T3DSO2000HD Data Sheet
Digital Oscilloscope

Debug with Confidence
100 MHz – 350 MHz
12-bit High Resolution

Tools for Improved Debugging

• **12-bit ADC** – combined with low noise front end provides excellent noise performance.	✓ Get better insight on the signal being measured with minimal noise interference.
• **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.
• **Built-in web server** – supports remote control over LAN port.	✓ Save data for external analysis and screen images for reports.
• **History** – record function, the maximum recorded waveform length is 80,000 frames.	✓ Replay the changing waveform history.
• **Includes Bode Plot and Power Analysis applications as standard.**	✓ Common applications coverage as standard.
• **MSO** – 16 Digital Channel models available.	✓ Add mixed signal debugging to your Oscilloscope.

T3DSO2104HD: 4 Channel 100 MHz
T3DSO2204HD: 4 Channel 200 MHz
T3DSO2354HD: 4 Channel 350 MHz
T3DSO2104HD-MS: 4 Channel 100 MHz
T3DSO2204HD-MS: 4 Channel 200 MHz
T3DSO2354HD-MS: 4 Channel 350 MHz

Teledyne Test Tools T3DSO2000HD Digital Oscilloscopes are available in bandwidths of 100 MHz, 200 MHz and 350 MHz, have maximum record length of 200 Mpts/ch, and display 4 analog channels + 16 digital channels mixed signal analysis ability.

The T3DSO2000HD series employs the latest technology which features a maximum waveform capture rate of up to 100,000 wfm/s (normal mode, up to 500,000 wfm/s in Sequence mode), 256-level intensity grading display function plus a color temperature display mode. It also employs an innovative digital trigger system with high sensitivity and low jitter. The trigger system supports multiple powerful triggering modes including serial bus triggering. Tools such as History waveform recording, Search and Navigate functions, Mask Test, Bode Plot, Power Analysis and Histogram allow for extended

waveform records to be captured, stored, and analyzed. An impressive array of measurement and math capabilities, built-in 25 MHz arbitrary waveform generator, as well as serial decoding are also features of the T3DSO2000HD.

The large 10.1″ display capacitive touch screen supports multi-touch gestures, with the addition of user-friendly UI design, can greatly improve the operation efficiency. It also supports mouse control, and remote web control over LAN.

Key Features

- 12-bit Analog-Digital Convertors with sample rate up to 2 GS/s
- Front ends with 65 µVrms noise floor @ 350 MHz bandwidth and 0.5 % DC gain accuracy
- 4 analog channels, up to 350 MHz bandwidth
- Waveform capture rate up to 100,000 wfm/s (normal mode), and 500,000 wfm/s (sequence mode)
- Supports 256-level intensity grading and color temperature display modes
- Up to 200 Mpts/ch record length
- Serial bus triggering and decoder, supports protocols I²C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I²S, MIL-STD-1553B, SENT and Manchester
- MSO−16 digital channels as standard on MS configured units.
- History waveform record (History) function, the maximum recorded waveform length is 80,000 frames

- Automatic measurements on 50+ parameters, supports statistics with histogram, track, trend, Gating measurement, and measurements on Math, History and Ref
- 4 Math traces (2 Mpts FFT, addition, subtraction, multiplication, division, integration, differential, square root, etc.), supports formula editor
- High Speed hardware-based Average, ERES; High Speed hardware-based Mask Test function, with Mask Editor tool for creating user-defined masks
- Built-in 25 MHz waveform generator
- 50 MHz waveform generator (optional)
- Interfaces include: USB Hosts, USB Device (USBTMC), LAN (VXI-11/Telnet/Socket), Pass/Fail, Trigger Out
- Built-in web server supports remote control over the LAN port using a web browser. Supports SCPI remote control commands. Supports external mouse and keyboard

Models and Key Specification

| Model	T3DSO2104HD / T3DSO2104HD-MS	T3DSO2204HD / T3DSO2204-MS	T3DSO2354HD / T3DSO2354-MS
Analog channels	4 + EXT		
Bandwidth	100 MHz	200 MHz	350 MHz
Vertical resolution	12-bit		
Sample rate (Max.)	2 GS/s (interleaving mode), 1 GS/s (non-interleaving mode)		
Memory depth (Max.)	200 Mpts/ch (interleaving mode), 100 Mpts/ch (non-interleaving mode)		
Waveform capture rate (Max.)	Normal mode: 100,000 wfm/s; Sequence mode: 500,000 wfm/s		
Trigger type	Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video, Qualified, Nth edge, Setup/hold, Delay, Serial		
Serial trigger and decode	I²C, SPI, UART, CAN, LIN CAN FD, FlexRay, I²S, MIL-STD-1553B, SENT, Manchester (decode only)		
Measurement	50+ parameters, statistics, histogram, trend, and track supported		
Math	4 traces 2 Mpts FFT, +, -, x, ÷, $\int dt$, d/dt, √, Identity, Negation, Absolute, Sign, e^x, 10^x, ln, lg, Interpolation, MaxHold, MinHold, ERES, Average. Supports formula editor		
Data analysis	Search, Navigate, History, Mask Test, Digital Voltmeter, Counter, Waveform Histogram, Bode plot, and Power Analysis		
Digital channel (optional)	16-channel; maximum sample rate up to 500 MS/s; record length up to 50 Mpts		
Waveform generator	Single-channel built-in waveform generator, frequency up to 25 MHz, 125 MS/s sample rate, 16 kpts waveform memory		
I/O	USB 2.0 Host x3, USB 2.0 Device, 10 M / 100 M LAN, External trigger, Auxiliary output (TRIG OUT, PASS/FAIL)		
Probe	One 500 MHz passive probe supplied for each channel		
Display	10.1 TFT-LCD with capacitive touch screen (1024*600)		

