Digital Phosphor Oscilloscopes

TDS5000 Series

Characteristics
Vertical System

	TDS5032/ TDS5034	TDS5052/ TDS5054	TDS5104
Input Channels	2/4	2/4	4
Analog Bandwidth (-3 dB) 5 mV/div - 1 V/div	350 MHz	500 MHz	1 GHz
Calculated Rise Time 5 mV/div (typical)	1.15 ns	800 ps	300 ps
Hardware Bandwidth Limits	150 MHz or 20 MHz		
Input Coupling	AC, DC, GND		
Input Impedance, 1 MΩ	±1%		
Input Impedance, 50 Ω	±1%		±2.5%
Input Sensitivity, 1 MΩ	1 mV/div to 10 V/div		
Input Sensitivity, 50 Ω	1 mV/div to 1 V/div		
Vertical Resolution	8-bits (>11-bits w/ averaging)		
Max Input Voltage, 1 MΩ	±150 V CAT I derate at 20 dB/decade to 9 V_{RMS} above 200 kHz		
Max Input Voltage, 50 Ω	5 V_{RMS} with peaks <±30 V		
DC Gain Accuracy	1.5% with offset set to 0 V		
Offset Range, 1 MΩ	1 mV/div - 99.5 mV/div ±1 V 100 mV/div - 1 V/div ±10 V 1.01 V/div - 10 V/div ±100 V		
Offset Range, 50 Ω	1 mV/div - 99.5 mV/div ±1 V 100 mV/div -1 V/div ±10 V		1 mV - 50 mV/div ±0.5 V 50.5 mV - 99.5 mV ±0.25 V 100 mV - 500 mV ±5 V 505 mV - 1 V/div ±2.5 V

	TDS5032/ TDS5034	TDS5052/ TDS5054	TDS5104
Channel-to-channel Isolation Any Two Channels at Equal Vertical Scale	≥100:1 at ≤100 MHz and ≥30:1 at >100 MHz up to the rated bandwidth		

Timebase System

	All Models
Timebase Range	200 ps/div to 40 s/div
Timebase Delay Time Range	16 ns to 250 s
Channel-to-channel Deskew Range	±75 ns
Delta Time Measurement Accuracy	±(0.30 sample interval) + (15 ppm * reading)
Trigger Jitter (RMS)	8 ps_{RMS} (typical)
Long Term Sample Rate and Delay Time Accuracy	±15 ppm over ≥1 ms interval

Acquisition System

	2 Ch Models (TDS5032/5052)	4 Ch Models (TDS5034/5054/5104)
Real-time Sample Rates		
1 Channel (max)	5 GS/s	
2 Channels (max)	2.5 GS/s	
3-4 Channels (max)	--	1.25 GS/s
Equivalent Time Sample Rate (max)	250 GS/s	
Maximum Record Length per Channel with Standard Memory	400 k (1 ch) 200 k (2 ch)	400 k (1 ch), 200 k (2 ch), 100 k (4 ch)
With Opt. 1M	2 M (1 ch), 1 M (2 ch)	2 M (1 ch), 1 M (2 ch), 500 k (4 ch)
With Opt. 2M	8 M (1 ch), 4 M (2 ch)	8 M (1 ch), 4 M (2 ch), 2 M (4 ch)

Maximum Duration at Highest Real-time Resolution (1 ch)

	All Models
Time Resolution (single shot)	200 ps (5 GS/s)
Max Duration with Standard Memory	80 µs
Max Duration with Opt. 1M	400 µs

Max Duration with Opt. 2M	1.6 ms

Acquisition Modes

FastAcq Acquisition	FastAcq optimizes the instrument for analysis of dynamic signals and capture of infrequent events
Maximum FastAcq Waveform Capture Rate	100,000 wfms/s
Sample	Acquire sampled values
Peak Detect	Captures narrow glitches at all real-time sampling rates
Minimum Peak Detect Pulse Width	<1 ns
Averaging	From 2 to 10,000 waveforms included in average
Envelope	From 2 to 2×10^9 waveforms included in min-max envelope
Hi-Res	Real-time boxcar averaging reduces random noise and increases resolution
FastFrame™ Acquisition	Acquisition memory divided into segments; maximum trigger rate >225,000 waveforms per second.

Trigger System

Sensitivity	
Internal DC Coupled	0.35 div DC to 50 MHz increasing to 1 div at rated bandwidth
External (auxiliary input)	400 mV from DC to 50 MHz increasing to 750 mV at 100 MHz
Main Trigger Modes	Auto, Normal, and Single
Trigger Sequences	Main, Delayed by time, Delayed by events. All sequences can include separate horizontal delay after the trigger event to position the acquisition window in time
Trigger Level Range	
Internal	±10 divisions from center of screen

External (auxiliary in)	±8 V
Line	Fixed at 0 V
Trigger Coupling	DC, AC (attenuate <60 Hz), HF reject (attenuate >30 kHz) LF reject (attenuates <80 kHz) Noise reject (reduce sensitivity)
Trigger Holdoff Range	250 ns minimum to 12 s maximum

TRIGGER MODES

Edge - Positive or negative slope on any channel or front panel auxiliary input. Coupling includes DC, AC, noise reject, HF reject, and LF reject.

