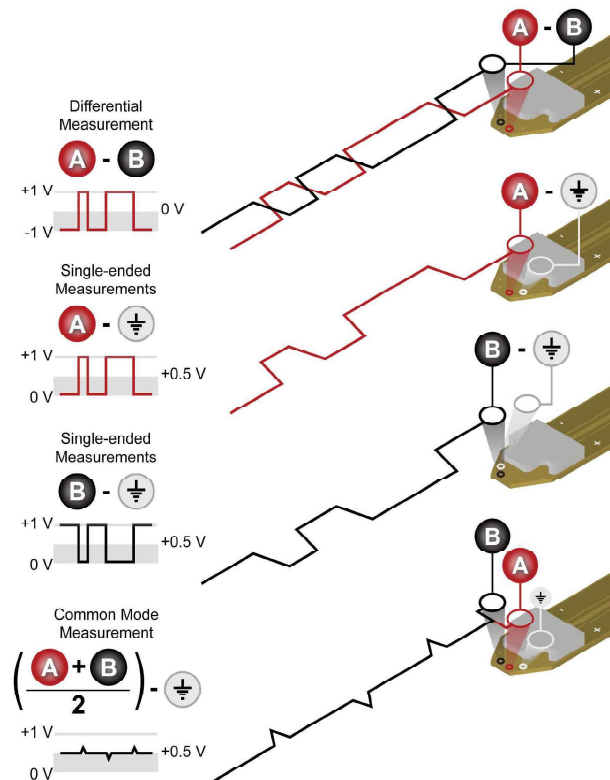
TekFlex connector technology

The TDP7700 Series TriMode probes use the new TekFlex connector technology that combines a high speed signal path with power and communication support for an active buffer tip in a single, easy to connect accessory connector. The TekFlex connector has a pinch-to-open design that when open requires minimal force to attach an accessory tip. When the TekFlex connector is closed, it provides a secure connection to the accessory to avoid accidental disconnections.

With the TekFlex connector, the TDP7700 series probes offer a set of active probe tips with the probe's buffer amplifier only millimeters from the input connections. The short signal path enabled with the active tips provides high fidelity and a high impedance input. It also minimizes signal loss, capacitance, and additive noise.
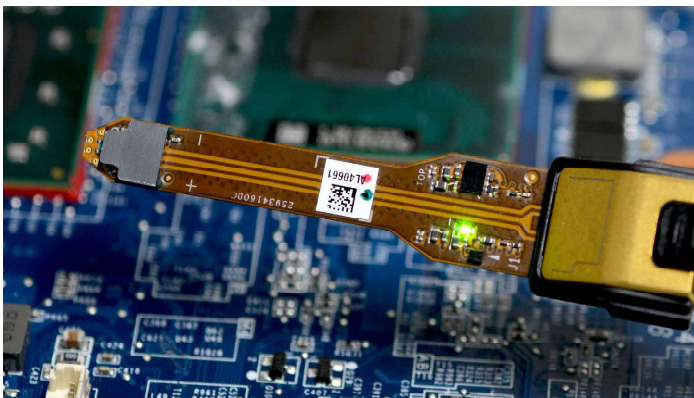
P77STFLXA solder down, flex-circuit accessory with an active buffer amplifier on its tip.
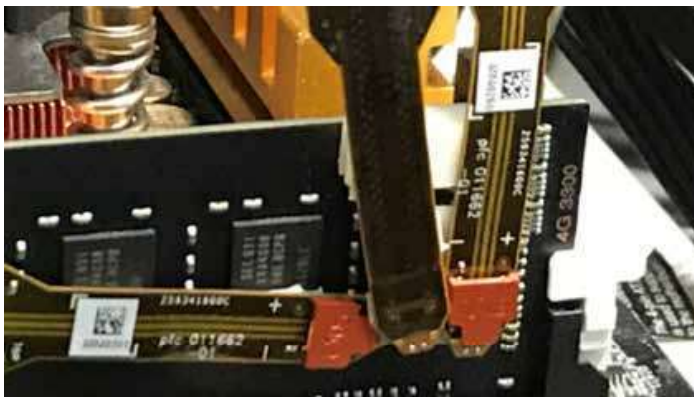
P77STFLXB solder down, flex-circuit accessory provides a probing solution for DDR4 and LPDDR4 electrical validation when used with Nexus XH Series Interposers.

