

DIGITAL STORAGE OSCILLOSCOPE

TDO3000 Series of Digital Storage Oscilloscope



Note : TDO3102B

Due to keeping innovation, the specification and Machine pictures or color are subject to alteration without notice!

Features

- Signal bandwidth: 25MHz/60MHz/100MHz/200MHz
- Real-time sampling rate: Max. 1Gsp/s
- Equivalent sampling rate: Max. 50Gsp/s
- 5.6-inch TFT LCD Color display with better clearance, multi-color schemes available
- With up to 2.4Mpts memory depth, more signal details can be seen.
- Independent vertical scale and position control knobs for each channel
- Edge, Pulse width and Video trigger mode available. Alternating triggering function is also available to stably display asynchronous signals
- Unique variable trigger sensitivity to suit special measurement requirements on different occasions
- Math functions including add, subtract, multiply and 1024-point FFT
- Up to 24 kinds of parameters automatic measurements
- Advanced cursor modes: Manual, Auto and Track
- Practical low-pass, high-pass, band-pass, band-reject digital filters with adjustable cut-off frequency
- Unique waveform recording and playback function.
- PASS / FAIL detection, optical isolated PASS/FAIL output
- Built-in 5 digits hardware frequency counter
- Auto-calibration feature
- Multiple language user interface
- Pop-up menu, the user operation more convenient and intuitive
- Embedded help information system in Chinese and English
- Up to 10 internal setup and waveform files memories, external storage of setup, track, waveform, BMP bitmap and CSV files
- USB Host Port, Support USB disk storage, and firmware upgrade can be carried out through an USB disk.
- PRINT button pressed to directly store the screen image (BMP) or the waveform data (CSV) in an USB disk
- USB device, LAN (only for B series) and RS232C interface for the instrument remote control
- Upgrade the working procedure via USB HOST

Application Fields

- Laboratory and training center in colleges and universities
- Production line test and quality Control
- Test and measurement in R&D department
- Maintenance and aftersales service

Brief Introduction

■ TDO3000 series digital storage oscilloscopes provide you with excellent performance and strong functions in a compact design. Even as a new generation of portable low-priced general product, the series still offers many measurement functions of middle or high end product and meets your measurement requirement with affordable cost.

With bandwidth 25MHz, 60MHz, 100MHz and 200MHz, the series offers a maximum real-time sampling rate of 1Gsp/s and equivalent sampling rate of 50Gsp/s to ensure you accurate observation of signal details.

Many standard configured advanced characteristics such as multi trigger modes, auto measurement, digital filtering, waveform storage, math function, FFT, PASS/FAIL judgement, multi communication interfaces, etc. make the measuring more convenient and quickly.

Prominent Signal Measuring Capability

Observation of the signal more clearly

TDO3000 Series has a 5.6-inch 320x234 TFT LCD color display for watching signals from any viewing angle. Different from traditional oscilloscope's fixed menu display, TDO3000 series can display the waveform to full screen according to your need.

Single MENU ON/OFF key enables you to view more information in 25% more display area.

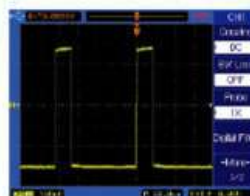


Figure 1 Normal display with menu on

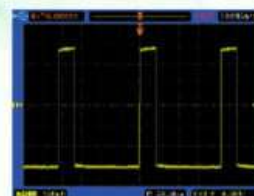


Figure 2 Full-screen display with menu off

Deep memory depth for capturing more

Maximum 2.4Mpts memory depth for each channel on all models, TDO3000 series is easy to record and analyze the waveform. Even under the slow time base settings, you can maintain a high sampling rate. This allows you observe the signal in more details. In a given sampling rate, the more sampling points mean the longer the time observed.

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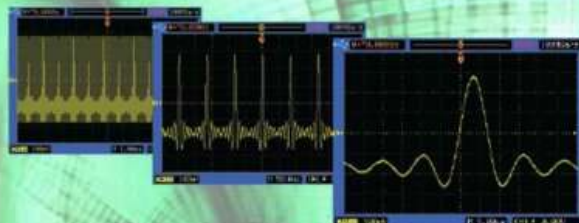


Figure 3 Deep memory depth waveform display

Delayed sweep mode for both details and the whole waveform

In Delayed sweep mode, you can view simultaneously the details on a particular part and the whole waveform. Through split display you can zoom in on a particular area on your signal while still viewing the entire captured waveform.