12-bit High Resolution
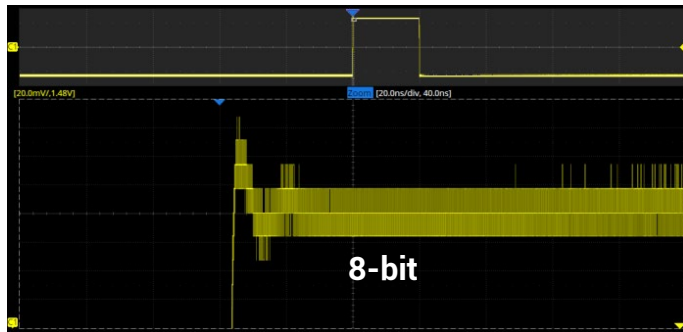
12-bit resolution shows you more details and less noise on the waveform.
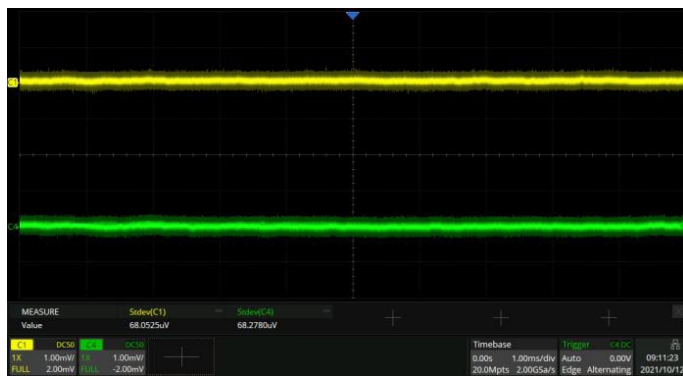
*Low noise floor: Only 65 µVrms at 350 MHz bandwidth*
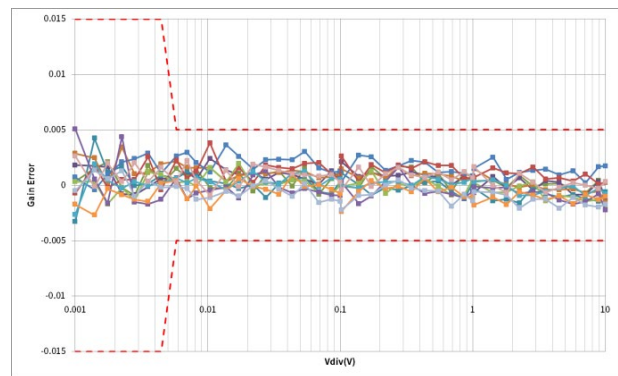
0.5 % DC gain accuracy

## Excellent User Interface and User Experience

- 10.1" display with 1024x600 resolution
- Capacitive touch screen, supporting multi-touch gestures, can move or scale the waveform traces quickly by finger-touch movements, which greatly improves the operation efficiency
- Built-in WebServer supports remote control on a web page over LAN
- Supports external mouse and keyboard

High Waveform Update Rate
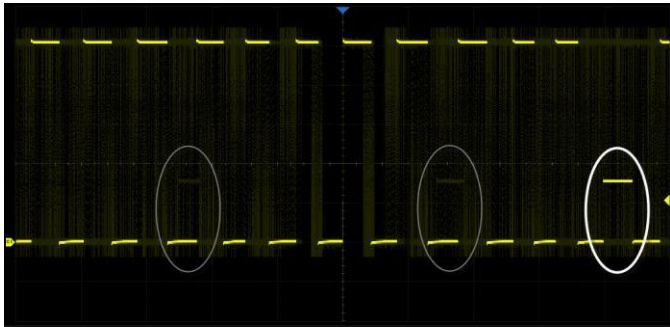
With a waveform update rate of up to 100,000 wfm/s, the oscilloscope can easily capture unusual or lowprobability events. In Sequence mode, the waveform capture rate can reach 500,000 wfm/s.

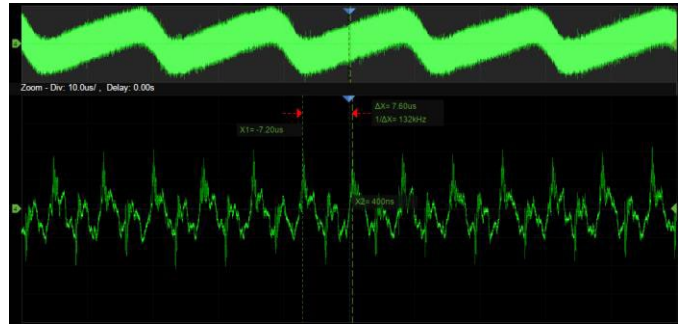## Multiple Trigger Functions
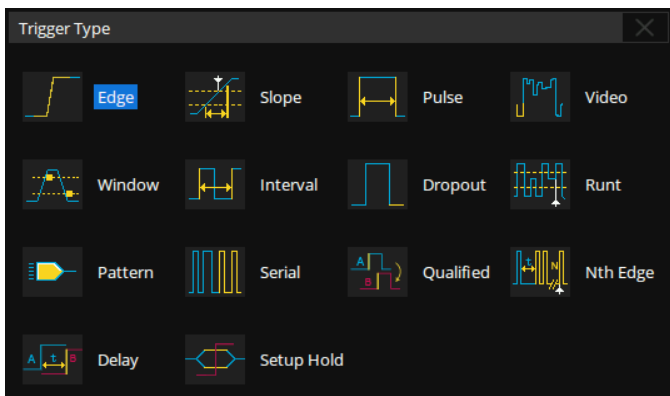
Edge, Slope, Pulse, Video, Windows, Runt, Interval, Dropout, Pattern, Qualified, Nth edge, Setup/hold, Delay, and serial trigger.

Trigger Zone
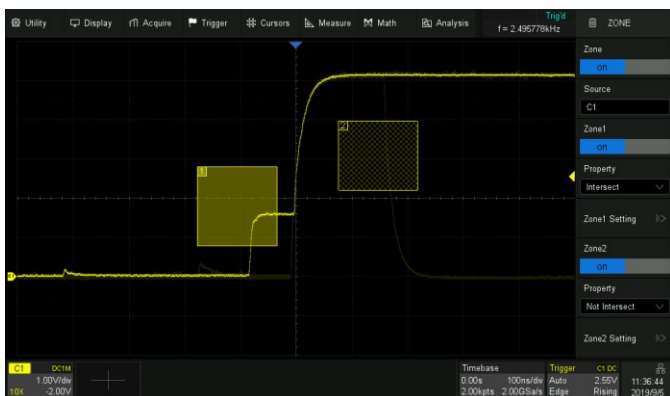
Trigger Zone is available for advanced triggering.