P77STCABL solder down accessory with a long reach, flexible cable combined with an active buffer amplifier on the tip.
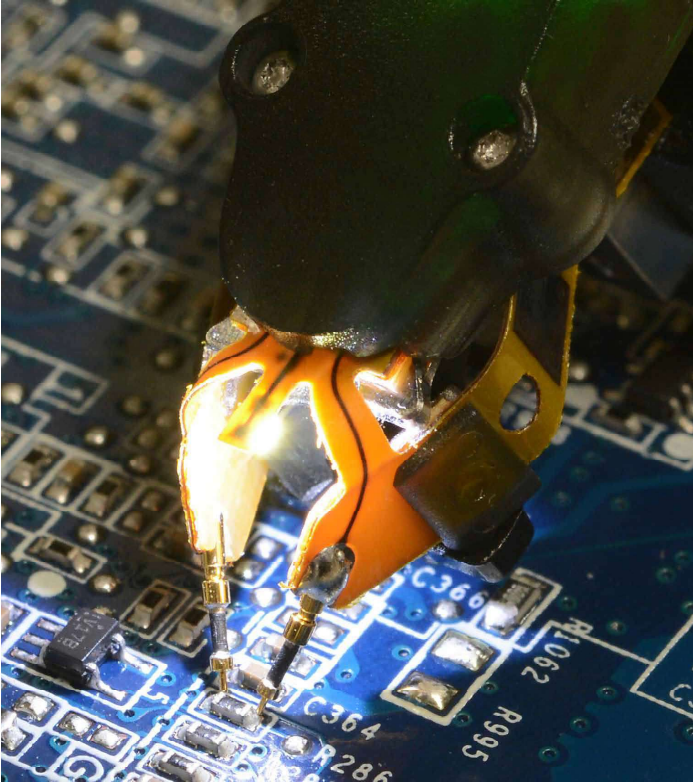
Browser accessory for handheld probing

When you need to make a quick measurement or debug a problem, the TDP7700 series browser accessory provides a simple to use option. With precision engineered tips that are easy to see and position accurately, the P77BRWSR handheld browser accessory enables hand or fixtured probing and is ideal for probing fine pitch components and differential traces with spacing as narrow as 0.2 mm (.008 in).

P77BRWSR handheld browser accessory enables hand or fixtured probing with adjustable tip spacing.

The browser's tips have a full range of compliance and are adjustable in spacing using a convenient thumb wheel. A headlight on the tip enhances visibility of the probe point and can be switched on and off as needed. The browser tips are constructed of high strength BeCu and super-ceramic resistors (patent pending pin technology). The P77BRWSR handheld browser accessory enables hand or fixtured probing with signal fidelity and convenience.

P77C292MM SMA/2.92mm adapter for connecting to coaxial connectors.

Headlight on P77BRWSR handheld browser accessory enables hand or fixtured probing and enhances visibility of the probe point.

Coaxial input (SMA) adapter

RF/coaxial connectors, such as SMA, are often found on test fixtures or on prototype board designs. Attaching a TDP7700 series probe to these on-board connectors is easy with the SMA adapter. The P77C292MM adapter allows you to connect to 2.92 mm, 3.5 mm or SMA connectors with full bandwidth and low noise. The P77C292MM adapter includes TriMode functionality enabling differential, single ended, and common mode measurements.

The termination voltage can be set manually or automatically using voltage sense circuitry in the TDP7700 probe and covers a range of ±2.5 V.

Specifications

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

Model overview

Characteristic	Description
Bandwidth (typical)	TDP7704: 4 GHz
	TDP7706: 6 GHz
	TDP7708: 8 GHz
	TDP7710: 10 GHz
Operating Voltage Window, A and B inputs	±4 V (2.92 tip)
	±5.25 V (active tip)
	±10 V (browser tip)
Differential Input Range	±2V (2.92 tip)
	±5V (active tip)
	±12V (browser tip)
DC input resistance (differential)	50 Ω (P77C292MM tip)
	100k Ω (active tips)
	144k Ω (browser tip)
DC Accuracy	±2%
TriMode functionality	Yes; Differential only (browser tip)

Electrical characteristics

Attenuation

Solder-in tips	4x
Browser	10x
Coaxial input (SMA) adapter	0.7x/1.3x/2.7x/5x/10x

DC gain accuracy, typical ±2.0%

Output zero, typical ±4 mV

Linearity, typical ±1%

Input sense voltage accuracy, typical Vin ±30 mV over the operating voltage range of the 2.92 mm adapter tip.