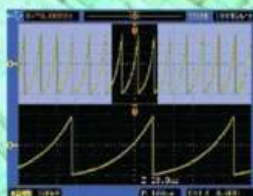


Figure 4 Delay mode to observe signal details

Powerful Functions

TDO3000 series oscilloscope is your indispensable assistant to get your job done easier and faster.

Auto scale

Auto scale can evaluate all input signals and set the correct condition to best display the signals. Single period or multiple periods can be selected to display in the current display window.

Running control

RUN/STOP mode: to continuously observe waveform or freeze the current waveform on the screen.

SINGLE mode: to automatically recognize signal meeting trigger conditions, and to immediately sample the signal to fixedly display, especially suitable to sample single signal.

Math Function and FFT

TDO3000 series provides some important math operations, including addition, subtraction, multiplication, or 1024-point FFT (Fast Fourier Transforms). For time-domain signal analysis, you can use additions (signal superimpose), subtraction (elimination of noisy component or differential operation, etc.), multiplication (frequency mixing, etc.) processes. For frequency-domain analysis, you have FFT (Fast Fourier Transforms) with five window function (Rectangular, Hanning, Hamming, Blackman, Flat-Top). And spectrum amplitudes of FFT can be displayed in linear or dBV (RMS) scale type.



Figure 5 FFT analysis (dBV)

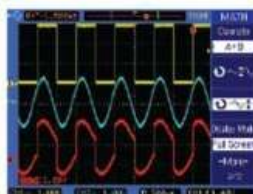


Figure 6 Addition operation

24 Automatic Parametric Measurements

TDO3000 series provides up to 24 automatic parametric measurements. You can either install three commonly used screen measurements or display all the 24 measurements of the current selected source on the screen. Auto measurement can not only save your time for eye observation, but also provide you more accurate results. Without complicated operation, you can get your measurement results easily and quickly.

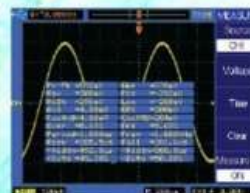


Figure 7 Auto measurement display

Convenient observation of all signals

Roll mode: It is one of the useful features of TDO3000A/B series to test low-speed signal accurately. Using the Roll mode, the change of ultra slow speed signal can be observed.



Figure 8 Slow speed signal in Roll mode

X-Y mode: In X-Y mode, channel 1 becomes the X input and channel 2 becomes the Y input. Lissajou's figure can be displayed to calculate phase difference of same-frequency signals.



Figure 9 Lissajou's figure in X-Y mode

Video Trigger: TDO3000 series can synchronously trigger on specified line or field of the standard NTSC or PAL/SECAM video signal.

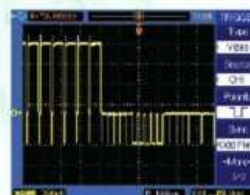


Figure 10 Video trigger mode for TV signal

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More Functions

Digital Filter

TDO3000 series provides several digital filters, including low pass, high pass, band pass, and band reject filters. It can be applied to displayed signals to acquire expected results, such as to simulate the effect of a hardware filter, to reject aliasing noise or error signal to clearly observe a signal of interest, etc. The high and low cut-off frequency can be set randomly.

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Figure 11 Signal with noises



Figure 12 Signal processed with a low pass filter

Waveform Record and Replay

TDO3000 series can record the input signal over a period of time continuously in the internal or external memory for future analysis. Up to 1000 frames can be recorded with the variable time interval ranging from 1 ms to 1000s. The recorded frames can be played back continuously or played frame by frame, so that you can observe any frame and capture any tiny abnormality.

PASS/FAIL Judgment

On the production line, it is valuable to judge some kind of signal and decide if it is good or not. TDO3000A series can measure the selected input signal and compare it with the predefined PASS/FAIL regulations and then output the PASS/FAIL result. This function is more convenient and quick and reduces error of man-made judgement.



Figure 13 PASS/FAIL measurement

Auto Calibration

TDO3000 can automatically calibrate its vertical, horizontal and trigger system, so that it can work with the best measurement accuracy.

