Isolated Measurement Systems

TIVP1, TIVP05, TIVP02 Datasheet

IsoVu probe technology delivers accurate differential measurements up to ±2500 V on reference voltages slewing ±60 kV at 100 V/ns or faster. With the IsoVu Generation 2 design, you get all the benefits of IsoVu technology at 1/5 of the size of first generation probes.

With versatile MMCX connectors and an unmatched combination of bandwidth, dynamic range, and common mode rejection, IsoVu Gen 2 probes are setting new standards for isolated probe technology and enabling wide bandgap power designs using SiC and GaN.

Benefits of IsoVu Probes

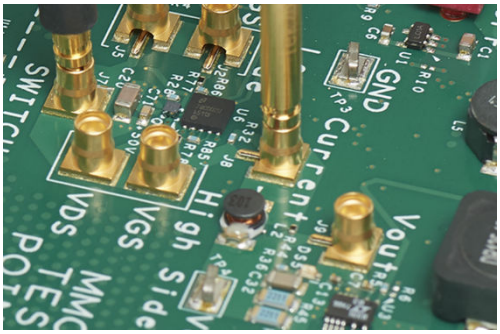
IsoVu technology uses power-over-fiber and an optical analog signal path for complete galvanic isolation between the measurement system and your DUT. By allowing the probe to float independently at the common mode voltage, isolation provides important advantages.

- 100 million to 1 (160 dB) CMRR from DC through 1 MHz
- 10,000 to 1 (80 dB) CMRR at 1 GHz
- ±60 kV Common Mode Voltage range
- Up to ±2500 V differential input Voltage range
- Up to ±2500 V offset range

High Voltage and High Bandwidth

With traditional differential probes you had to choose between high bandwidth or high voltage levels. IsoVu probes, with their shielded coaxial cable and isolation, provide high bandwidth and a differential voltage range of ±2500 V. IsoVu Gen 2 offers bandwidths of 200 MHz, 500 MHz, and 1 GHz to fit your budget and performance needs.

High Performance and Convenient Connections



IsoVu probe tips have a range of connections and accessories that offer high performance and accessibility. The probes can connect directly to MMCX connectors, which are inexpensive and widely-available. This makes for stable, hands-free test points and offer high bandwidth and common mode rejection. The solid metal body shields the center conductor and minimizes ground loop area for the lowest interference possible.

Other accessories are available to adapt the probe tips to a wide range of connections. Additional 0.100" and 0.200" spaced square-pin tips are available for applications that require greater than ±250V differential voltage. When not using a tip, the sensor head has 1 MΩ and 50Ω switchable termination at the probe's SMA connector. This feature effectively adds an isolated channel to any compatible oscilloscope.

Floating Measurements in Power Converter and Motor Drive Designs

Making high-side measurements in half-bridge power converters is challenging because the source or collector to which the measurements are referenced is slewing rapidly up and down. Wide bandgap devices like SiC and GaN FETs are even harder to measure because they can switch high voltages in a few nanoseconds. Noise from this rapidly changing common mode voltage leaks into the differential measurements and hides details on VGS and VDS. IsoVu probes have unmatched common mode rejection at full bandwidth that lets you see signal details, often for the first time.

Applications

- Half/Full bridge designs using SiC or GaN, FETs, or IGBTs
- Floating measurements
- Power converter design
- Power device evaluation
- Switching power supply design
- Inverter design
- Motor drive design
- Electronic ballast design
- EMI and ESD troubleshooting
- Current shunt measurements

Specifications

All specifications are Typical and apply to all models unless noted otherwise.

Note: Preliminary specifications are indicated by an asterisk (*)

Overview

Characteristic	TIVP1	TIVP05	TIVP02
Bandwidth	1 GHz	500 MHz	200 MHz
Rise time	450ps	850ps	2ns

Differential Input Voltage Range, Offset Range, Differential Impedance

Use only the sensor tip cables listed.

Sensor tip cable	Differential input voltage range	Offset range	Input impedance
SMA Input (50 Ω mode)	±5 V	±25 V	50 Ω || N.A.
SMA Input (1 MΩ mode)	±5 V	±25 V	1 MΩ || 11 pF
TIVPMX10X	±50 V	±200 V	10 MΩ || 2.8 pF
TIVPMX50X	±250 V	±250 V	10 MΩ || <5 pF*
TIVPSQ100X	±500 V	±500 V	10 MΩ || <5 pF*
TIVPWS500X	±2.5 kV	±2.5 kV	40 MΩ || <4 pF*
TIVPMX1X	±5 V	±25 V	50 Ω or 1 MΩ || 11 pF

Common Mode Rejection Ratio

Sensor tip cable	DC	1 MHz	100 MHz	200 MHz	500 MHz	1 GHz
SMA Input (50 Ω mode)	160 dB	145 dB	100 dB	100 dB	100 dB	90 dB
SMA Input (1 MΩ mode)	160 dB	145 dB	100 dB	100 dB	100 dB	90 dB
TIVPMX10X	160 dB	115 dB	92 dB	90 dB	85 dB	80 dB
TIVPMX50X	160 dB*	104 dB*	85 dB*	80 dB*	73 dB*	70 dB*
TIVPSQ100X	160 dB*	100 dB*	70 dB*	57 dB*	39 dB*	30 dB*
TIVPWS500X	160 dB*	100 dB*	60 dB*	48 dB*	33 dB*	25 dB*
TIVPMX1X	160 dB*	145 dB*	100 dB*	100 dB*	100 dB*	90 dB*