Deep Record Length

Using hardware-based Zoom technique and record length of up to 200 Mpts, users can select a slower timebase without compromising the sample rate, and then quickly zoom in to focus on the area of interest.

Advanced Math Function
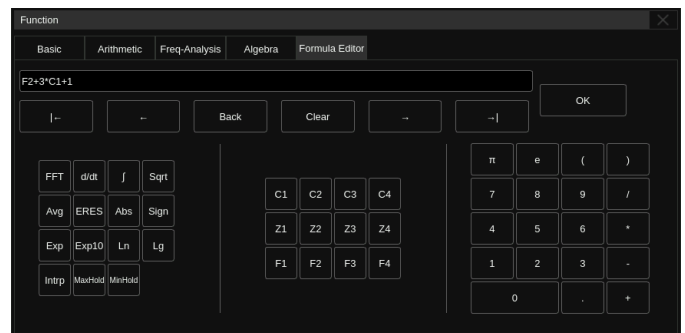
In addition to the traditional (+, -, X, /) operations, FFT, integration, differential, square root, and more are supported. Formula Editor is available for more complex operations. 4 math traces are available.
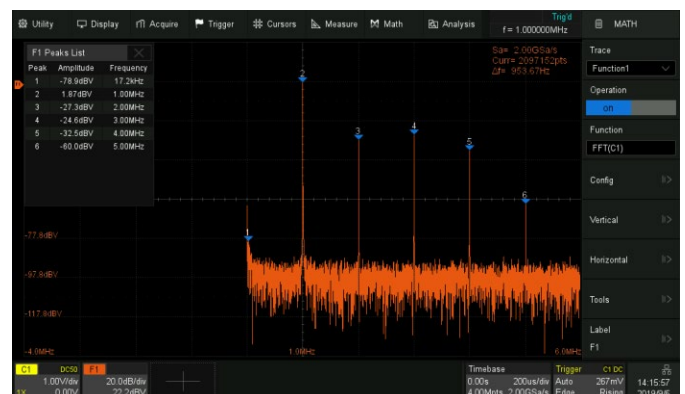
Hardware-accelerated FFT supports up to 2 Mpts operation. This provides high-frequency resolution with a fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs. Three modes (Normal, Average, and Max hold) can satisfy different requirements for observing the power spectrum. Auto peak detection and markers are supported.

Measurements of a Variety of Parameters

Parameter measurements include 4 categories: horizontal, vertical, miscellaneous, and CH delay providing a total of 50+ different types of measurements. Measurements can be performed within a specified gate period. Measurements on Math, Reference, and History frames are supported.
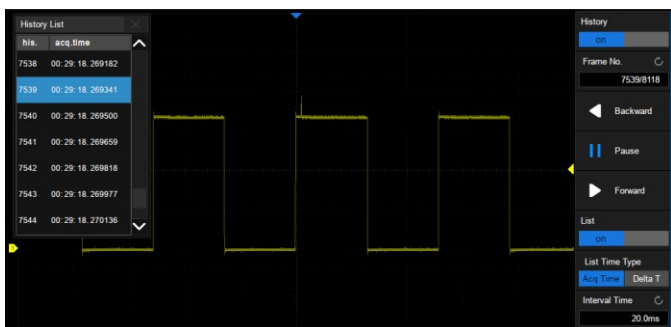
Parameter Statistics Function

Statistics show the current value, maximum value, minimum value, standard deviation, and mean value of up to 12 parameters simultaneously. A histogram is available to show the probability distribution of a parameter. Trend and Track are available to show the parameter value vs. time.

For horizontal parameters such as period, all results are extracted from a frame, instead of just calculating the first one. This accelerates statistics on horizontal measurements much more and enables distribution observation in a frame using Histogram and Track.

History Mode

History function can record up to 80,000 frames of waveforms. The recording is executed automatically so that the customer can playback the history waveforms at any time to observe unusual events and quickly locate the area of interest using the cursors or measurements. The failed frames of the Mask Test can be stored as history.

Sequence Mode
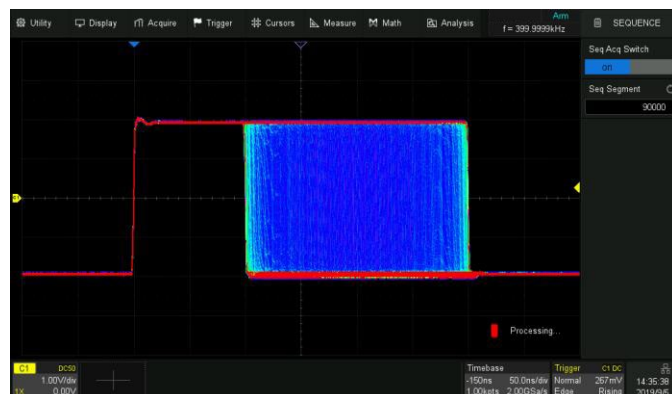
Segmented memory collection will store the waveform into multiple memory segments (up to 80,000) and each segment will store a triggered waveform as well the dead time information. The interval between segments can be as small as 2 μs. All of the segments can be played back using the History function.

Search and Navigate
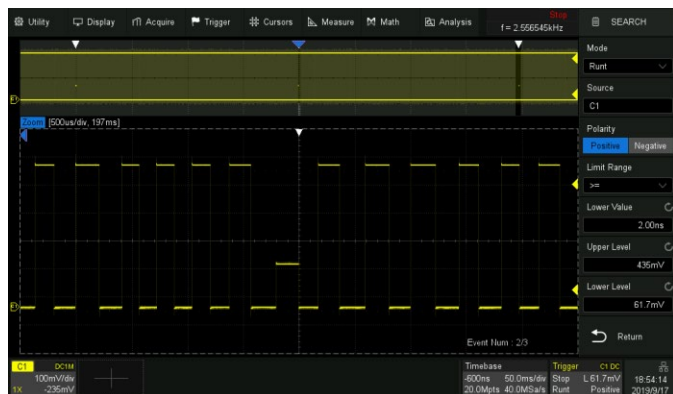
The oscilloscope can search events specified by the user in a frame. Events flagged by the Search can be recalled automatically using Navigate. It can also navigate by time (delay position) and history frames.