Video - Trigger on NTSC, PAL, SECAM, analog HDTV, and non-standard video formats.

Glitch - Trigger on or reject glitches of positive, negative or either polarity. Minimum glitch width is 1.0 ns with 200 ps resolution.

Width - Trigger on width of positive or negative pulse either within or out of selectable time limits ranging from 1 ns to 1 s with 200 ps resolution.

Runt - Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Event can be time or logic qualified (logic on 4 channel models only).

Window - Trigger on an event that enters or exits a window defined by two user-adjustable thresholds. Event can be time or logic qualified (logic on 4 channel models only).

Timeout - Trigger on an event which remains high, low or either, for a specified time period, selectable from 1 ns to 1 s with 200 ps resolution.

Transition - Trigger on pulse edge rates that are faster or slower than specified. Slope may be positive, negative or either.

Setup/Hold - Trigger on violations of both setup time and hold time between clock and data present on any two input channels.

Pattern - Trigger when pattern goes false or stays true for specified period of time. Pattern (AND, OR, NAND, NOR) specified for four input channels defined as High, Low or Don't Care.

State - Any logical pattern of channels (1, 2, 3) clocked by edge on channel 4 (channel 2 on TDS5052). Trigger on rising or falling clock edge.

Trigger Delay by Time - 16 ns to 250 seconds.

Trigger Delay by Events - 1 to 10,000,000 Events.

WAVEFORM MEASUREMENTS

Amplitude - Amplitude, High, Low, Maximum, Minimum, Peak to Peak, Mean, Cycle Mean, RMS, Cycle RMS, Positive Overshoot, Negative Overshoot.

Time - Rise Time, Fall Time, Positive Width, Negative Width, Positive Duty Cycle, Negative Duty Cycle, Period, Frequency, Delay.

Combination - Area, Cycle Area, Phase, Burst Width.

Histogram-related (optional) - Waveform count, Hits in box, Peak hits, Median, Maximum, Minimum, Peak to Peak, Mean (µs), Standard Deviation (sigma), µ+1 (σ), µ+2 (σ), µ+3 (σ).

WAVEFORM PROCESSING/MATH
Standard Math

Arithmetic - Add, subtract, multiply, and divide waveforms.

FFT - Magnitude.

Vertical Units - Magnitude: Linear, dB, dBm.

Window Functions - Rectangular, Hamming, Hanning, Kaiser-Bessel, Blackman-Harris, Gaussian, Flattop2, Tek Exponential.

Optional Math

Algebraic Expressions - Define extensive algebraic expressions including waveforms, scalars, and results of parametric measurements e.g. (Integral (Ch1-Mean(Ch1))*1.414).

Calculus - Integrate, differentiate.

Frequency Domain Functions - Spectral magnitude and phase, real and imaginary spectra.

Additional Vertical Units - Phase: degrees, radians.

DISPLAY CHARACTERISTICS
Display Type - Liquid crystal active-matrix color display.

Display Size - 211.2 mm (W) x 158.4 mm (H), 264 mm (10.4 in) diagonal.

Display Resolution - 640 horizontal x 480 vertical pixels.

Waveform Styles - Vectors, Dots, Intensified Samples, Variable Persistence, Infinite Persistence.

COMPUTER SYSTEM AND PERIPHERALS
CPU - Intel Celeron Processor, 1.2 GHz.

PC System Memory - 256 MB.

Hard Disk Drive - ≥20 GB capacity.

Floppy Disk Drive - Front panel 3.5 in floppy disk drive, 1.44 MB capacity.

CD-ROM Drive - Side panel CD-ROM drive.

CD-RW Drive (Optional) - Side panel CD-RW drive.

Printer (Optional) - Built-in thermal printer.

Mouse - Logitech thumb wheel model included, USB interface.

Keyboard - Order 119-6633-00 (USB interface).

OPENCHOICE SOFTWARE
TekVISA - Application Programmers Interface (API) for Windows developers. Documentation includes descriptions and samples of programming test and measurement applications on the unit in Visual BASIC, C and C++.

TekVisa Control (TVC) - Active controls to make access to TekVISA easy for integration into Microsoft Windows applications.

VXI-11 server - An Application Programmers Interface (API) for LAN connectivity from a variety of external host computers.

For information regarding TDS5000 Series compatibility with National Instruments hardware and software products, contact your local Tektronix account manager.

For information about using a TDS5000 Series oscilloscope as a GPIB controller, contact your local Tektronix account manager.

