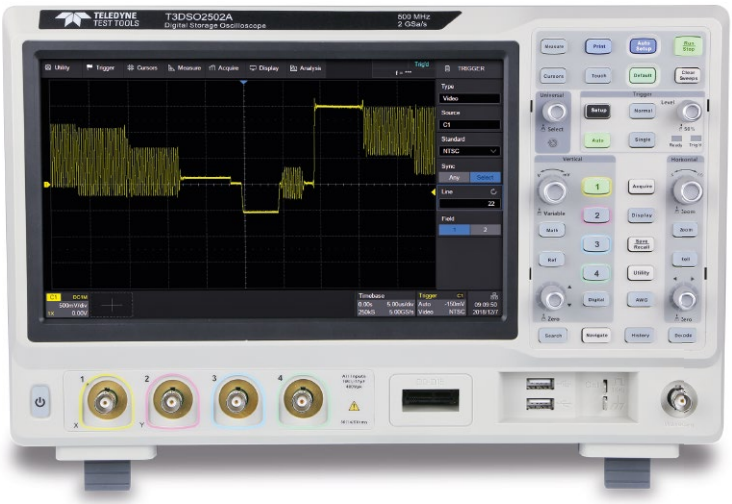
TELEDYNE TEST TOOLS
Everywhereyoulook™

T3DSO2000A Data Sheet

Oscilloscopes

Debug with Confidence

100 MHz – 500 MHz



Tools for Improved Debugging

• **Long Capture** – 100 Mpts/Ch and 200 Mpts interleaved.	✓ Capture more time and show more waveform detail.
• **Math and Measure** – 9 basic math functions plus FFT and 50+ automatic measurement parameters.	✓ Extract results from waveforms and measurements.
• **Connectivity** – USB for mass storage, printing and PC control, plus LAN for fast data transfer.	✓ Save data for external analysis and screen images for reports.
• **Includes Serial Bus Trigger and Decode** – I^2C, SPI, UART, CAN, LIN. Optional CAN FD, I^2S, MIL-1553B, FlexRay.	✓ Debug serial buses directly in your Oscilloscope.
• **Waveform Sequence Recorder** – record and play back up to 90,000 waveforms.	✓ Replay the changing waveform history.
• **Includes Bode Plot and Power Analysis applications as standard.**	✓ Common applications coverage as standard.
• **Optional MSO** – 16 Digital Channels .	✓ Add mixed signal debugging to your Oscilloscope.

Key Specifications

Bandwidth	100 MHz, 200 MHz, 350 MHz, 500 MHz
Channels	2 or 4
Memory	100 Mpts/Ch (200 Mpts interleaved)
Sample Rate	up to 2 GS/s (Interleaved)
Display	Large 10.1" Bright TFT LCD (1024 x 600)
Connectivity	USB Host, USB Device, LAN
Warranty	3 Years

T3DSO2104A: 4 Channel 100 MHz
T3DSO2204A: 4 Channel 200 MHz
T3DSO2354A: 4 Channel 350 MHz
T3DSO2502A: 2 Channel 500 MHz / 4 Channel 350 MHz

Teledyne Test Tools new T3DSO2000A Oscilloscopes feature two channel and four channel models with analog bandwidth options from 100 MHz to 500 MHz. Each model offers a maximum sample rate of 2 GSa/s, and a maximum memory depth of 200 Mpts in half channel mode. All models incorporates two 2 GSa/s ADCs and two 200 Mpts memory modules. When all channels are enabled, each channel has sample rate of 1 GSa/s and a standard record length of 100 Mpts. When only a single channel per ADC is active, the maximum sample rate is 2 GSa/s and the maximum record length is 200 Mpts. For ease-of-use, the most commonly used functions can be accessed with its user-friendly front panel design.

The T3DSO2000A series employs a new generation of high speed display technology that provides excellent signal clarity, fidelity and performance. The system noise floor is also lower than similar products in the industry. It comes with a minimum vertical input range of 500 µV/div, an innovative digital trigger system with high sensitivity and low jitter, and a waveform capture rate of 500,000 waveforms/sec (sequence mode). The T3DSO2000A also employs a 256-level intensity grading display function and a color temperature display mode which complement the high speed update rate. Teledyne Test Tools latest oscilloscope offering supports multiple powerful triggering modes including serial bus triggering. IIC, SPI, UART, CAN and LIN serial bus trigger and decode is included as standard. There are low cost options for serial bus decoding of CAN FD, FlexRay, I^2S, and MIL-STD-1553B bus types. The models also include History waveform recording, and sequential triggering that enable extended waveform recording and analysis, as well as a 50 MHz function / arbitrary waveform generator. There is also an option to add 16 channel MSO capability (user upgradable option). The new digital design also includes a hardware co-processor that delivers measurements quickly and accurately without slowing acquisition and front-panel response. The features and performance of Teledyne Test Tools new T3DSO2000A offers outstanding value for money.