Serial Bus Decode
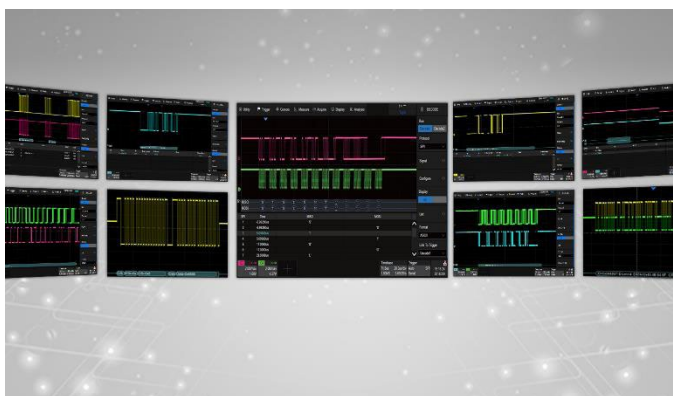
Display the decoded characters through the events list. Bus protocol information can be quickly and intuitively displayed in tabular form. I²C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I²S, MIL-STD-1553B, SENT, and Manchester are supported.

Hardware-based High-Speed Mask Test Function
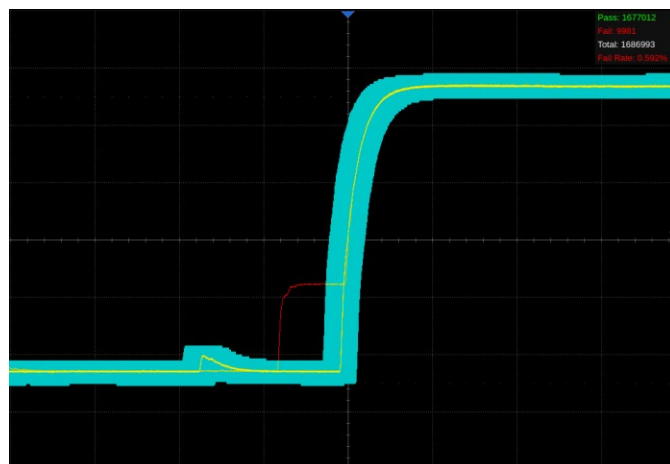
The oscilloscope utilizes a hardware-based Mask Test function, performing up to 14,000 Pass / Fail decisions each second. It is easy to generate user-defined test templates to provide trace mask comparisons, making it suitable for long-term signal monitoring or automated production line testing.
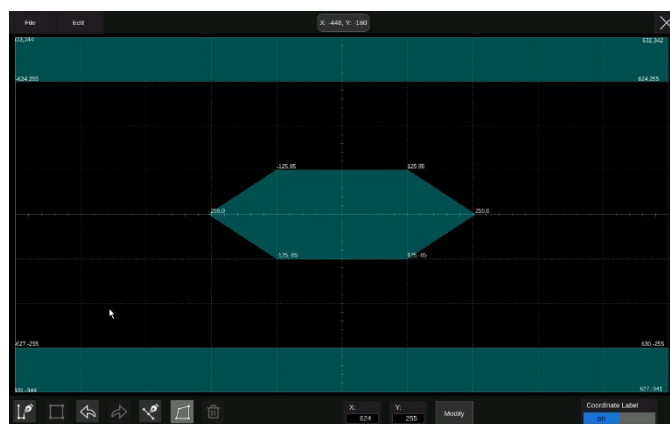
Built-in Mask Editor application helps to create custom masks.
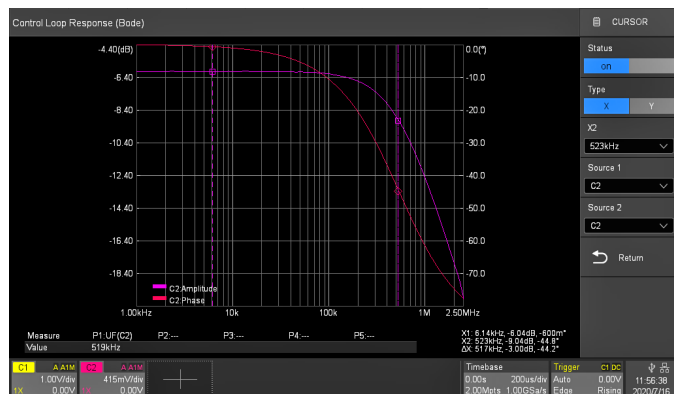
Bode Plot

The oscilloscope can control the built-in waveform generator or a stand-alone Teledyne Test Tool generator, to scan the amplitude and phase-frequency response of the DUT, and display the data as a Bode Plot. This makes it possible to replace expensive network analyzers in some applications.

Digital Channels (T3DSO2000-LS)

Four analog channels plus 16 digital channels enable users to acquire and trigger the waveforms then analyze the pattern, simultaneously with one instrument.

Power Analysis

The Power Analysis option provides a full suite of power measurements and analysis, which greatly improve the measurement efficiency in switching power supplies and power devices design.

Built-in 25 MHz Waveform Generator
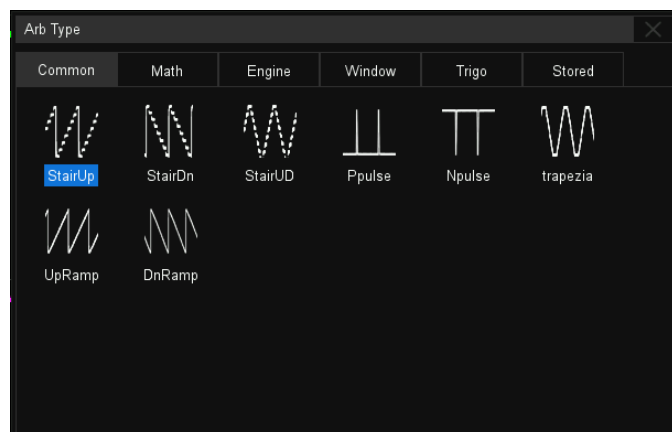
The built-in waveform generator can output waveforms with up to 25 MHz frequency and ±3 V amplitude.
Six basic waveforms together with multiple types of predefined waveforms and as user-defined arbitrary waveforms are supported (Optional USB 50 MHz AWG module: T3DSO-FGMOD).

