

# RIGOL

## Data Sheet

### DS1000 Series Digital Oscilloscopes

#### DS1000X series:

DS1102C, DS1102M, DS1062C, DS1062M  
DS1042C, DS1042M, DS1022C, DS1022M

#### DS1000XD series:

DS1102CD, DS1102MD, DS1062CD, DS1062MD  
DS1042CD, DS1042MD, DS1022CD, DS1022MD

#### Product Overview

DS1000 series are kinds of economical digital oscilloscopes with high-performance.

DS1000X series are designed with dual analog channels and 1 external trigger channel.

DS1000XD series are designed with dual analog channels and 1 external trigger channel as well as 16-channel logic analyzer (MSO).



#### Applications

- Electronic Circuit Test
- Circuit Functional Test
- Logical Relation Between Signals Verification
- Circuit of Mixed Signal Test
- Education & Training

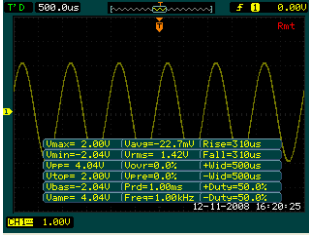
#### Main Features

- Dual analog channels and 16-channel logic analyzer. 100MHz maximum bandwidth, 400 MSa/s (single channel) and 200MSa/s (dual channels) maximum real-time sample rate, 25GSa/s maximum equivalent sample rate
- High-definition color/monochrome LCD with 320X234 resolution make the waveform displays more clear and vivid
- Abundant trigger types: Edge, Video, Slope, Pulse width, Alternate, Pattern and Duration triggers
- Unique adjustable trigger sensitivity enables to meet different demands
- Enable to measure 20 types of wave parameters and track measurements via

#### Easy to Use Design

- Built-in help menu enables information getting more convenient
- Multiple Language User Interface, support Chinese & English input
- Support U disk and local files storage
- Waveform intensity can be adjusted
- To display a signal automatically by **AUTO**
- Pop-up menu makes it easy to read and use
- cursor automatically
- Unique waveform record and replay function
- Fine delayed scan function
- Built-in FFT function, hold practical digital filters
- Pass/Fail detection Function enables to output testing results
- Math operations available to multiple waves
- Powerful PC application software UltraScope
- Standard configuration interface: USB Device, USB Host, RS-232, support U disk storage and USB print
- Support for remote command control

### ➤ Automatically Measure 20 Wave Parameters

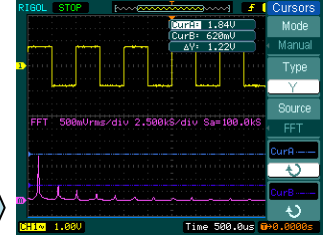


Automatic measure

DS1000 series oscilloscopes provide 20 types of wave parameters for automatically measuring which contains 10 Voltage and 10 Time parameters.

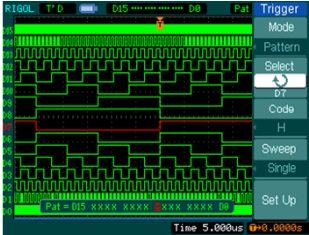
In cursor mode, users can easily measure by moving cursor. Besides, 3 types of cursor measurement are optional: Manual, Track and Auto.

### ➤ Cursor Measure



FFT cursor measure

### ➤ Multiple Trigger



Pattern trigger

DS1000 series digital oscilloscopes contain abundant triggers:

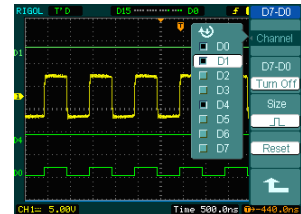
- Edge trigger, Video trigger, Slope trigger, Pulse Width trigger
- Alternate trigger, Pattern trigger, Duration trigger

Especially the duration trigger is a new type from perfect combination of pattern and pulse width trigger. Unique function of adjustable trigger sensitivity is good for filtering possible noise from signal in order to avoid false triggers.

### ➤ 16 Channels Logic Analyzer

Being equipped with 16 channels logic analyzer, DS1000XD series mixed signal oscilloscopes achieve mixed signal measure coordinating with 2 analog channels.

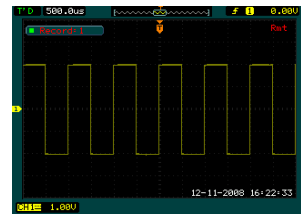
Each channel can be turned on or off independently, or in groups of 8(D7-D0 and D15-D8); also, you can set waveform size and threshold types or change the display position on screen for digital channel.



Digital channels setup

### ➤ Waveform Recording

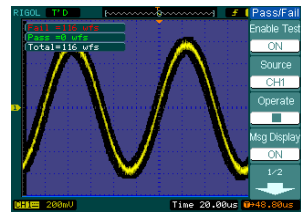
In virtue of waveform recording function from DS1000 series, not only the outputs from two channels could be recorded, but also the waves outputted by Pass/Fail test could be easily recorded. Totally, up to 1000 frames of waves are available to record. Besides, users can analyze waves according to recall or save transient waves so as to get more exact datum.



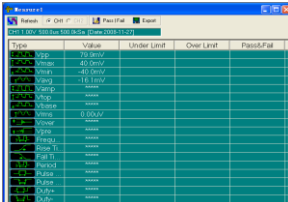
Waveform recording

### ➤ Pass/Fail Testing

The Pass/Fail function monitors the changes of signals by comparing whether the input signal is within the pre-defined mask. The testing results not only can be displayed on screen or output by isolated pass/fail port but also can be alarmed if turn on system sound.