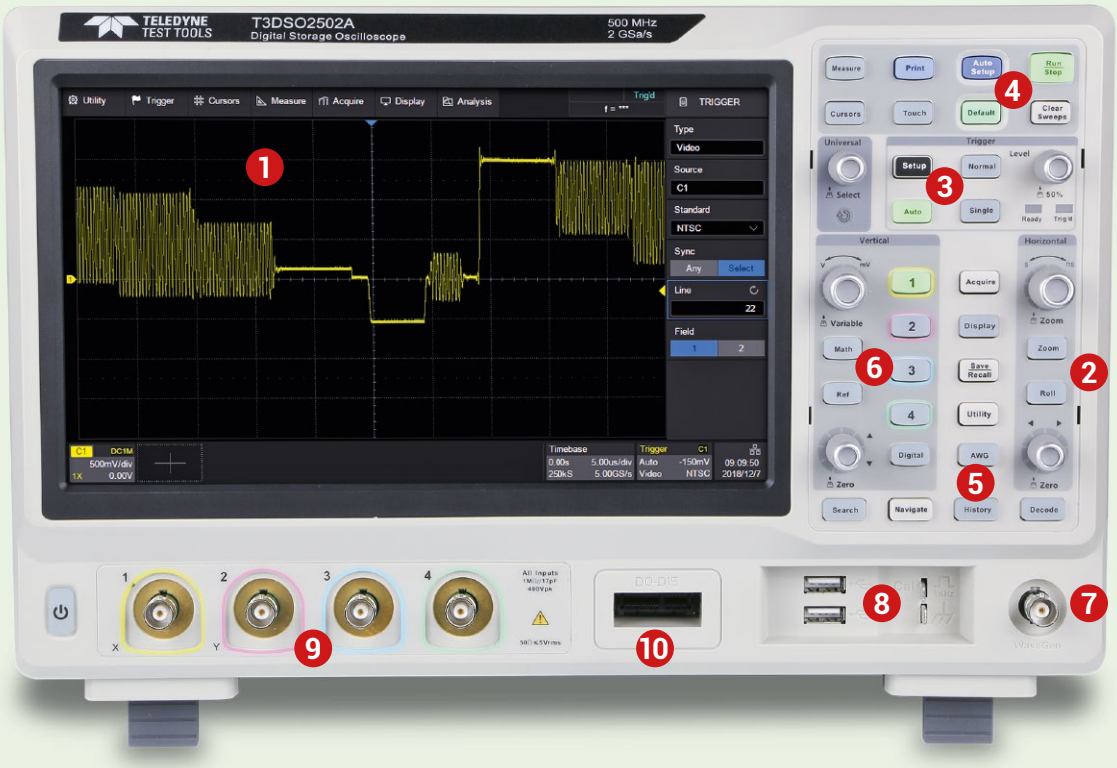
Key Features

- 100 MHz, 200 MHz, 350 MHz and 500 MHz bandwidth models
- Real-time sampling rate up to 2 Gsa/s
- New generation of high speed display technology
  - Waveform capture rate up to 120,000 wfm/s (normal mode), and 500,000 wfm/s (sequence mode)
  - Supports 256-level intensity grading and color display modes Record length up to 200 Mpts
  - Digital trigger system
- Intelligent trigger: Edge, Slope, Pulse Width, Window, Runt, Interval, Time out, Dropout, Pattern, Serial and Video
- Zone trigger: Up to 2 zones with user defined Intersect / Not Intersect events.
- Standard serial bus triggering and decoding, supports protocols IIC, SPI, UART, CAN, LIN. Optionally CAN FD, FlexRay, I^2S, MIL-STD-1553B
- Video trigger, supports HDTV
- Low background noise with voltage scales from 500 µV/div to 10 V/div
- High performance10-bit mode with typically 100 MHz bandwidth.
- Segmented acquisition (Sequence) mode, divides the maximum record length into multiple segments (up to 90,000), according to trigger conditions set by the user, with a very small dead time segment to capture the qualifying event.
- History waveform record (History) function, maximum recorded waveform length is 90,000 waveforms.

Models and key Specification

Model	T3DSO2104A	T3DSO2204A	T3DSO2354A	T3DSO2502A
Bandwidth	100 MHz	200 MHz	350 MHz	500 MHz
SamplingRate (Max.)	All models have two 2 GSa/s ADCs. When all channels are enabled, each channel has a maximum sample rate of 1 GSa/s. When a single channel per pair is active, that channel has sample rate of 2 GSa/s			The T3DSO2502A has one 2 Gsa/s ADC per channel in 2 channel > 350 MHz mode, and one 2 Gsa/s ADC per pair of channels in ≤ 350 MHz four channel mode.
Channels	T3DSO2104A 4 + EXT, T3DSO2204A 4 + EXT, T3DSO2354A 4 + EXT, T3DSO2502A ≤ 350 MHz: 4 + EXT, > 350 MHz: 2 + EXT			
Memory Depth (Max.)	100 Mpts/Ch (not interleave mode); 200 Mpts/Ch (interleave mode)			
Waveform Capture Rate (Max.)	120,000 wfm/s (normal mode), 500,000 wfm/s (sequence mode)			
Trigger Type	Edge, Slope, Pulse, Window, Runt, Interval, Dropout, Pattern, Video, Zone			
Serial Trigger and decoder	IIC, SPI, UART, CAN, LIN. Optional: CAN FD, FlexRay, I^2S, MIL-STD-1553B			
16 Digital Channels (MSO option)	Maximum waveform capture rate up to 500 MSa/s, Record length up to 50 Mpts/Ch			
Waveform Generator	One channel, 50 MHz, sample rate of 125 MHz, wave length of 16 kpts			
I/O	USB Host, USB Device, LAN 100M, Pass/Fail, Trigger In/Out			
Probe (Std)	1 for each Channel			
Display	10.1 inch Touch Screen TFT-LCD (1024 x 600)			

- Automatic measurement function for more than 50 parameters as well as Measurement Statistics, Zoom, Gating, Math, History and Reference functions
- 10 Math functions (FFT, addition, subtraction, multiplication, division, integration, differential, square root, average, Enhanced Resolution and formula editor)
- 2 Math operators allowing 2 math functions to be used at the same time.
- High Speed hardware based Pass/Fail function
- Optional MSO, 16 digital channels. Record Length up to 50 Mpts/Ch
- 50 MHz function/arbitrary waveform generator included as standard. Built-in 6 waveform types (Sine, Square, Ramp, Pulse, DC, Noise) and 45 Arbitrary waveforms
- Bode Plot from 10 Hz to 50 MHz using the T3DSO2000A 50 MHz function/arbitrary waveform generator, or 10 Hz to 120 MHz using the T3AFG120 arbitrary function generator.
- Power Analysis application included as standard, measuring power quality, current harmonics, inrush current, switching loss, slew rate, modulation, output ripple, turn on / turn off, transient response, PSRR, efficiency.
- T3DSO2502A supports 2 channels at up to 500 MHz and 4 channels at ≤ 350 MHz
- Large 10.1 inch capacitive touch screen TFT-LCD display with 1024 x 600 resolution
- Multiple interface types: USB Host, USB Device (USB-TMC), LAN, Trigger In/Out
- Supports SCPI remote control commands
- Supports Multi-language display and embedded online help

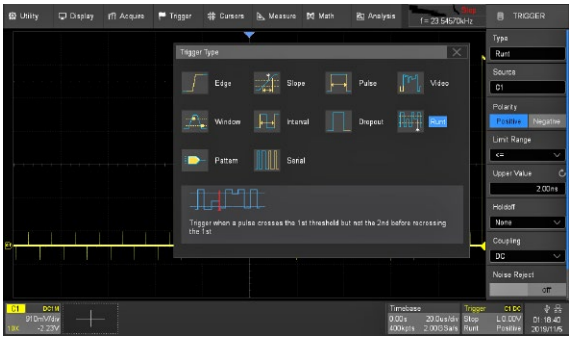


1. High Resolution 10.1-inch TFT-LCD touch screen display for clear images.
2. Horizontal controls of Timebase, Zoom, Roll and trigger position.
3. Advanced Triggering controls including Edge, Pulse, Interval, Window, Slope, DropOut, Runt and Pattern trigger types.
4. Easy to use Auto Setup, Run / Stop and Default Controls.
5. Multi-functional controls for AWG, Search, Navigate, History and Decode.
6. Individual color coded channels, Math and Digital inputs.
7. 50 MHz built in arbitrary waveform generator.
8. Probe compensation calibrator.
9. Color coded input channels.
10. Digital lead set socket.

10.1 inch TFT-LCD display and 15 one-button menus

- 10.1 inch TFT-LCD capacitive touch screen display with 1024 x 600 resolution
- Most commonly used functions are accessible using 15 different one-button operation keys Auto Setup, Default, Cursors, Measure, Roll, History, Persist, Clear Sweeps, Zoom, Print, Math, Measure, Search / Navigate, Decode, AWG, and more.