Plug-and-play Drivers - Provides support to run National Instrument's LabVIEW and LabWindows on an external PC connected to a TDS5000 Series oscilloscope.

IVI Drivers - Provides support for new and existing program environments utilizing the IVI instrumentation standard, such as LabVIEW, LabWindows/CVI, MATLAB, Visual BASIC, and C/C++.

Excel Toolbar - Provides direct access to waveforms and measurements on the oscilloscope from a toolbar in Excel.

Report Generator - Enables the ability to design and create customized report templates that extract the oscilloscope's waveforms, settings, measurements, and other on-screen information with a click of the mouse.

LabVIEW and MATLAB - 30 day evaluation copies plus non-expiring demo programs that perform a variety of LabVIEW and MATLAB display and analysis functions with the oscilloscope.

Software Developer's Kit (SDK) - a CD is included in the *Getting Started With OpenChoice™* book. This SDK includes a wealth of documentation, programming tools, and examples to assist programmers working with the TDS5000 Series.

INPUT/OUTPUT PORTS
Auxiliary Input - Front panel BNC connector. Trigger level range is adjustable from +8 V to -8 V. The maximum input voltage is ±20 V.

Probe Compensator Output - Front panel pins. Amplitude 1 V ± 1% into a ≥10 kΩ load, frequency 1 kHz ±5%.

Analog Signal Output Amplitude - Rear-panel BNC connector, provides a buffered version of the signal that is attached to the Channel 3 input. 20 mV/div ±20% into a 1 MΩ load, 10 mV/div ±20% into a 50 Ω load (4 channel models only).

Analog Signal Output Bandwidth, Typical - 100 MHz into a 50 Ω load (4 channel models only).

Auxiliary Output Levels - Rear-panel BNC connector, provides a TTL-compatible, negative polarity pulse when the oscilloscope triggers.

External Reference In - Rear-panel BNC connector. 9.8 MHz to 10.2 MHz.

Parallel Port - IEEE 1284, DB-25 connector.

Audio Ports - Miniature phone jacks for stereo microphone input and stereo line output.

USB Port - Allows connection or disconnection of USB keyboard and/or mouse while oscilloscope power is on.

Keyboard Port - PS-2 compatible.

Mouse Port - PS-2 compatible.

LAN Port - RJ-45 connector, supports 10Base-T and 100Base-T.

Serial Port - DB-9 COM1 port.

SVGA Video Port - DB-15 female connector; connect a second monitor to use dual-monitor display mode. Supports basic requirements of PC99 specifications.

GPIB Port - IEEE 488.2 standard.

Scope VGA Video Port - DB-15 female connector, 31.6 kHz sync, EIA RS-343A compliant, connect to show the oscilloscope display, including live waveforms on an external monitor or projector.

POWER SOURCE
Power - 100 to 240 V_{RMS} ±10%, 47 to 63 Hz; CAT II, <220 W.

Physical Characteristics

Benchtop Configuration

| Dimensions | mm | in. |
| Weight | kg | lbs. |

Rackmount Configuration

| Dimensions | mm | in. |
| Weight | kg | lbs. |

Mechanical

| Dimensions | mm | in. |

	mm	in.
Height	285	11.2
Width	447	17.6
Depth	288	11.35
Net	10.55	23.25
Shipping	25	55
Height	267	10.5

Benchtop Configuration

Dimensions	mm	in.
Weight	kg	lbs.

Rackmount Configuration

Dimensions	mm	in.
Weight	kg	lbs.

Mechanical

Dimensions	mm	in.
Width	483	19
Depth	288	11.35
Net	11.8	26
Kit	5	11

Cooling - Required Clearance for Benchtop Configuration		
Top	0	0
Bottom	0	0
Left Side	76	3
Right Side	0	0
Front	0	0
Rear	0	0

ENVIRONMENTAL
Temperature

Operating - +5 °C to +45 °C.

Nonoperating - -20 °C to +60 °C without diskette in floppy drive.

Humidity

Operating - 20% to 80% relative humidity with a maximum wet bulb temperature of +29 °C at or below +50 °C, noncondensing. Upper limit derated to 25% relative humidity at +50 °C.

Nonoperating - With no diskette in floppy disk drive. 5% to 90% relative humidity with a maximum wet bulb temperature of +29 °C at or below +60 °C, noncondensing. Upper limit derated to 20% relative humidity at +60 °C.

Altitude

Operating - 10,000 ft. (3,048 m).

Nonoperating - 40,000 ft. (12,190 m).

Random Vibration

Operating - 0.1 GRMS from 5 to 500 Hz, 10 minutes each axis, 3-axes, 30 minutes total.

Nonoperating - 2.0 GRMS from 5 to 500 Hz, 10 minutes each axis, 3-axes, 30 minutes total.

Electromagnetic Compatibility - 89/336/EEC.

Safety - UL 3111-1, CSA-22.2 No. 1010.1, EN61010-1, IEC61010-1/A2.