Complete Connectivity

USB Host 2.0 x3, USB Device 2.0 (USBTMC) , LAN (VXI-11/Telnet/ Socket), Auxiliary output (Pass/Fail, Trigger Out), etc.

SPECIFICATIONS

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

- The oscilloscope calibration period is current
- The oscilloscope has been working continuously for at least 30 minutes at the specified temperature (18 °C ~ 28 °C)

Acquire (analog)

Sample rate	2 GS/s (interleaving mode)[1], GS/s (non-interleaving mode)[2]
Memory depth	200 Mpts/ch (interleaving mode), 100 Mpts/ch (non-interleaving mode)[3]
Waveform update rate	Normal mode: up to 100,000 wfm/s Sequence mode: up to 500,000 wfm/s
Intensity grading	256-level
Peak detect	1 ns
Average	4, 16, 32, 64, 128, 256, 512, 1024
ERES	Enhanced bit: 0.5, 1, 1.5, 2, 2.5, 3 bits
Sequence	Up to 80,000 segments, interval between triggers = 2 µs min.
History	Up to 80,000 frames
Interpolation	sinx/x, x

[1] Interleaving mode: only one of CH1/CH2 and/or only one of CH3/CH4 activated
[2] Non-interleaving mode: both CH1/CH2 and/or both CH3/CH4 activated
[3] In Average and ERES modes, the memory depth is 20 Mpts/ch (interleaving mode), 10 Mpts/ch (non-interleaving mode)

Model	T3DSO2104HD / T3DSO2104HD-MS	T3DSO2204HD / T3DSO2204HD-MS	T3DSO2354HD / T3DSO2354HD-MS

Vertical (analog)

|			
Channel	4 + EXT		
Bandwidth (-3 dB) @ 50 Ω	100 MHz	200 MHz	350 MHz
Flatness@50 Ω	10 kHz ~ BW/10: ±0.5 dB BW/10 ~ BW/3: ±0.8 dB BW/3 ~ BW2/3: +1.0 dB, -1.2 dB BW2/3 ~ BW: +2.0 dB, -2.5 dB		
Rise time@50 Ω (typical)	3.5 ns	1.7 ns	1 ns
Resolution	12-bit		
ENOB[4] (typical)	8.7-bit	8.6-bit	8.4-bit
Noise floor[5] (rms, @50 Ω, typical,[4] mV/div)	50 µV	55 µV	65 µV
Range	8 divisions		
Vertical scale (probe 1X)	1 MΩ: 0.5 mV/div − 10 V/div 50 Ω: 0.5 mV/div − 1 V/div		
DC gain accuracy (typical)	0.5 mV/div ~ 4.95 mV/div: ±1.5 %; 5 mV/div ~ 10 V/div: ±0.5 %;		
Offset accuracy	± (0.5 % of the offset setting + 0.5 % of full scale + 1 mV)		
Offset range (probe 1X)	**1 MΩ:** 0.5 mV/div ~ 5 mV/div: ±1.6 V; 5.1 mV/div ~ 10 mV/div: ±4 V; 10.2 mV/div ~ 20 mV/div: ±8 V; 20.5 mV/div ~ 100 mV/div: ±16 V; 102 mV/div ~ 200 mV/div: ±80 V; 205 mV/div ~ 1 V/div: ±160 V; 1.02 V/div ~ 10 V/div: ±400 V	**50 Ω:** 0.5 mV/div ~ 5 mV/div: ±1.6 V; 5.1 mV/div ~ 10 mV/div: ±4 V; 10.2 mV/div ~ 20 mV/div: ±8 V; 20.5 mV/div ~ 1 V/div: ±10 V;	

[4] 99.99 MHz input (100 MHz model uses 49.99 MHz), -0.5 dBFS, 20 mV/div, 50 Ω input impedance
[5] Use the "Stdev" measurement @ 2 GS/s, 10 Mpts/ch

SPECIFICATIONS

Model	T3DSO2104HD / T3DSO2104HD-MS	T3DSO2204HD / T3DSO2204HD-MS	T3DSO2354HD / T3DSO2354HD-MS
Bandwidth limit	Hardware Bandwidth limit: 20 MHz, 200 MHz		
Low frequency response (AC coupling -3 dB)	5 Hz (typical)		
Overshoot (100 mV/div, 150 ps edge @50 Ω, typical)	12 %	3 %	1 %
Coupling	DC, AC, GND		
Impedance	1 MΩ: (1 MΩ±2 %) || (16 pF±2 pF) 50 Ω: 50 Ω±1 %		
Max. input voltage	1 MΩ ≤ 400 Vpk (DC + AC), DC~10 kHz 50 Ω ≤ 5 V rms		
SFDR	≥ 45 dBc		
CH to CH Isolation (@50Ω)	> 60 dBc, < 500 MHz > 70 dBc, < 350 MHz		
Probe Attenuation	1X, 10X, 100X, custom		

Horizontal

Time scale	1 ns/div − 1000 s/div
Range	10 divisions
Display mode	Y-T, X-Y, Roll
Roll mode	≥ 50 ms/div
Skew (CH1~CH4)	< 100 ps
Time base Accuracy	±2 ppm initial (0~50 °C); ±0.5 ppm 1st year aging; ±3 ppm 20-year aging