A Wide Range Of Trigger Functions



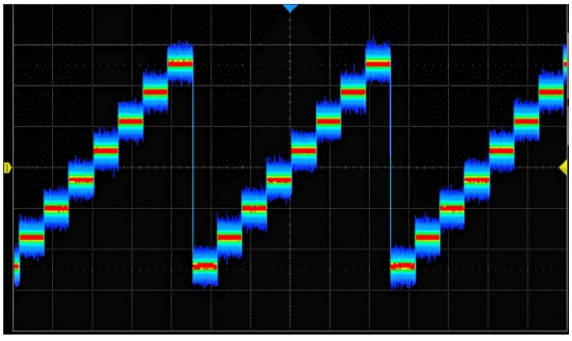
A wide range of powerful triggering functions including Edge, Slope, Pulse, Video, Window, Runt, Interval, Dropout, Pattern, Serial, etc, allows users to debug complex hardware issues with ease.

Powerful User Set Zone Trigger Extends Trigger Capability

Set up to 2 zones defining each as Intersect or Not Intersect. Trigger occurs when conditions are met. Zone Trigger helps to simplify advanced triggering.

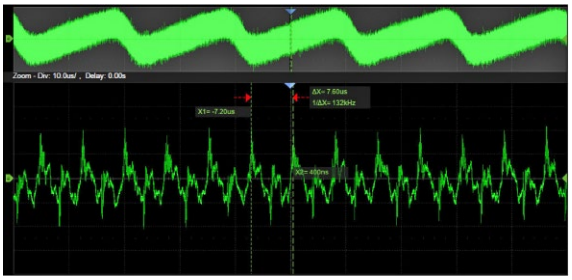
256-level Intensity Grading and Color Temperature Display

256-level intensity graded waveform display is ideal for viewing modulated and changing waveforms.



The Color temperature display clearly shows noise and jitter with infrequently occurring waveforms shown in blue through to the most frequently occurring waveforms shown in red.

Record Length of up to 200 Mpts

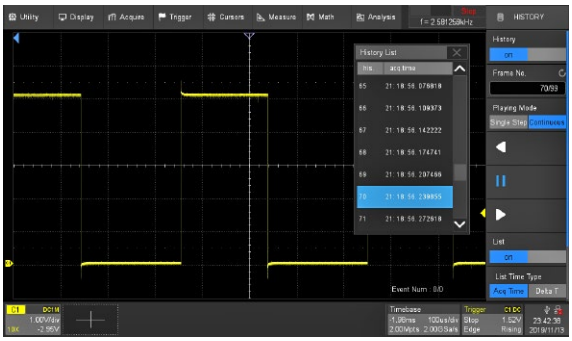


The record length of up to 200 Mpts (interleaved) or up to 100 Mpts (non-interleaved) allows use of a higher sampling rate to capture more signal detail. The hardware-based Zoom then allows quick zoom in to any area of interest.

Waveform Capture Rate up to 500,000 wfm/s

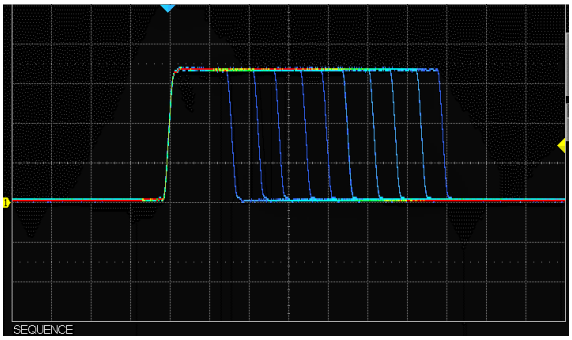
With a waveform capture rate of up to 500,000 wfm/s (sequence mode) and 120,000 wfm/s (standard mode) the T3DSO2000A can easily capture glitches, infrequent anomalies and other low-probability events.

History Mode



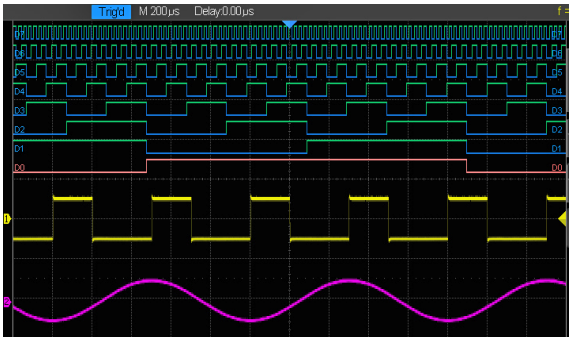
The always enabled History mode records up to 90,000 waveforms allowing users to scroll back through previous acquisitions to analyze past events and locate anomalies quickly. Serial decode, zoom and cursor measurements can be used.

Sequence Mode



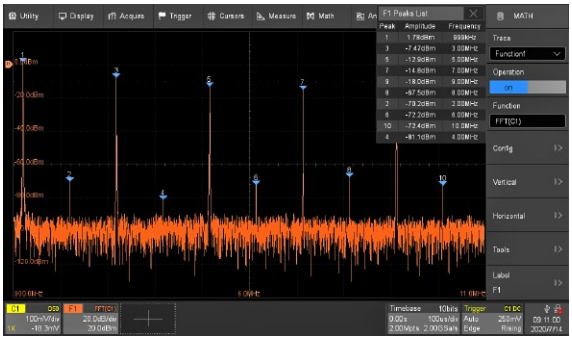
Segmented memory mode can store up to 90,000 waveforms into memory segments for capturing fast pulses in quick succession. Combine SequenceMode with advanced triggers to isolate rare events. All the segments can be play back using the History function.

16 Digital Channels/MSO (Optional)



The MSO option adds 16 digital channels to the T3DSO2000A analog channels enabling users to trigger and acquire digital as well as analog waveforms in a mixed signal debug environment.

Advanced Math Function



Two Math traces support Plus,Minus, Multiply, Divide, FFT, integration, differential, square root, average, Eres and formula editor, for quick insight into waveform characteristics.

Eres Mode

Enhanced Resolution (Eres) function reveals hidden Waveform detail by using a linear average filter to reduce waveform noise on single acquisition waveforms, where regular averaging doesn't work. The Eres function can be combined with the regular 8 bit acquisition mode, or the higher detailed 10 bit acquisition mode.

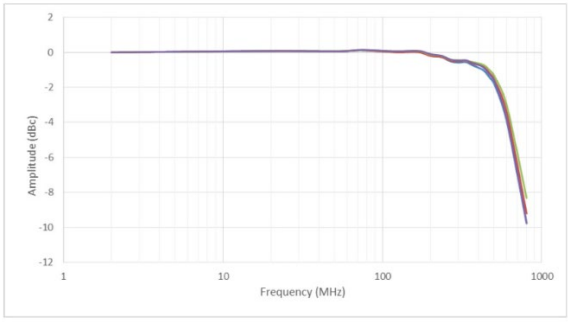
10-bit Mode

10-bit mode combined with zoom shows more detail and less noise on the waveform. The small perturbation, circled in red, can be more clearly viewed in 10 bit mode. The T3DSO2000A Oscilloscope family not only supports horizontal zoom but also the more unusual vertical voltage based zoom capability, enabling viewing of very small perturbations on a larger waveform.
Eres can be combined with 8 bit or 10 bit mode to give an even clearer view of waveform detail.