Unique Built-in Function/Arbitrary Waveform Generator Module

- The first digital oscilloscope with built-in function/ arbitrary waveform generator module in the world
- More accurate, stable and low distortion output with the help of advanced DDS technology
- 200MSa/S sampling rate, 14bits vertical A/D resolution
- 10MHz / 20MHz / 40MHz sine/ square waveform frequency output
- Maximum 10MHz impulse signal frequency output
- Up to 30 kinds of built-in waveforms , such as sine, square,

triangular wave etc.

- Built-in multiple modulation function, including AM, FM, PWM, FSK, PSK and Bias modulation.
- 1uHz ~ 10MHz/1uHz ~ 20MHz/1uHz ~ 40MHz frequency sweep in Up, Down and Round sweep mode.
- Up to 30 kinds of commonly used waveforms burst output, including sine, square, triangular waveforms
- 8kpts arbitrary waveform memory depth
- Realize the seamless connection between oscilloscope and function/arbitrary waveform generator

Flexible Human-Machine Interface

Logical and easy operation

Different function areas, including input channels, time base, trigger channel and function areas, are positioned and marked respectively, so that it is easy to access and operate. The main front-panel keys light when the corresponding functions are available or active. This human-oriented feature makes your job much easier.



Figure 14 The front panel key board

Multi interface selections

The instrument provides multi interfaces, including USB host interface used to store waveform files (BMP, CSV file format) to an USB disk by simply pressing "PRINT" key, and USB device interface or RS232 interface used to communicate with a computer to control the instrument or to transmit the waveform data.

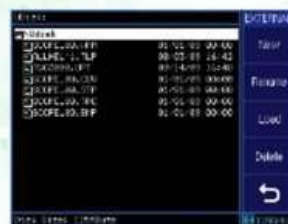


Figure 15 USB disk file system

Software update

The latest updated software of TDO3000 series can be downloaded free from our website (www.tonghui.com.cn), and can be loaded to the corresponding oscilloscope through the USB host interface.