Trigger

Mode	Auto, Normal, Single
Level	Internal: ± 4.1 div from the center of the screen EXT: ± 0.61 V EXT/5: ± 3.05 V
Ext Trigger input voltage	1 MΩ ≤ 42 Vpk 50 Ω ≤ 5 V rms
Hold off range	By time: 8 ns ~ 30 s (8 ns step) By event: $1 \sim 10^8$
Coupling	**CH1~CH4** DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 7 Hz LFRJ: Attenuates the frequency components below 1.17 MHz HFRJ: Attenuates the frequency components above 660 kHz Noise RJ: Increases the trigger hysteresis **EXT** DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 18 Hz LFRJ: Attenuates the frequency components below 7.5 kHz HFRJ: Attenuates the frequency components above 250 kHz
Accuracy (typical)	CH1~CH4: ±0.2 div EXT: ±0.3 div

			Noise RJ = OFF	Noise RJ = ON
Sensitivity	CH1~CH4:	>10 mV/div: 5 mV/div ~ 10 mV/div: ≤ 2 mV/div:	±0.26 div ±0.26 div ±0.5 div	±0.33 div ±0.33 div ±0.5 div
	EXT:	200 mVpp, DC ~ 200 MHz 500 mVpp, 200 MHz ~ bandwidth (300 MHz)		
	EXT/5:	1 Vpp, DC ~ 200 MHz 1.5 Vpp, 200 MHz ~ bandwidth (300 MHz)		
Jitter	CH1~CH4: EXT:	< 10 ps rms (typical), ≥ 6 div Vpp sine, 2.5 mV/div ~ 10 V/div < 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

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

Slope Trigger

Source	CH1~CH4
Slope	Rising, Falling
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns

Pulse Width Trigger

Source	CH1~CH4 / D0~D15
Polarity	+width, -width
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns

Video Trigger

Source	CH1~CH4
Standard	NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom
Synchronization	Any, Select
Trigger Condition	Line, Field

Window Trigger

Source	CH1~CH4
Window type	Absolute, Relative

Interval Trigger

Source	CH1~CH4 / D0~D15
Slope	Rising, Falling
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns

Dropout Trigger

Source	CH1~CH4 / D0~D15
Timeout type	Edge, State
Slope	Rising, Falling
Time range	2 ns ~ 20 s, Resolution = 1 ns

SPECIFICATIONS

Runt Trigger	
Source	CH1~CH4
Polarity	Positive, Negative
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
Pattern Trigger	
Source	CH1~CH4 / D0~D15
Pattern Setting	Don't Care, Low, High
Logic	AND, OR, NAND, NOR
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
Qualified Trigger	
Type	State, State with Delay, Edge, Edge with Delay
Qualified Source	CH1~CH4 / D0~D15
Edge Trigger Source	CH1~CH4 / D0~D15
Nth Edge Trigger	
Source	CH1~CH4 / D0~D15
Slope	Rising, Falling
Idle time	8 ns ~ 20 s, Resolution = 1 ns
Edge Number	1 ~ 65535
Delay Trigger	
Source A	CH1~CH4 / D0~D15
Source B	CH1~CH4 / D0~D15
Slope	Rising, Falling
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
Serial Trigger	
Source	CH1~CH4 / D0~D15
Protocol	I^2C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I^2S, MIL-STD-1553B, SENT
I^2C	Type: Start, Stop, Restart, No Ack, EEPROM, Address & Data, Data Length
SPI	Type: Data
UART	Type: Start, Stop, Data, Parity Error
CAN	Type: All, Remote, ID, ID+Data, Error
LIN	Type: Break, Frame ID, ID+Data, Error
CAN FD	Type: Start, Remote, ID, ID+Data, Error
FlexRay	Type: TSS, Frame, Symbol, Errors
I^2S	Type: Data, Mute, Clip, Glitch, Rising Edge, Falling Edge
MIL-STD-1553B	Type: Transfer, Word, Error, Timing
SENT	Type: Start, Slow channel, Fast channel, Error

Serial Decoder

Decoders	2
Threshold	-4.1 ~ 4.1 div
List	1 ~ 7 lines
Decoder type	Full duplex
I²C	
Source	CH1~CH4 / D0~D15
Signal	SCL, SDA
Address	7-bit, 10-bit
SPI	
Source	CH1~CH4 / D0~D15
Signal	CLK, MISO, MOSI, CS
Edge Select	Rising, Falling
Chip select	Active high, Active low, Clock timeout
Bit Order	LSB, MSB
UART	
Source	CH1~CH4 / D0~D15
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
CAN	
Source	CH1~CH4 / D0~D15
LIN	
LIN Version	Ver 1.3, Ver 2.0
Source	CH1~CH4 / D0~D15
Baud Rate	600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, Custom
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
FlexRay	
Source	CH1~CH4 / D0~D15
Baud Rate	2.5 Mbps, 5 Mbps, 10 Mbps, Custom
I²S	
Source	CH1~CH4 / D0~D15
Signal	BCLK, WS, DATA
Audio Variant	Audio-I2S, Audio-LJ, Audio-RJ
Start Bits	0~31
Data Bits	1~32
MIL-STD-1553B	
Source	CH1~CH4
SENT	
Source	CH1~CH4 / D0~D15
Manchester	
Source	CH1~CH4
Baud Rate	500 bps ~ 5 Mbps

SPECIFICATIONS

ARINC429	
Source	CH1~CH4
Baud Rate	12.5 kbps ~ 100 kbps, tolerance 1% ~ 20 %
Word format	L/SDI/D/SSM, L/D/SSM, L/D

Measurement

Automatic Measurement	
Source	CH1~CH4, D0~D15, Z1~Z4, F1~F4, Ref, History
Mode	Simple, Advanced
Range	Screen Gated: inside screen, definable with separate Gate cursors
Custom Threshold	Upper, Middle, Lower
No. of Measurements	Display 12 measurements at the same time (Display mode = M2)
Vertical Parameters	Max, Min, Pk-Pk, Top, Base, Amplitude, Mean, Cycle Mean, Stdev, Cycle Stdev, RMS, Cycle RMS, Median, Cycle Median, FOV, FPRE, ROV, RPRE, Level@Trigger
Horizontal Parameters	Period, Frequency, Time@max, Time@min, +Width, -Width, 10-90 %Rise time, 90-10 %Fall time, Rise time, Fall time, +Burst Width, -Burst Width, +Duty Cycle, -Duty Cycle, Delay, Time@Middle, Cycle-Cycle jitter
Miscellaneous Parameters	+Area@DC, -Area@DC, Area@DC, Absolute Area@DC, +Area@AC, -Area@AC, Area@AC, Absolute Area@AC, Cycles, Rising Edges, Falling Edges, Edges, Positive pulses, Negative pulses, Positive Slope, Negative Slope
Delay Parameters	Phase, FRFR, FRFF, FFFR, FFFF, FRLR, FRLF, FFLR, FFLF, Skew, Tsu@R, Tsu@F, Th@R, Th@F
Statistics	Current, Mean, Min, Max, Sdev, Count, Histogram, Trend, Track
Statistics Count	Unlimited, 1~1024
Cursors	
Source	CH1~CH4, D0~D15, F1~F4, Ref, Histogram
Type	Manual : Time X1, X2, (X1−X2), (1/ΔT); Vertical Y1, Y2, (Y1−Y2) Track: Time X1, X2, (X1−X2) Measure: indicates the measurement on specific parameter