High Performance Front End

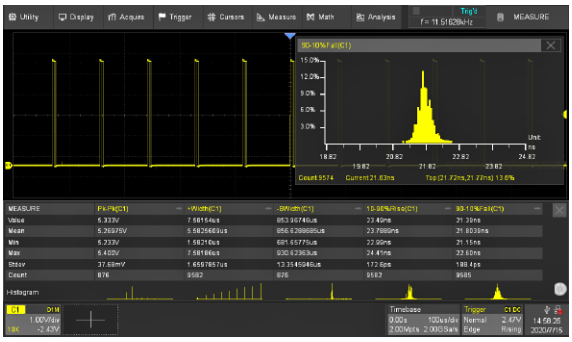
T3DSO2502A: At 500 MHz bandwidth the input noise floor is only 80 uVrms, and FFT Peaks are typically < -105 dBV.

Flat Frequency Response



T3DSO2502A at 2 Gsa/s shows exceptionally flat frequency response up to its maximum 500 MHz bandwidth.

Measurements of all relevant Parameters with Statistics



Parameter measurements includes 4 categories: Vertical, Horizontal, Miscellaneous and Channel Delay providing a total of 50+ different types of measurements.

Measurements can be performed on the whole waveform or within a specified gate period.

Measurements on Math, Reference and History frames are supported.

Simple measurement mode measures up to 12 waveform characteristics simultaneously, whereas advanced measurement mode offers statistics measuring the current value, maximum value, minimum value, standard deviation, mean value and count, on up to 5 parameters simultaneously.

Histogram is available to show the probability distribution of a parameter. Trend is available to show the parameter value vs. time.

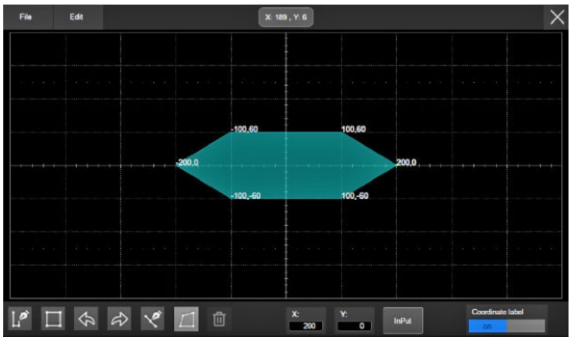
In addition, horizontal measurements can process up to 1000 signal edges within one single acquisition, thus greatly improving the test efficiency.

Serial Bus Trigger and Decode

Trigger and decode up to 2 common embedded and automotive serial buses (I^2C, SPI, UART, LIN and CAN) simultaneously. Options are available to add decoding of CAN FD, FlexRay, I^2S and MIL-STD-1553B. Bus protocol information can be quickly and intuitively displayed time aligned with the waveform and in table format.

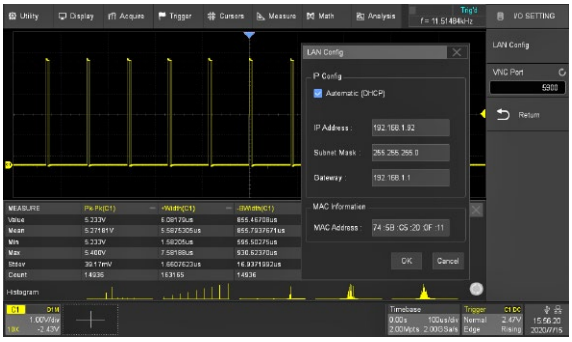
Mask Test Function

The mask test function enables users to define their own masks directly from a waveform or from the mask editor capability. The masks can then be used for Go/No Go testing with any failures stored as history waveforms or screen shots. The masks can be stored in the T3DSO2000A for future use, so are not lost when the T3DSO2000A is powered off, making it suitable for long-term signal monitoring or automated production line testing.



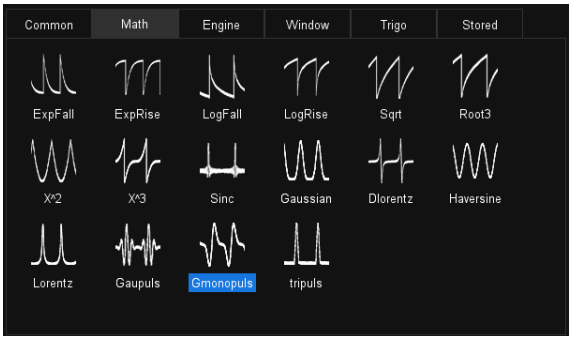
Built in mask editor

Complete Connectivity



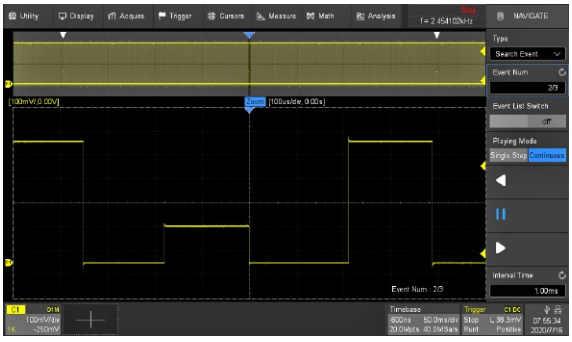
Connectivity includes External Trigger Input, Pass/Fail and Trigger Out, USB Device (USBTMC) and LAN for remote control, and a Kensington Lock security point.

Built-in 50 MHz Function/ArbitraryWaveform Generator as standard



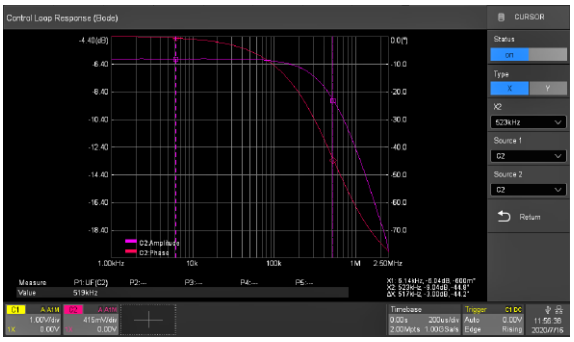
The 50 MHz built-in function/arbitrary waveform generator comprises 6 standard waveforms and 45 arbitrary waveforms.

Search and Navigate

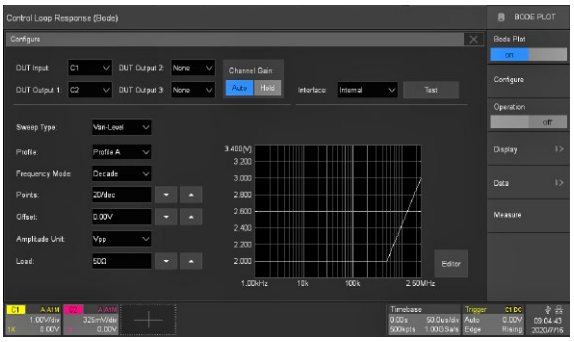


The T3DSO2000A can find events within an acquisition record or history acquisition based on user specified trigger conditions. Navigate browses through Events flagged by the Search, plays back history events or continuously moves the delay position on long records (useful in zoom view).