Termination voltage range, typical ± 2.5 mV.

Overload indicator range, typical The Overload indicator is active when the probe input is current limited or when an input overvoltage condition is detected.

CMRR/DMRR, typical

Frequency range	Min. CMRR/DMRR
≤ 50 MHz	34 dB
> 50 MHz, ≤ 800 MHz	24 dB
> 800 MHz, ≤ 4 GHz	14 dB
> 4 GHz, ≤ 10 GHz	10 dB

Time delay, typical 5.05 ns ± 0.1 ns

Small signal rise time, typical

Probe	10% - 90% Rise time	20% - 80% Rise Time
TDP7710	<45 ps	<32 ps
TDP7708	<55 ps	<38 ps
TDP7706	<65 ps	<46 ps
TDP7704	<100 ps	<72 ps

Small signal frequency response, typical

Probe	Frequency response
TDP7710	≥10 GHz
TDP7708	≥8 GHz
TDP7706	≥6 GHz
TDP7704	≥4 GHz

System noise, 10 mvV/div, probe with P77STCABL tip

System Noise

Probe	A, B mode	C mode	D mode
TDP7710	<4.65 mV RMS	<4.65 mV RMS	<4.65 mV RMS
TDP7708	<4.65 mV RMS	<4.65 mV RMS	<4.65 mV RMS
TDP7706	<4.1 mV RMS	<4.1 mV RMS	<4.1 mV RMS
TDP7704	<4.1 mV RMS	<4.1 mV RMS	<4.1 mV RMS

System Noise, typical

Probe	A, B mode	C mode	D mode
TDP7710	<3.6 mV RMS	<2.8 mV RMS	<3.9 mV RMS
TDP7708	<3.3 mV RMS	<2.6 mV RMS	<3.8 mV RMS
TDP7706	<3.0 mV RMS	<2.5 mV RMS	<3.7 mV RMS
TDP7704	<2.7 mV RMS	< 2.3 mV RMS	<3.2 mV RMS

DC input resistance, typical

Tips/Adapters	Differential
P77C292MM	100 Ω
P77STFLXA, P77STCABL	100 kΩ
P77BRWSR	144 kΩ ± 20%

Low frequency input capacitance (differential, typical)