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Specifications

Model		TDO3022A/TDO3022AS	TDO3062A/TDO3062AS TDO3062B/TDO3062BS	TDO3102A/ TDO3102AS TDO3102B/ TDO3102BS	TDO3202B/ TDO3202BS
Sampling System					
Max real time sampling rate		Series A:400Msps Series B:1Gsps			
Max equivalent sampling rate		10Gsps	Series A:20Gsps	Series B:50Gsps	
Memory depth		Single channel ON:2.4Mpts Double channel ON:1.2Mpts			
Vertical A/D resolution		8 Bits			
Sampling mode		Sample, Peak detect, Averaging			
Auto scale		Automatically set vertical scale(V/div), time base(s/div), and trigger mode.			
Vertical System					
Channels		2 analog input channels and 1 trigger input channel			
Bandwidth		25MHz	60MHz	100MHz	200MHz
Coupling		DC, AC and GND			
Bandwidth limit (-3dB)		Not available	20MHz		
Calculated rise time		<14.0ns	<5.83ns	<3.50ns	<1.75ns
Vertical scale (V/div)		Series A: 2mV/div to 5V/div 1-2-5 step Series B: 2mV/div to 10V/div 1-2-5 step			
Vertical gain accuracy		2mV/div, 5mV/div $\pm 4\% \times \text{reading} \pm 0.1 \text{ div} \times \text{V/div} + 0.5 \text{ mV}$; 10mV/div to 10V/div $\pm 3\% \times \text{reading} \pm 0.1 \text{ div} \times \text{V/div} + 1 \text{ mV}$;			
Vertical offset range		± 8 div away from the screen center			
Probe attenuation factor		$\times 1, \times 10, \times 100, \times 1000$			
Input impedance		1M Ω 18pF			
Delay differential		± 150 ps when vertical scale and coupling settings are identical			
Max. input voltage		400V (DC+AC peak,@1M Ω)			
Probe compensation output		3Vp-p, 1kHz			
Horizontal System					
Time base range (1-2-5 step)		10ns—50s/div	Series A:5ns—50s/div	Series B: 2ns—50s/div	5ns—50s/div
Horizontal mode		Main, Delayed, X-Y and Roll			
Time base accuracy		$\pm 0.01\%$			
XY mode	Input	X-axis input (horizontal): CH1 Y-axis input (vertical): CH2			
	Bandwidth	25MHz	60MHz	100MHz	200MHz
	Phase error	$\pm 3^\circ$			
Trigger System					
Trigger source		CH1, CH2, EXT, EXT/5, LINE, Alternating			
Trigger mode		Auto, Normal, Single			
Trigger coupling		DC, AC, LF-reject, HF- reject			
Trigger type		Edge, Pulse width, Video			
Trigger level range		Internal: ± 8 div from screen center; EXT: ± 1.6 V; EXT/5: ± 8 V			
Trigger sensitivity		0.1div to 1.0div user adjustable			
EXT input impedance		1M Ω 18pF			
EXT max. Input voltage		400V (DC+AC peak,@1M Ω)			
Signal Measurement					
Voltage parameters		Max, Min, VPP, High, Low, Amplitude, Average, RMS, Overshoot, Preshoot, Cycle average, Cycle RMS			
Time parameters		Frequency, Period, Rise time, Fall time, +Width, -Width, +Duty, -Duty, Delay, Phase, X@MAX, X@MIN			
Math functions		A-B, A+B, A $\times$ B, FFT(1024points)			
Cursor measurement		Manual, Auto, Track			
Hardware frequency counter		5-digit frequency counter up to full bandwidth			
Storage & Interface					
Internal storage		10 setup files and 10 trace files			
File format		Setup, Waveform, Trace, BMP and CSV file			
Interface		USB HOST, USB DEVICE, RS232C and PASS/FAIL OUT,LAN(only for B series)			
Display System					
Display screen		TFT LCD display, 5.6-inch			
Resolution		320(horizontal) $\times$ 234(vertical) dot matrix			
Color		24 bit true color			
Menu language		Simplified Chinese, Traditional Chinese, English etc.			
Waveform Display	Scale	Menu ON:8div(vertical) $\times$ 10div(horizontal) i.e. 200(vertical) $\times$ 250(horizontal) dot matrix Menu OFF:8div(vertical) $\times$ 12div(horizontal) i.e. 200(vertical) $\times$ 300(horizontal) dot matrix			
	Type	Dot , Vector			
	Interpolation	(Sinx)/x, Linear			
	Persistence	Off, Infinite			
	Format	YT / XT			
Other Specifications					
Operation ambient temperature & humidity		0°C to 40°C, $\leq 90\%$ RH			
Line voltage		99V to 242V AC,47Hz to 440Hz			
Power consumption		≤ 50 VA			
Instrument dimension		320mm(W) $\times$ 156.5mm(H) $\times$ 123mm(D)			
Net weight		Approx. 2.5kg			

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Function/Arbitrary Waveform Generator Specifications