Bode Plot



The T3DSO2000A Bode Plot application can control the built-in waveform generator or any T3AFG40-80-120 function generator to make Bode Plot measurements by scanning the amplitude and phase response over frequency of passive or active components and circuits. This makes it possible to replace expensive network analyzers in less demanding applications. The built-in waveform generator allows Bode Plot measurements up to 50 MHz whereas using the T3AFG120 allows Bode Plot measurements up to 120 MHz.

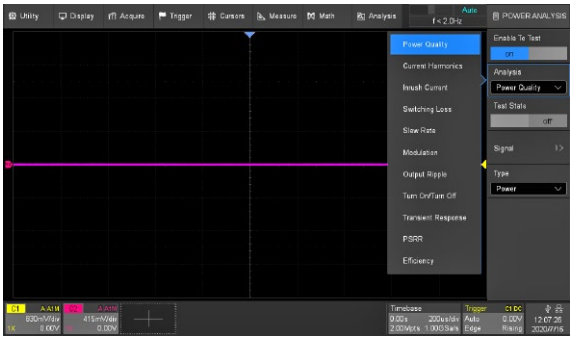


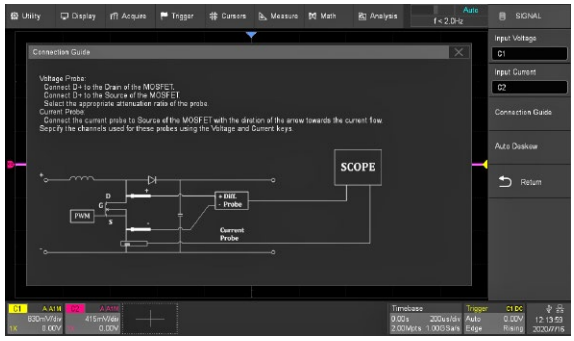
The configuration screen allows configuration of the reference and measurement channels with up to three measurement channels possible. Configuration of the measurement frequency and amplitude, setting the number of measurement points, load, variable level sweeps, channel gain, decade or linear frequency mode, etc.

The measurement screen allows the setting of five common measurements: Upper cutoff frequency, lower cutoff frequency, bandwidth, gain margin and phase margin, as well as having user settable measurement cursors.

Power Analysis

The T3DSO2000A Power Analysis application provides a full suite of power measurements and analysis tools, thus improving the efficiency of measurement in switching power supplies and power device designs. The power analysis application can measure Power Quality, Current Harmonics, Inrush Current, Switching Loss, Slew Rate, Modulation, Output Ripple, Turn On/Turn Off, Transient Response, PSRR and Efficiency. Each measurement has a help screen showing a connection diagram with notes.





SPECIFICATIONS

All specifications are not guaranteed unless the following conditions are met:

- The oscilloscope calibration period is valid
- The oscilloscope has been working continuously for at least 30 minutes at the specified temperature (18 – 28)

Acquire System

Sampling Rate	2 GSa/s (single-channel[1)]), 1 GSa/s (dual-channel)
Memory Depth	200 Mpts (single-channel), 100 Mpts (dual-channel)
Peak Detect	1 ns
Average	Averages: 4, 16, 32, 64, 128, 256, 512, 1024
Eres	Enhance bits: 0.5, 1, 1.5, 2., 2.5, 3 selectable
Interpolation	Sinx/x, Linear

Input

Channels	2/4 + EXT
Coupling	DC, AC, GND
Impedance	DC: (1 MΩ ± 2 %) || (17 pF ± 2 pF) 50 Ω: 50 Ω ± 1 %
Max.Input voltage	1 MΩ ≤ 400 Vpk (DC + Peak AC), DC – 10 kHz 50 Ω ≤ 5 Vrms, ± 10 V Peak
CH to CH Isolation	DC – 100 MHz > 40 dB, 100 MHz – BW ≥ 34 dB
Probe Attenuation	1X, 10X, 100X, Custom

Horizontal System

Time Scale	1.0 ns/div – 1000 s/div T3DSO2502A 0.5 ns/div – 1000 s/div
Channel Skew	< 100 ps
Waveform Capture Rate	Up to 120,000 wfm/s (normal mode), 500,000 wfm/s (sequence mode)
Intensity grading	256-level
Display Format	Y-T, X-Y, Roll (≥ 50 ms/div)
Time base Accuracy	±1 ppm initial; ±1 ppm 1st year ageing; ± 3.5 ppm 10-year ageing
Roll Mode	50 ms/div – 1000 s/div (1-2-5 Step)

Vertical System

Bandwidth (-3dB)	500 MHz T3DSO2502A (2 Channels), 350 MHz (4 Channels) 350 MHz (T3DSO2354A) 200 MHz (T3DSO2204A) 100 MHz (T3DSO2104A)
Vertical Resolution	8 bit 10 bit mode ≤ 100 MHz
Vertical Range	8 divisions
Vertical Scale (Probe 1X)	1 MΩ 500 µV/div – 10 V/div 50 Ω: 500 µV/div – 1 V/div
Offset Range (Probe 1X)	500 µV/div – 100 mV/div: ± 2 V 102 mV/div – 1 V/div: ± 20 V 1.02 V/div – 10 V/div: ± 200 V
Bandwidth Limit	20 MHz -0 % – +20 %, 200 MHz -0 % – +20 %
Bandwidth Flatness 50 Ω	DC – 10 % (BW): ± 0.5 dB 10 % – 33 % (BW): ± 0.8 dB 33 % – 66 % (BW): + 1 dB, - 1.2 dB 66 % – BW: + 2 dB, - 2.5 dB
Low Frequency Response (AC Coupling –3 dB)	≤ 5 Hz (typical, at input BNC)
Noise	80 µV at 500 MHz bandwidth
DC Gain Accuracy	≤ 3.0 %
Offset Accuracy	± (1 % * offset + 1.5 % * 8 * div + 1 mV)
Rise Time[1)] 50 Ω	(Typ.) ≤ 800 ps (T3DSO2502A 2 Channel 500 MHz mode) ≤ 1 ns (T3DSO2502A 4 Channel mode) (Typ.) ≤ 1 ns (T3DSO2354A) (Typ.) ≤ 1.7 ns (T3DSO2204A) (Typ.) ≤ 3.5 ns (T3DSO2104A) (Typ.) ≤ 3.3 ns (T3DSO2104A, T3DSO2204A, T3DSO2354A, T3DSO2502A in 10 bit mode)
Overshoot (150 ps Fast Edge, 50 Ω input)	< 12 %

Trigger System

Mode	Auto, Normal, Single
Level	Internal: ± 4.1 div from the center of the screen EXT: ± 0.61 V EXT/5: ± 3.05 V
Holdoff Range	By Time: 8 ns – 30 s (8 ns Step) By Event: 1 – 10^8
Coupling	AC, DC, LFRJ, HFRJ, Noise RJ (CH1 – CH4) | AC, DC, LFRJ, HFRJ, (EXT)
Coupling Frequency Response (CH1 – CH4)[2]	DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 20 Hz LFRJ: Attenuates the frequency components below 1.2 MHz HFRJ: Attenuates the frequency components above 600 kHz
Coupling Frequency Response (EXT)[2]	DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 8 Hz LFRJ: Attenuates the frequency components below 33 kHz HFRJ: Attenuates the frequency components above 967 kHz
Accuracy[2]	CH1 – CH4: ± 0.2 div EXT: ± 0.3 div
Sensitivity	CH1 – CH4: ≤ 2 mV / div ± 0.5 div, > 2 mV / div ± 0.33 div EXT: 200 mVpp (DC – 10 MHz), 300 mVpp (10 MHz – 300 MHz) EXT/5: 1 Vpp (DC – 10 MHz), 1.5 Vpp (10 MHz – 300 MHz)
Jitter	CH1 – CH4 < 10 ps rms, 6 divisions pk-pk, 2 ns edge, EXT < 200 ps rms
Displacement	Pre-Trigger: 0 – 100 % memory Delay-Trigger: 0 – 5,000 div
Zone	Up to 2 zones, Source: CH1 – CH4, Property: Intersect / Not Intersect