Math

Trace	F1~F4
Source	CH1~CH4, Z1~Z4, F1~F4
Operation	FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation, |x|, Sign, ex, 10x, ln, lg, Interpolation, Max hold, Min hold, ERES, Average, 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), Customized (Mask Editor)
Mask test speed	Up to 14,000 frames/s
DVM	
Source	CH1~CH4
Mode	DC mean, DC RMS, AC RMS, Peak-peak, Amplitude
Plot	Bar, Histogram, Trend
Gate	20 ms
Bode Plot	
Source	CH1~CH4
Supported signal sources	Built-in waveform generator, optional USB AWG Module (connection: USB) 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/turn off, Transient response, PSRR, Efficiency, SOA
Histogram	
Source	CH1~CH4
Type	Horizontal, Vertical, Both
Counter	
Source	CH1~CH4
Frequency resolution	7 digits
Totalizer	Counter on edges, supports Gate and Trigger

Digital Channels (T3DSO2000-LS)

Max. Sampling Rate	500 MS/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	D0 ~ D15: ±1 sampling interval Digital to Analog: ± (1 sampling interval +1 ns)

SPECIFICATIONS

Waveform Generator

Channels	1
Max. Output Frequency	25 MHz
Sampling Rate	125 MS/s
Frequency Resolution	1 µHz
Frequency Accuracy	±50 ppm
Vertical Resolution	14 bit
Amplitude Range	-1.5 V ~ +1.5 V (into 50 Ω) -3 V ~ +3 V (into High-Z)
Waveforms	Sine, Square, Ramp, Pulse, DC, Noise, 45 Arbitrary
Output Impedance	50 Ω ± 2 %
Protection	Over voltage protection, Current limit
Sine	
Frequency	1 µHz ~ 25 MHz
Offset accuracy (10 kHz)	±(1 %*offset setting value +3 mVpp)
Amplitude flatness	±0.3 dB, compare to 10 kHz, 2.5 Vpp into 50 Ω
SFDR	DC ~ 1 MHz -60 dBc 1 MHz ~ 5 MHz -55 dBc 5 MHz ~ 25 MHz -50 dBc
Harmonic distortion	DC ~ 5 MHz -50 dBc 5 MHz ~ 25 MHz -45 dBc
Square/Pulse	
Frequency	1 µHz ~ 10 MHz
Duty cycle	1 % ~ 99 %
Edge	< 24 ns (10 % ~ 90 %)
Overshoot	< 3 % (typical, 1 kHz, 1 Vpp)
Pulse width	> 50 ns
Jitter (cycle-cycle)	< 500 ps + 10 ppm
Ramp	
Frequency	1 µHz ~ 300 kHz
Linearity	< 0.1 % of Pk-Pk (typical, 1 kHz, 1 Vpp, 50 % symmetry)
Channels	0 % ~ 100 %
DC	
Offset range	±1.5 V (into 50 Ω) ±3 V (into Hi-Z)
Accuracy	±(| setting value |*1 % + 3 mV)
Noise	
Bandwidth (-3 dB)	>25 MHz
Arb	
Frequency	1 µHz ~ 5 MHz
Waveform memory	16 kpts
Sample rate	125 MS/s
Wave import	From EasyWaveX, from U-disk, directly from waveform data of analog channels

I/O

Front	USB 2.0 Host x2, Calibration Signal: 1 kHz, 3 V Square
Rear	USB 2.0 Host, USB 2.0 Device, LAN: 10/100MbaseT (RJ45), External Trigger, EXT: ≤1.5 Vrms, EXT/5: ≤ 7.5 Vrms, Auxiliary Output: TRIG OUT (3.3 V LVCMOS), PASS/FAIL OUT (3.3 V TTL)

USB AWG Module (optional)

Channels	1
Max. Output Frequency	50 MHz
Sampling Rate	125 MS/s
Frequency Resolution	1 µHz
Frequency Accuracy	±50 ppm
Vertical Resolution	14 bit
Amplitude Range	-1.5 V ~ +1.5 V (into 50 Ω) -3 V ~ +3 V (into High-Z)
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	±0.3 dB, compare to 10 kHz, 2.5 Vpp into 50 Ω
SFDR	DC ~ 1 MHz -60 dBc 1 MHz ~ 5 MHz -55 dBc 5 MHz ~ 25 MHz -50 dBc
Harmonic distortion	DC ~ 5 MHz -50 dBc 5 MHz ~ 25 MHz -45 dBc
Square/Pulse	
Frequency	1 µHz ~ 10 MHz
Duty cycle	1 % ~ 99 %
Edge	< 24 ns (10 % ~ 90 %)
Overshoot	< 3 % (typical, 1 kHz, 1 Vpp)
Pulse width	> 50 ns
Jitter (cycle-cycle)	< 500 ps + 10 ppm
Ramp	
Frequency	1 µHz ~ 300 kHz
Linearity	< 0.1 % of Pk-Pk (typical, 1 kHz, 1 Vpp, 50 % symmetry)
Channels	0 % ~ 100 %
DC	
Offset range	±1.5 V (into 50 Ω) ±3 V (into Hi-Z)
Accuracy	±(| setting value |*1 % + 3 mV)
Noise	
Bandwidth (-3 dB)	>50 MHz
Arb	
Frequency	1 µHz ~ 5 MHz
Waveform memory	16 kpts
Sample rate	125 MS/s
Wave import	From EasyWaveX, from U-disk, directly from waveform data of analog channels