Solder-in tips 0.4 pF

Browser 0.23 pF @ 50 mil spacing

0.22 pF @ 200 mil spacing

Operating voltage window, typical

Solder-in tips	±5.25 V
Browser	±10 V
SMA adapter	±4 V

DC gain accuracy, typical   ±2.0%

Offset voltage range, typical

Solder-in tips	-4 V to +4 V
Browser	-10 V to +10 V
SMA adapter	-4 V to +4 V

Non-destructive input range, typical

Solder-in tips, Browser	-15 V to +15 V
SMA adapter	-5 V to +5 V

Input slew rate, typical   ≥ 30 V/ns, single-ended, both inputs

Input range, typical

Solder-in tips

Single-ended	Differential
2.5 V_{pp}	5.0 V_{pp}

Browser

Single-ended	Differential
6.0 V_{pp}	12.0 V_{pp}

SMA adapter

Single-ended	Differential
1.2 V_{pp}	2.0 V_{pp}

SMA adapter termination voltage range   -4 V to +4 V

Impedance graphs
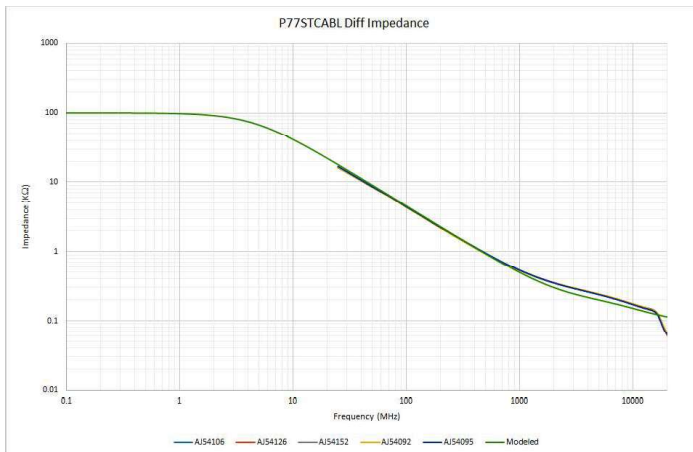
P77STCABL differential impedance
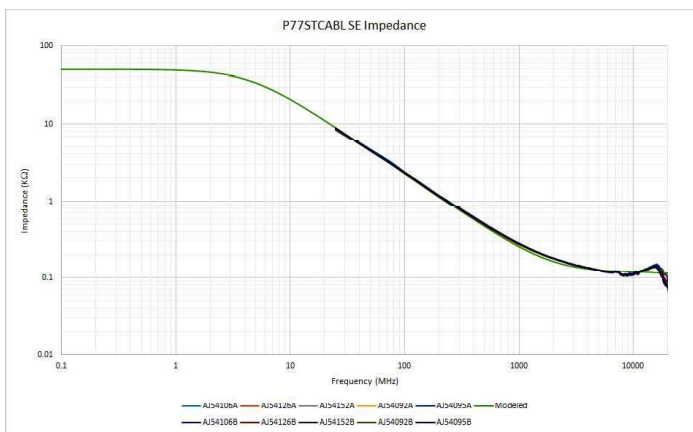
P77STCABL single-ended impedance
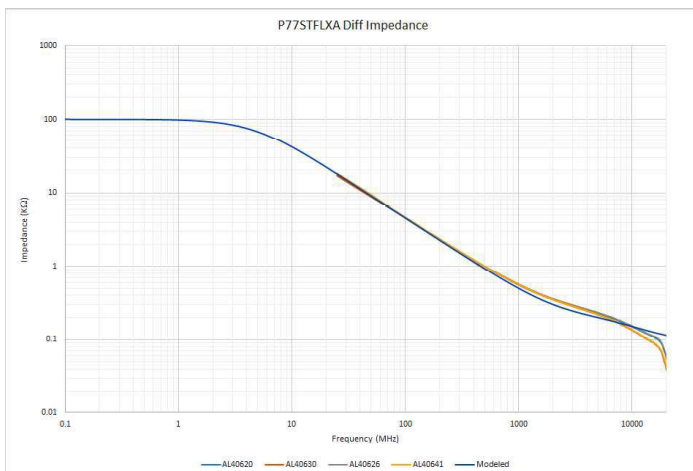
P77STFLXA differential impedance
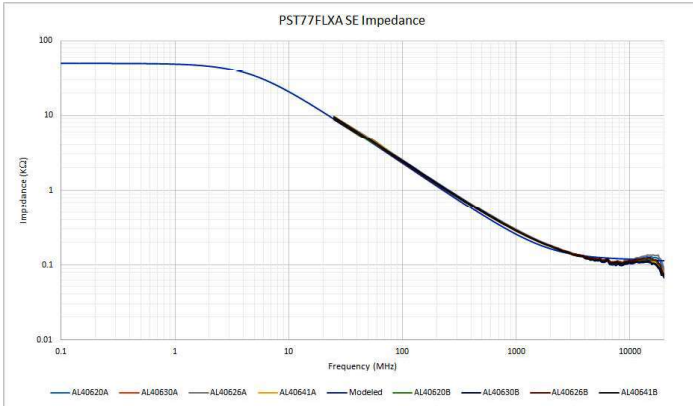
PST77FLXA single-ended impedance
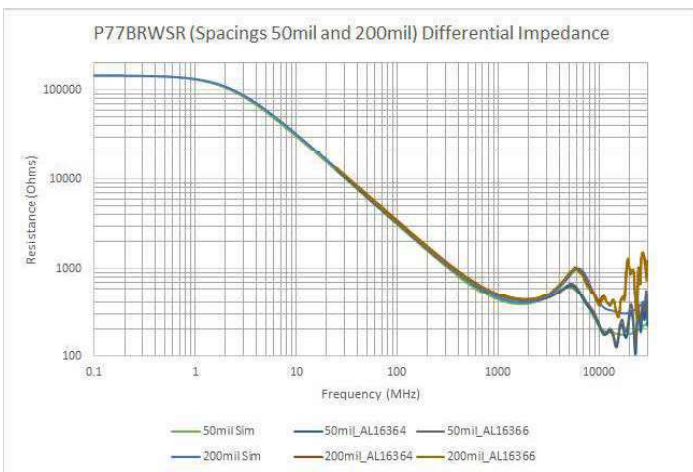
P77BRWSR differential impedance

Nominal characteristics

Weight

Probe cable and head	3.5 oz
Probe (comp box, cable, head)	9.6 oz

Cable length	1.21 m (4.0 feet)
Oscilloscope interface	TekVPI ®
Accessory connector	TekFlex