Edge Trigger

Slope	Rising, Falling, Rising & Falling
Source	CH1 – CH4/EXT/(EXT/5)/AC Line/D0 – D15

Slope Trigger

Slope	Rising, Falling
Limit Range	≤, ≥, < >, > <
Source	CH1 – CH4
Time Range	2 ns – 20 s
Resolution	1 ns

Pulse Width Trigger

Polarity	+wid , -wid
Limit Range	≤, ≥, < >, > <
Source	CH1 – CH4 / D0 – D15
Pulse Width Range	2 ns – 4.2 s
Resolution	1 ns

Video Trigger

Signal Standard	NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom
Source	CH1 – CH4
Sync	Any, Select
Trigger condition	Line, Field

Window Trigger

Window Type	Absolute, Relative
Source	CH1 – CH4

[1] Single-channel: one channel in CH1/CH2 (or CH3/CH4) is ON and another is OFF
Dual-channel: both channels in CH1/CH2 (or CH3/CH4) are ON

[2] Typical Value refers to the tested value under specific conditions. It might vary with the ambient temperature or other conditions

Interval Trigger

Slope	Rising, Falling
Limit Range	≤, ≥, < >, > <
Source	CH1 – CH4 / D0 – D15
Time Range	2 ns – 20 s
Resolution	1 ns

Dropout Trigger

Timeout Type	Edge, State
Source	CH1 – CH4 / D0 – D15
Slope	Rising, Falling
Time Range	2 ns – 20 s
Resolution	1 ns

Runt Trigger

Polarity	+wid , -wid
Limit Range	≤, ≥, < >, > <
Source	CH1 – CH4
Time Range	2 ns – 20 s
Resolution	1 ns

Pattern Trigger

Pattern Setting	Low, High, Don't Care
Logic	AND, OR, NAND, NOR
Source	CH1 – CH4 / D0 – D15
Limit Range	≤, ≥, < >, > <
Time Range	2 ns – 20 s
Resolution	1 ns

Serial Trigger

IIC Trigger	
Condition	Start, Stop, Restart, No Ack, EEPROM, Address&Data, Data Length
Source (SDA/SCL)	CH1 – CH4 / D0 – D15
Data format	Hex
Limit Range	EEPROM: =, >, <
Data Length	EEPROM: 1 byte Address & Data: 1 – 2 byte Data Length: 1 – 12 byte
R/W bit	Address & Data: Read, Write, Don't Care
SPI Trigger	
Condition	Data
Source (CS/CL/Data)	CH1 – CH4 / D0 – D15
Data format	Binary
Data Length	4 – 96 bit
Bit Value	0, 1, X
Bit Order	LSB, MSB

UART Trigger	
Condition	Start, Stop, Data, Parity Error
Source (RX/TX)	CH1 – CH4 / D0 – D15
Data format	Hex
Limit Range	=, >, <
Data Length	1 byte
Data Width	5 bit, 6 bit, 7 bit, 8 bit
Parity Check	None, Odd, Even
Stop Bit	1 bit, 1.5 bit, 2 bit
Idle Level	High, Low
Baud Rate (Selectable)	600/1200/2400/4800/9600/19200/38400/57600/115200 bit/s
Baud Rate (Custom)	300 bit/s – 334000 bit/s
CAN Trigger	
Type	All, Remote, ID, ID + Data, Error
Source	CH1 – CH4 / D0 – D15
ID	STD (11 bit), EXT (29 bit)
Data format	Hex
Data Length	1–2 byte
Baud Rate (Selectable)	5 k/10 k/20 k/50 k/100 k/125 k/250 k/500 k/800 k/1 M bit/s
Baud Rate (Custom)	5 kbit/s – 1 Mbit/s
LIN Trigger	
Type	Break, Frame ID, ID+Data, Error
Source	CH1 – CH4 / D0 – D15
ID	1 byte
Data format	Hex
Data Length	1 – 2 byte
Baud Rate (Selectable)	600/1200/2400/4800/9600/19200 bit/s
Baud Rate (Custom)	300 bit/s – 20 kbit/s

Serial Decoder

No. of Decoder	2
Decode Type	Full Duplex
Threshold	-4.1 – +4.1 Div
List	1 – 7 lines
IIC Decoder	
Signal	SCL, SDA
Address	7 bit, 10 bit
Decoded Frames (Max.)	2,000
SPI Decoder	
Signal	CLK, MISO, MOSI, CS
Edge Select	Rising, Falling
Chip Select	Active Low, Active High, Clock Timeout
Bit Order	MSB, LSB
Decoded Frames (Max.)	15,000
UART Decoder	
Signal	RX, TX
Data Width	5 bit, 6 bit, 7 bit, 8 bit
Parity Check	None, Odd, Even, Mark, Space
Stop Bit	1 bit, 1.5 bit, 2 bit
Idle Level	Low, High
Bit Order	LSB, MSB
Decoded Frames (Max.)	15,000

CAN Decoder	
Signal	CAN_H, CAN_L
Source	CH1 – CH4 / D0 – D15
Decoded Frames (Max.)	2,000
LIN Decoder	
LIN Specification Package Revision	Ver1.3, Ver2.0
Baud Rate (Selectable)	600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, custom
Decoded Frames (Max.)	3,000

Serial Decoder (Optional)

CAN FD	
Source	CH1 – CH4 / D0 – D15
Nominal Baud Rate	10 kbps, 25 kbps, 50 kbps, 100 kbps, 250 kbps, 1 Mbps, custom
Data Baud Rate	500 kbps, 1 Mbps, 2 Mbps, 5 Mbps, 8 Mbps, 10 Mbps, custom
Decoded Frames (Max.)	1,000
FlexRay	
Source	CH1 – CH4
Data Baud Rate	2.5 Mbps, 5 Mbps, 10 Mbps, custom
Decoded Frames (Max.)	1,000
I²S	
Signal	BCLK, WS, DATA
Audio Variant	Audio-I²S, Audio-LJ, Audio-RJ
Start Bits	0 – 31
Baud Rate	1 – 32
Decoded Frames (Max.)	10,000
MIL-STD-1553B	
Source	CH1 – CH4
Decoded Frames (Max.)	10,000