SPECIFICATIONS

Display

Display Type	10.1 TFT LCD with capacitive touch screen
Resolution	1024 × 600
Contrast (typical)	500 : 1
Backlight (typical)	500 nit

Display Setting

Range	8 x 10 grid
Display Type	Dot, Vector
Persistence Time	OFF, 0.1 s, 0.2 s, 0.5 s, 1 s, 5 s, 10 s, 30 s, infinite
Color Display	Normal, Color; Supports customer trace color
Language	English, Simplified Chinese, Traditional Chinese, French, Japanese, German, Spanish, Russian, Italian, Portuguese
Built-in Help System	English, Simplified Chinese

Environmental

Temperature	Operating: 0 °C ~ 50 °C Non-operating: -30 °C ~ 70 °C		
Humidity	Operating: 5 % ~ 90 %RH, 30 °C, degraded to 50 % RH at 50 °C Non-operating: 5 % ~ 95 %		
Altitude	Operating: ≤ 3,000 m, 25 °C Non-operating: ≤15,000 m		
Electromagnetic Compatibility	Meets EMC directive (2014/30/EU), meets or exceeds EN IEC 61326-1:2021 (Basic)		
	Conducted disturbance	CISPR 11/EN 55011	CLASS A group 1 150 kHz – 30 MHz
	Radiated disturbance	CISPR 11/EN 55011	CLASS A group 1 30 MHz – 1 GHz
	Electrostatic discharge (ESD)	IEC 61000-4-2/EN 61000-4-2	4.0 kV (Contact), 8.0 kV (Air)
	Radio-frequency electromagnetic field Immunity	IEC 61000-4-3/EN 61000-4-3	10 V/m (80 MHz to 1 GHz); 3 V/m (1.4 GHz to 2 GHz); 1 V/m (2.0 GHz to 2.7 GHz)
	Electrical fast transients (EFT)	IEC 61000-4-4/EN 61000-4-4	2 kV (Input AC Power Ports)
	Surges	IEC 61000-4-5/EN 61000-4-5	1 kV (Line to line) 2 kV (Line to ground)
	Radio-frequency continuous conducted Immunity	IEC 61000-4-6/EN 61000-4-6	3 V, 0.15 – 80 MHz
	Voltage dips and interruptions	IEC 61000-4-11/EN 61000-4-11	Voltage Dips: 0 % UT during 1 cycle; 40 % UT during 10/12 cycles; 70 % UT during 25/30 cycles Voltage interruptions: 0 % UT during 250/300 cycles
Safety	TUV Certified. Conforms to: UL 61010-1:2012/R:2018-11; CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11. UL 61010-2-030:2018; CAN/CSA-C22.2 No. 61010-2-030:2018. EN 61010-1:2010+A1:2019		
RoHS	EU 2015/863		

Power Supply

Input Voltage & Frequency	100 ~ 240 Vrms 50/60 Hz
Power consumption	120 W max., 70 W typical, 4 W typical in standby mode

Mechanical

Dimensions	Length × Height × Width = 317.2 mm × 236.0 mm × 149.0 mm (including knobs and supporting legs)
Weight	Net Weight 4.1 kg, Gross Weight 5.6 kg

All T3DSO2000HD Series Oscilloscopes come with a 3 year Teledyne LeCroy warranty.

T3DSO2000HD Probes and Accessories

Probe type	Model	Picture	Description
Passive	PP026-1		500 MHz bandwidth, 10 MΩ, 10X Probe, 1 supplied per channel. Replacement probe for the T3DSO2104HD, T3DSO2204HD and T3DSO2304 Oscilloscope.
Logic Probe	T3DSO2000-LS		Optional 16 Channel Logic Probe.
USB AWG Module	T3DSO-FGMOD		Output Sine, Square, Ramp, pulse, Noise, DC and 45 built-in waveforms. The arbitrary waveforms can be accessed and edited by the EasyScope PC software
Rackmount	T3DSOHD-RACK		The rackmount occupies a height of 5U. Support the oscilloscope for rack installation.
Soft Case	WS4KHD-SOFTCASE		Oscilloscope Soft Carrying Case.

Ordering information

Description	12-bit, 100 MHz, 2 GS/s, 4-CH, 200 Mpts/ch memory depth, 10.1" capacitive touch screen	T3DSO2104HD
	12-bit, 200 MHz, 2 GS/s, 4-CH, 200 Mpts/ch memory depth, 10.1" capacitive touch screen	T3DSO2204HD
	12-bit, 350 MHz, 2 GS/s, 4-CH, 200 Mpts/ch memory depth, 10.1" capacitive touch screen	T3DSO2354HD
	12-bit, 100 MHz, 2 GS/s, 4-CH, 200 Mpts/ch memory depth, 10.1" capacitive touch screen	T3DSO2104HD-MS
	12-bit, 200 MHz, 2 GS/s, 4-CH, 200 Mpts/ch memory depth, 10.1" capacitive touch screen	T3DSO2204HD-MS
	12-bit, 100 MHz, 2 GS/s, 4-CH, 200 Mpts/ch memory depth, 10.1" capacitive touch screen	T3DSO2354HD-MS
Standard Accessories	Passive Probe x 4	
	USB Cable	
	Power Cord	
	Wireless mouse	
	Quick Start Guide	
	Certificate of Calibration	
Optional Accessories	16 Channel MSO Probe	T3DSO2000-LS
	500 MHz Passive Probe, 10:1, 10 MΩ	PP026-1
	USB AWG Module	T3DSO-FGMOD

TELEDYNE TEST TOOLS
Everywhere**you**look™

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/

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

World wide instrument service can be found at:
https://teledynelecroy.com/support/service.aspx

RoHS and WEEE information can be found at:
https://teledynelecroy.com/support/rohs.aspx

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:	support@teledynelecroy.com
Web Site:	http://teledynelecroy.com/

teledynelecroy.com