Maximum Non-Destructive Differential Voltage

Sensor tip cable	Vpk (DC + peak AC) [1]
SMA Input (50 Ω mode)	5V RMS
SMA Input (1 MΩ mode)	100 Vpk
TIVPMX10X	250 Vpk
TIVPMX50X	300 Vpk*
TIVPSQ100X	600 Vpk*

Table continued…

[1] Derated with frequency; refer to the Maximum differential input voltage vs. frequency derating graph in the Specifications section of the TIVP Series IsoVu Measurement System User Manual.

Sensor tip cable	Vpk (DC + peak AC) [1]
TIVPWS500X	3300 Vpk*
TIVPMX1X	5 V RMS (50 Ω), 100 Vpk (1 MΩ)

Common mode voltage range 60 kV peak

Common mode input impedance (Typical)

Input resistance Galvanically isolated through the fiber optic connection

Input capacitance [2] <2 pF

DC Gain accuracy

Differential DC gain accuracy <2%

System noise (rms)

Sensor tip cable	±20 mV range (most sensitive)	±320 mV range	±5 V range (widest range)
SMA Input (50 Ω mode)	0.43 mV rms	1.46 mV rms	48 mV rms
SMA Input (1 MΩ mode)	0.43 mV rms	1.46 mV rms	48 mV rms
TIVPMX10X	4.3 mV rms	14.6 mV rms	480 mV rms
TIVPMX50X	21.5 mV rms*	73 mV rms*	2.4 V rms*
TIVPSQ100X	43 mV rms*	146 mV rms*	4.8 V rms*
TIVPWS500X	215 mV rms*	730 mV rms*	24 V rms*

Propagation delay

2 meter cable 18.3 ns

10 meter cable 57.3 ns *

Laser certification

CLASS I LASER PRODUCT This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

[1] Derated with frequency; refer to the Maximum differential input voltage vs. frequency derating graph in the Specifications section of the TIVP Series IsoVu Measurement System User Manual.

[2] The capacitance between the sensor head and a reference plane. The sensor head is placed six inches (15.25 cm) above the reference plane.

Ordering information

Models

TIVP1	Tektronix IsoVu 1 GHz High Voltage Probe with 2 m cable
TIVP05	Tektronix IsoVu 500 MHz High Voltage Probe with 2 m cable
TIVP02	Tektronix IsoVu 200 MHz High Voltage Probe with 2 m cable

Standard accessories

016-2147-xx	IsoVu carrying case; soft case (with foam insert) protects the TIVP and enforces the optical fiber minimum bend radius
003-1947-xx	SMA wrench/driver tool; 5/16" wrench for use on SMA connector
131-9717-xx	Probe tip adapter; adapt an MMCX IsoVu tip to standard 0.100" spaced, 0.025" square pins
352-1179-xx	Probe bipod for probe; TIVP can rotate in holder to accommodate square pin headers
TIVPMX10X	MMCX probe tip; MMCX tip is recommended for the best bandwidth and CMRR performance
071-3733-xx	TIVP Series Quick Reference Guide
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Translated manuals can be downloaded as pdf files on your local Tektronix Web site.

Recommended accessories

TIVPMX50X	50X sensor tip cable with MMCX connector
TIVPSQ100X	100X sensor tip cable with 0.100" spaced square pin connectors
TIVPWS500X	500X sensor tip cable with 0.200" spaced wide square pin connector
TIVPMX1X	1X MMCX sensor tip
131-9677-xx	Square Pin to MMCX Adapter, 0.062" Spacing
352-1170-xx	Probe Tip Tripod Support
196-3546-xx	Lead, MMCX to IC Grabber
196-3547-xx	Lead, Square Pin to IC Grabber
020-3189-xx	Lead, Wide Square Pin to Banana Jack
TPR4KIT	MMCX Y-Lead
196-3434-xx	Square Pin Y-lead
206-0569–xx	MicroCKT grabbers
020-3169-xx	Spare Pins for 0.062" Spaced Test Points
003-1946-xx	Solder Aid for 0.062" Spaced Square Pins

Supported oscilloscopes

The measurement systems can be used with the following Tektronix oscilloscopes. For oscilloscopes not included in this list, contact your local Tektronix representative.

- 4 Series MSO
- 5 Series MSO
- 6 Series MSO

Service options

Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D1	Calibration Data Report
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. R3	Repair Service 3 Years (including warranty)
Opt. R5	Repair Service 5 Years (including warranty)

Probes and accessories are not covered by the oscilloscope warranty and Service Offerings. Refer to the datasheet of each probe and accessory model for its unique warranty and calibration terms.

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

Product Area Assessed: The planning, design/development and manufacture of electronic Test and Measurement instruments.

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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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