Measurement

Source	CH1 – CH4 / D0 – D15, F1 – F2, Ref, History, Z1 – Z4	
Mode	Simple, Advanced	
Range	Screen, Gate	
Measurement Parameters		
Vertical (Voltage)	Max	Highest value in input waveform
	Min	Lowest value in input waveform
	Pk-Pk	Difference between maximum and minimum data values
	Amplitude	Difference between top and base in a bimodal signal, or between max and min in an unimodal signal
	Top	Value of most probable higher state in a bimodal waveform
	Base	Value of most probable lower state in a bimodal waveform
	Mean	Average of all data values
	Cycle Mean	Average of data values in the first cycle
	stdev	Standard deviation of all data values
	Cycle stdev	Standard deviation of data values in the first cycle
	RMS	Root mean square of all data values
	Cycle RMS	Root mean square of all data values in the first cycle
	Median	Middle data value of all data values
	Cycle Median	Middle data value of all data values in the first cycle
	FOV	Overshoot after a falling edge; (base-min)/Amplitude
	FPRE	Overshoot before a falling edge; (max-top)/Amplitude
	ROV	Overshoot after a rising edge; (max-top)/Amplitude
	RPRE	Overshoot before a rising edge; (base-min)/Amplitude
	Level@Trigger	The voltage value of the trigger point

Horizontal (Time)	Period	Period for every cycle in waveform at the 50 % level, and positive slope
	Freq	Frequency for every cycle in waveform at the 50 % level, and positive slope
	Time@max	Time of maximum value
	Time@min	Time of minimum value
	+Width	Width measured at 50 % level and positive slope
	-Width	Width measured at 50 % level and negative slope
	10 – 90 % Rise	Time Duration of rising edge from 10 – 90 %
	90 – 10 % Fall	Time Duration of falling edge from 90 – 10 %
	20 – 80 % Rise	Time Duration of rising edge from 20 – 80 %
	80 – 20 % Fall	Time Duration of falling edge from 80 – 20 %
	+Bwidth	Time from the first rising edge to the last falling edge at the 50 % crossing
	-Bwidth	Time from the first falling edge to the last rising edge at the 50 % crossing
	+Duty	Ratio of positive width to period
	-Duty	Ratio of negative width to period
	Delay	Time from the trigger to the first transition at the 50 % crossing
	T@M	Time from the trigger to each rising edge at the 50 % crossing
	CCJ	The difference between two consecutive period
Delay	Phase	Calculate the phase difference between two edges
	FRFR	Time between the first rising edge of source A and the following first rising edge of source B at the 50 % crossing
	FRFF	Time between the first rising edge of source A and the following first falling edge of source B at the 50 % crossing
	FFFR	Time between the first falling edge of source A and the following first rising edge of source B at the 50 % crossing
	FFFF	Time between the first falling edge of source A and the following first falling edge of source B at the 50 % crossing
	FRLR	Time between the first rising edge of source A and the last rising edge of source B at the 50 % crossing
	FRLF	Time between the first rising edge of source A and the last falling edge of source B at the 50 % crossing
	FFLR	Time between the first rising edge of source A and the last falling edge of source B at the 50 % crossing
	FFLF	Time between the first falling edge of source A and the last falling edge of source B at the 50 % crossing
	Skew	Time of source A edge minus time of nearest source B edge
Miscellaneous	+Area	Area of the waveform above zero
	-Area	Area of the waveform below zero
	Area	Area of the waveform
	AbsArea	Absolute area of the waveform
	Cycles	Number of cycles in a periodic waveform
	Rising Edges	Number of rising edges in a waveform
	Falling Edges	Number of falling edges in a waveform
	Edges	Number of edges in a waveform
	Ppulses	Number of positive pulses in a waveform
	Npulses	Number of negative pulses in a waveform
Cursors	Manual: Time X1, X2, (X1–X2), (1/ΔT) Voltage Y1, Y2, (Y1–Y2) Track: Time X1, X2, (X1–X2) Source: CH1 – CH4 / D0 – D15, Math, Ref	
Statistics	Current, Mean, Min, Max, Sdev, Count, Histogram, Trend	
Counter	Source: CH1 – CH4 Frequency Resolution: 7 Digits	

Math

Number of Math Operators	2
Source	CH1 – CH4, Z1 – Z4, F1, F2
Operation	+, -, *, /, FFT, d/dt, ∫dt, square root, Formula Editor
FFT	Length: 2 Mpts, 1 Mpts, 512 kpts, 256 kpts, 128 kpts, 64 kpts, 32 kpts, 16 kpts, 8 kpts, 4 kpts, 2 kpts Window: Rectangular, Blackman, Hanning, Hamming, Flattop Display: Full Screen, Split, Exclusive Mode: Normal, Max hold, Average Tools: Peaks, Markers

Analysis

Search	
Source	CH1 – CH4, History
Mode	Edge, Slope, Pulse, Interval, Runt
Copy setting	Copy from trigger, Copy to trigger
Navigate	
Type	Search event, Time, History frame
Mask Test	
Source	CH1 – CH4, Z1 – Z4
Mask creating	Auto (Create mask), Custom (Mask Editor, optional)
Mask test speed	Up to 80,000 frames/s
Store failed frames	To history, To screenshot
Bode Plot	
Source	CH1 – CH4
Supported signal sources	Built-in waveform generator T3AFG series waveform generators, Connection: USB, LAN
Sweep type	Simple, Vari-level
Frequency	Mode: Linear, Logarithmic Range: 10 Hz – 120 MHz
Measure	Upper cutoff frequency, Lower cutoff frequency, Bandwidth, Gain margin, Phase margin
Power Analysis	
Measure	Power quality, Current Harmonics, Inrush current, Switching loss, Slew rate, Modulation, Output ripple, Turn on/off, Transient response, PSRR, Efficiency

Built-in Function/Arbitrary Waveform Generator

Channel	1
Max. Output Frequency	50 MHz
Sampling Rate	125 MSa/s
Frequency Resolution	1 μHz
Frequency Accuracy	± 50 ppm
Vertical Resolution	14 bits
Amplitude Range	-1.5 V – +1.5 V (into 50 Ω) -3 V – +3 V (into HiZ)
Waveforms	Sine, Square, Ramp, Pulse, DC, Noise, 45 Arbitrary
Output Impedance	50 Ω ± 2 %
Protection	Over voltage protection, Current limit

Sine

Frequency	1 μHz – 50 MHz
Offset Accuracy (10 kHz)	± (1 % * offset setting value + 3 mVpp)
Amplitude Flatness (Compared to 10 kHz, 5 Vpp)	± 0.3 dB ≤ 25 MHz ± 0.5 dB > 25 MHz
SFDR	DC – 1 MHz -60 dBc 1 MHz – 5 MHz -55 dBc 5 MHz – 25 MHz -50 dBc 25 MHz – 50 MHz -40 dBc
Harmonic Distorsion	DC – 5 MHz -50 dBc 5 MHz – 25 MHz -45 dBc 25 MHz – 50 MHz -40 dBc

Square/Pulse

Frequency	1 μHz – 10 MHz
Duty Cycle	1 % – 99 %
Rise/Fall time	< 24 ns (10 % – 90 %)
Overshoot	< 3 % (typical, 1 KHz, 1 Vpp)
Pulse Width	> 50 ns
Jitter	< 500 ps + 10 ppm