Environmental

Operating

Item	Specification
Compensation box and browser	0 °C to +50 °C (32 °F to 122 °F)
Cable and solder-in tips	-35 °C to 85 °C (-31 °F to 185 °F)
SMA adapter	-35 °C to 85 °C (-31 °F to 185 °F)

Non-operating

Item	Specification
Compensation box and browser	-20 °C to +60 °C (-4 °F to 140 °F)
P77C292MM (SMA adapter)	-35 °C to 85 °C (-31 °F to 185 °F)
Cable and Solder-in Tips	-35 °C to 85 °C (-31 °F to 185 °F)

Altitude non-operating   12,000 meters

Humidity, comp box

    Operating   5% to 90% relative humidity (% RH) at up to +40 °C, 5% to 55% RH above +40 °C up to +50 °C, non-condensing.

    Nonoperating   5% to 90% RH (Relative Humidity) at up to +40 °C, 5% to 55% RH above +40 °C up to +60 °C, non-condensing.

Compatibility

Compatible oscilloscopes   The TDP7700 series probes are compatible with the following oscilloscopes: MSO6 series

Ordering information

TDP7710	10 GHz TriMode probe with TekFlex connector technology
TDP7708	8 GHz TriMode probe with TekFlex connector technology
TDP7706	6 GHz TriMode probe with TekFlex connector technology
TDP7704	4 GHz TriMode probe with TekFlex connector technology

Standard accessories

All probes include the following items: Manual, Two solder-in tips, Certificate of traceable calibration, Calibration data report, One-year warranty.

Below is the list of standard accessories:

Service options

Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. G3	Complete Care 3 Years (includes loaner, scheduled calibration, and more)
Opt. G5	Complete Care 5 Years (includes loaner, scheduled calibration, and more)
Opt. R3	Repair Service 3 Years (including warranty)
Opt. R3DW	Repair Service Coverage 3 Years (includes product warranty period). 3-year period starts at time of instrument purchase
Opt. R5	Repair Service 5 Years (including warranty)
Opt. R5DW	Repair Service Coverage 5 Years (includes product warranty period). 5-year period starts at time of instrument purchase

Recommended accessories

P77STFLXA	Active, solder-in tip with TekFlex connector technology, 20 GHz (5 tips/kit). Each probe ships with two of these solder-in tips as standard accessories.
P77STFLXB	Active, 75 Ω solder-in tip with TekFlex connector technology for DDR4/LPDDR4 electrical validation, 15 GHz (5 tips/kit). For use with Nexus Technology XH Series Interposers.
P77STCABL	Active, coaxial cable based, solder-in tip with TekFlex connector technology, 20 GHz
P77BRWSR	Browser accessory with TekFlex connector technology, 16 GHz
P77C292MM	SMA Coaxial adapter with TekFlex connector technology, 20 GHz
407-6019-xx	Probe adapter to attach the browser to the PPM203B articulated arm/positioner

Replacement parts

Tektronix part number	Description	
P77STFLXA		Active, solder-in tip with TekFlex connector technology, 20 GHz (5 tips/kit). Each probe ships with two of these solder-in tips as standard accessories.

Table continued…
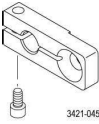
Tektronix part number		Description
P77STFLXB		Flex circuit based DDR4/LPDDR4 memory solder in tips. These tips use flex circuit material and provide soldered, multi-point connections. They support full TriMode measurement capabilities and full probe bandwidth, 15 GHz (5 tips/kit).
P77STCABL		Active, coaxial cable based, solder-in tip with TekFlex connector technology, 20 GHz
P77BRWSR		Browser accessory with TekFlex connector technology, 16 GHz
P77C292MM		SMA Coaxial adapter with TekFlex connector technology, 20 GHz
407-6019-xx		Probe adapter to attach the browser to the PPM203B articulated arm/positioner
020-3162-xx		Replacement tip for browser accessory
020-3160-xx		Browser pen wand
020-3161-xx		Browser hands-free tripod
020-3163-xx		Browser adapters
121-1003-xx		Magnetic cable holder
129-1867-xx		Large metal cable band

Table continued…

Tektronix part number		Description
129-1857-xx		Small metal cable band
196-3436-xx		Browser ground lead
016-2111-xx		Color bands
017-0103-xx		38 AWG wire spool
020-3167-xx		Double-sided adhesive tape

Tektronix is ISO 14001:2015 and ISO 9001:2015 certified by DEKRA.

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.tek.com.

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