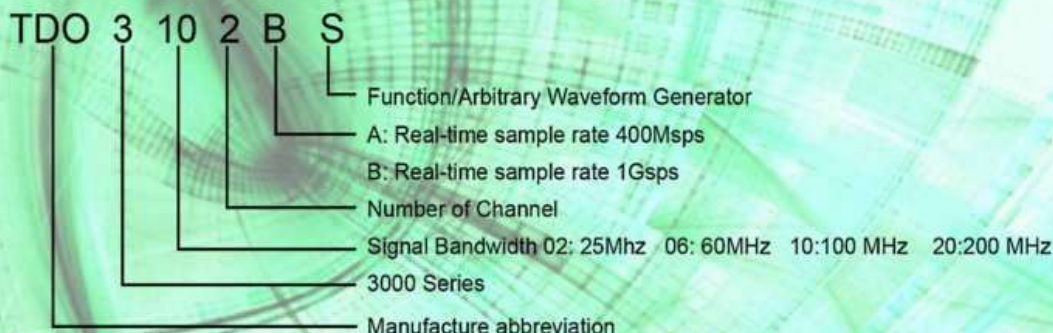
Model	TDO3022AS		TDO3062AS/TDO3062BS	TDO3102AS/TDO3102BS/TDO3202BS
Frequency Characteristics				
Sine waveform	1μHz~10MHz		1μHz~20MHz	1μHz~40MHz
Pulse waveform	1μHz~10MHz			
Other waveforms	1mHz~1MHz			
Frequency resolution	1μHz(Sine, Square, Pulse), 1mHz(other)			
Frequency accuracy	±5×10 ⁻⁴			
Frequency stability	±5×10 ⁻⁵			
Sine Characteristics				
Harmonic Distortion	<5MHz:	-50dBc		
	≤10MHz:	-45dBc		
	>10MHz:	-40dBc		
Total harmonic distortion	20Hz~100kHz:	≤0.2%		
Amplitude Characteristics				
Amplitude range into open circuit	When freq.≤ 20MHz, 2mVpp to 20 Vpp When freq. > 20MHz, 2mVpp to 6 Vpp			
Max resolution into 50Ω	1μVp-p			
Max resolution into open circuit	2μVp-p			
Amplitude accuracy	±2%+1mV (1kHz sine waveform)			
Amplitude stability	±1 % in 4 hours			
Amplitude flatness	When freq. ≤ 5 MHz: ±5% When freq. > 5MHz: ±10%			
(Sine, Square, Pulse)				
Amplitude flatness	When freq. ≤ 50 kHz: ±5% When freq. > 50kHz: ±20%			
(other waveforms)				
Output impedance	50Ω			
AM Modulation Characteristics				
Carrier waveforms	Sine, Square			
Source waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.			
Source frequency	1mHz to1MHz			
Source depth	0% to 120%			
FM Modulation Characteristics				
Carrier waveforms	Sine, Square			
Source waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.			
Source frequency	1mHz to 1MHz			
Frequency deviation	0.1% to 99.9%			
PWM Modulation Characteristics				
Carrier waveform	Pulse			
Source waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.			
Source frequency	1mHz to 1MHz			
Width deviation	1% ~ 99%			
FSK Modulation Characteristics				
Carrier waveform	Sine			
Hop frequency	1μHz to10MHz	1μHz to20MHz	1μHz to40MHz	
Interval time	1ms to 40s			
PSK Modulation Characteristics				
Carrier waveform	Sine			
Hop phase	0° to 360°			
Interval time	1ms to 40s			
DCOM Modulation Characteristics				
Carrier waveforms	Sine, Square			
Source waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.			
Source frequency	1mHz to1MHz			
Function description	Realize addition of carrier waveform and modulated waveform			
Frequency Sweep Characteristics				
Waveforms	Sine, Square			
Frequency range (≤ 6 V _{pp})	1μHz to 10MHz	1μHz to 20MHz	1μHz to 40MHz	
Frequency range (> 6 V _{pp})	1μHz to 10MHz	1μHz to 20MHz	1μHz to 20MHz	
Sweep mode	Up, Down, Round			
Sweep time	1ms to 500s			
Burst Characteristics				
Waveforms	30 commonly used waveforms, including Sine, Square, Triangle etc.			
Counts	1 to 60000 cycles			
Burst frequency	1mHz to 1MHz			

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Ordering Information

Naming principle:



TDO3000 Series

Model	Real-time sample rate	Equivalent sample rate	Memory depth	Bandwidth	Function/Arbitrary Waveform Generator
TDO3022A	400Mpsps	10Gpsps	2.4Mpts	25MHz	-----
TDO3062A	400Mpsps	20Gpsps	2.4Mpts	60MHz	-----
TDO3102A	400Mpsps	20Gpsps	2.4Mpts	100MHz	-----
TDO3062B	1Gpsps	50Gpsps	2.4Mpts	60MHz	-----
TDO3102B	1Gpsps	50Gpsps	2.4Mpts	100MHz	-----
TDO3202B	1Gpsps	50Gpsps	2.4Mpts	200MHz	-----
TDO3022AS	400Mpsps	10Gpsps	2.4Mpts	25MHz	10MHz
TDO3062AS	400Mpsps	20Gpsps	2.4Mpts	60MHz	20MHz
TDO3102AS	400Mpsps	20Gpsps	2.4Mpts	100MHz	40MHz
TDO3062BS	1Gpsps	50Gpsps	2.4Mpts	60MHz	20MHz
TDO3102BS	1Gpsps	50Gpsps	2.4Mpts	100MHz	40MHz
TDO3202BS	1Gpsps	50Gpsps	2.4Mpts	200MHz	40MHz

Instrument Accessories

TDO-XXX oscilloscope probe (XXX indicating bandwidth) 2
 3-wire power cord 1
 Operation Manual 1

Options

TDO-comsoft03 connection software
 BNC cable

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