Ramp

Frequency	1 μHz – 300 kHz
Linearity (Typical)	< 0.1 % of Pk-Pk (Typical, 1 kHz, 1 Vpp, 50 % Symmetry)
Symmetry	0 % – 100 %

DC

Offset range	± 1.5 V (into 50 Ω) ± 3 V (into HiZ)
Accuracy	± (|Setting Value| * 1 % + 3 mV)

Noise

Bandwidth	> 25 MHz (-3 dB)

Arb

Frequency	1 μHz – 5 MHz
Wave Length	16 Kpts
Sampling Rate	125 MSa/s
Waveform Import	EasyWave, U-Disk, directly from waveform data of analog channels

Digital Channels

No. of Channels	16
Max. Sampling Rate	500 MSa/s
Memory Depth	50 Mpts/Ch
Min. Detectable Pulse Width	3.3 ns
Level Group	D0 – D7, D8 – D15
Level Range	-10 V – +10 V
Logic Type	TTL, CMOS, LVCMOS3.3, LVCMOS2.5, custom
Skew[2)]	D0 – D15: ± 1 sampling interval Digital to Analog: ± (1 sampling interval +1 ns)

[2)] Typical Value refers to the tested value under specific conditions. It might vary with the ambient temperature or other conditions

SPECIFICATIONS

I/O

Standard	USB 2.0 Host x2, USB 2.0 Device, LAN 100 M, Pass/Fail Out 3.3 V TTL, Trigger Out 3.3 V LVCMOS, EXT Trigger ≤ 1.5 Vrms, EXT/5 Trigger ≤ 7.5 Vrms

Display

Display Type	10.1 inch TFT LCD Capacitive Touch Screen
Resolution	1024 x 600
Contrast	500:1
Backlight	500 nit typical
Range	8 x 10 grid

Waveform Display

Type	Dot, Vector
Persistence Time	OFF, 1 s, 5 s, 10 s, 30 s, infinite
Color Display	Normal, Color
Screen Saver	1 min, 5 min, 10 min, 30 min, 1 hour, OFF

Language

Language	Simplified Chinese, Traditional Chinese, English, French, Japanese, German, Russian, Italian, Portuguese, Spanish

Environments

Temperature	Operating: 10 – 40 Non-operating: -20 – 60
Humidity	Operating: 85 % RH, 40 Deg C, 24 hours Non-operating: 85 % RH, 65 Deg C, 24 hours
Altitude	Operating: ≤ 3000 m Non-operating: ≤ 15,266 m
Electromagnetic Compatibility	2014/30/EU Execution Standard EN 61326-1:2013
Safety	2014/35/EU Execution Standard EN 61010-1:2010

All T3DSO2000 Series Oscilloscopes come with a 3 year return to Teledyne LeCroy warranty.

Power Supply

Input Voltage & Frequency	100 – 240 Vrms 50/60 Hz 100 – 120 Vrms 400 Hz
Power	80 W Max, 50 W typical, 4 W typical in standby mode

Mechanical

Dimensions	Length * Width * Height = 352 mm * 111 mm * 224 mm
Weight	N.W 3.9 Kg G.W 5.4 Kg

T3DSO2000 Probes

Probe type	Model	Picture	Description
Passive	**T3PP300**		300 MHz bandwidth, 10 MΩ, 10X Passive Probe. Replacement probe for the T3DSO2104A and T3DSO2204A Oscilloscopes. **Note:** This probe has a wider bandwidth than the probes originally supplied with the oscilloscope. It is the recommended replacement and is fully compatible with the listed oscilloscopes.
	T3PP350A		350 MHz bandwidth, 10 MΩ 10X Probe 1 supplied per channel. Replacement probe for the T3DSO2354A Oscilloscope.
	PP020-1		500 MHz bandwidth, 10 MΩ 10X Probe 1 supplied per channel. Replacement probe for the T3DSO2502A Oscilloscope.
Logic Probe	**T3DSO2000-LS**		16 Channel Logic Probe. This probe REQUIRES that the Oscilloscope has option T3DSO2000A-MSO
MSO Software	**T3DSO2000A-MSO**[1)]		Software License for the MSO capability. Enables one T3DSO2000-LS 16 channel logic probe lead set to be shared amongst several licensed T3DSO2000A oscilloscopes. This software option does not come with a logic probe lead set.

[1)] This option REQUIRES that the scope has probe T3DSO2000-LS.

Ordering information

Description	500 MHz, 2 Channel / 350 MHz, 4 Channel, 4 x 500 MHz PP020-1 Passive Probes	T3DSO2502A
	350 MHz, 4 Channels, 4 x 350 MHz T3PP350A Passive Probes	T3DSO2354A
	200 MHz, 4 Channels, 4 x 200 MHz Passive Probes	T3DSO2204A
	100 MHz, 4 Channels, 4 x 100 MHz Passive Probes	T3DSO2104A
Standard Accessories	USB Cable -1	
	Standard Passive Probe appropriate to the oscilloscope bandwidth -4	
	Power Cord -1	
	Quick Start -1	
	Certificate of Calibration -1	
Optional Accessories	FlexRay trigger & decode (software)	T3DSO2000A-FLEXRAY
	MIL-STD-1553B trigger & decode (software)	T3DSO2000A-MIL-1553
	CAN FD trigger & decode (software)	T3DSO2000A-CANFD
	I^2S trigger & decode (software)	T3DSO2000A-I2S
	16 Digital Channels (Software, requires T3DSO2000-LS)	T3DSO2000A-MSO
	16 Channel Logic Probe, requires T3DSO2000A-MSO	T3DSO2000-LS

ABOUT TELEDYNE TEST TOOLS

TELEDYNE TEST TOOLS
Everywhereyoulook™

Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand extends the Teledyne LeCroy product portfolio with a comprehensive range of test equipment solutions. This new range of products delivers a broad range of quality test solutions that enable engineers to rapidly validate product and design and reduce time-to-market. Designers, engineers and educators rely on Teledyne Test Tools solutions to meet their most challenging needs for testing, education and electronics validation.

Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy has sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

Distributed by:

Teledyne LeCroy (US Headquarters)

700 Chestnut Ridge Road
Chestnut Ridge, NY. USA 10977-6499

Phone:	800-553-2769 or 845-425-2000
Fax Sales:	845-578-5985
Phone Support:	1-800-553-2769
Email Sales:	contact.corp@teledynelecroy.com
Email Support:	support@teledynelecroy.com
Web Site:	http://teledynelecroy.com/

Teledyne LeCroy (European Headquarters)

Teledyne GmbH
Im Breitspiel 11c
D-69126 Heidelberg, Germany

Phone:	+49 6221 82700
Fax:	+49 6221 834655
Phone Service:	+49 6221 8270 85
Phone Support:	+49 6221 8270 28
Email Sales:	contact.gmbh@teledynelecroy.com
Email Service:	service.gmbh@teledynelecroy.com
Email Support:	tlc.t3.appsupport.eu@teledyne.com
Web Site:	http://teledynelecroy.com/germany

World wide support contacts can be found at:
https://teledynelecroy.com/support/contact/#

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T3 stands for Teledyne Test Tools.

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