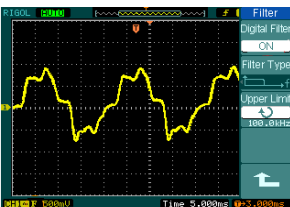
Pass/Fail testing



Measurement window

### ➤ UltraScope Software

RIGOL provides powerful PC application software: UltraScope, which enables to: Capture and measure wave; Perform local or remote operation; Save waves as ".bmp" format; Save files as ".txt" or ".xls" format; Print waveforms.



Digital filters

### ➤ Digital Filters

DS1000 series digital oscilloscopes provide 4 kinds of practical digital filter: LPF, HPF, BPF and BRN, which can achieve very good filtering effect by setting up the range of filter bandwidth.

# Specifications

All specifications apply to the DS1000 Series Oscilloscopes unless noted otherwise. To meet these specifications two conditions must first be met:

- The instrument must have been operating continuously for thirty minutes within the specified operating temperature.
- Must perform the Self-Calibration operation, accessible through the Utility menu, if the operating temperature changes by more than 5°C.

All specifications are guaranteed unless noted "typical".

## Specifications

<b>Acquisition</b>	
Sample Modes	Real-Time Sample
Sample Rate	400MSa/s (single channel) <sup>[1]</sup> , 200MSa/s <sup>[2]</sup> 200MSa/s (double channels), 200MSa/s <sup>[2]</sup>
Averages	Equivalent Sample 25GSa/s <sup>[3]</sup>
A waveform will be displayed one time while all the channels finish N times sample, N could be selectable from 2, 4, 8, 16, 32, 64, 128 and 256	
<b>Inputs</b>	
Input Coupling	DC, AC, GND
Input Impedance	1MΩ±2%, in parallel with 15pF±3pF Input Impedance of LA is 100kΩ <sup>[2]</sup>
Probe Attenuation Factors	1X, 5X, 10X, 50X, 100X, 500X, 1000X
Maximum Input Voltage	400V (DC+AC Peak, 1MΩ input impedance) 40V (DC+AC Peak) <sup>[2]</sup>
Time Delay between Channel (typical)	500ps
<b>Horizontal</b>	
Sample Rate Range	1Sa/s-400MSa/s (Real-Time), 25GSa/s (Equivalent)
Waveform Interpolation	Sin(x)/x
Record Length	Up to 1M samples for single channel 512K samples for each channel 512K samples <sup>[2]</sup>
Scanning Speed Range (Sec/div)	2ns/div-50s/div, DS1102XX, DS1062XX 10ns/div-50s/div, DS1042XX 20ns/div-50s/div, DS1022XX 1-2-5 Sequence
Sample Rate and Delay Time Accuracy	±100ppm (over any 1ms time interval)
Delta Time Measurement Accuracy (Full Bandwidth)	Single: ±(1 sample interval + 100ppm × reading + 0.6 ns) >16 averages: ±(1sample interval + 100ppm × reading + 0.4 ns)
<b>Vertical</b>	
A/D Converter	8-bit resolution, all channels sample simultaneously <sup>[1]</sup>
Volts/div Range	2mV/div-5V/div (at the input terminal connecting to BNC)
Offset Range	±40V(200mV/div-5V/div) ±2V(2mV/div -100mV/div)
Analog Bandwidth	100MHz(DS1102CD, DS1102C, DS1102MD, DS1102M) 60MHz(DS1062CD, DS1062C, DS1062MD, DS1062M) 40MHz(DS1042CD, DS1042C, DS1042MD, DS1042M) 25MHz(DS1022CD, DS1022C, DS1022MD, DS1022M)
Single-shot Bandwidth	80MHz(DS1102CD, DS1102C, DS1102MD, DS1102M)

	60MHz(DS1062CD, DS1062C, DS1062MD, DS1062M) 40MHz(DS1042CD, DS1042C, DS1042MD, DS1042M) 25MHz(DS1022CD, DS1022C, DS1022MD, DS1022M)	
Selectable Analog Bandwidth Limit (typical)	20MHz	
Lower Frequency Response (AC -3dB)	≤5Hz (at input BNC)	
Rise Time at BNC (typical)	<3.5ns, <5.8ns, <8.7ns, <14ns, On 100 MHz, 60 MHz, 40 MHz, 25 MHz respectively	
DC Gain Accuracy	2mV/div-5mV/div: ±4% (Normal or Average acquisition mode) 10mV/div-5V/div: ±3% (Normal or Average acquisition mode)	
DC Measurement Accuracy Average Acquisition Mode	Average of ≥16 Waveforms with vertical position at zero: ±(4%×reading+0.1div+1mV) at 2mV/div or 5mV/div ±(3%×reading+0.1div+1mV) at 10mV/div-5V/div Average of ≥16 Waveforms with vertical position not at zero: ±[3%×(reading+vertical position)+(1% of vertical position) + 0.2div] Add 2mV for settings from 2mV/div to 200 mV/div Add 50mV for settings from >200mV/div to 5V/div	
Delta Volts Measurement Accuracy (Average Acquisition Mode)	Under same setting and condition, the voltage difference ( $\Delta V$ ) between any two points in the waves coming from the average of more than 16 waves have been acquired: ±(DC Gain Accuracy× reading + 0.05 div)	
<b>Trigger</b>		
Trigger Sensitivity	0.1div-1.0div (adjustable)	
Trigger Level Range	Internal	±6 divisions from center of screen
	EXT	±1.2V
	EXT/5	±6V
Trigger Level Accuracy (typical) applicable for the signal of rising and falling time ≥20ns	Internal	±(0.3div×V/div)(±4 divisions from center of screen)
	EXT	±(6% of setting + 40mV)
	EXT/5	±(6% of setting + 200mV)
Trigger Offset	In Normal mode: pre-trigger (262144/ sample rate), delayed trigger 1s	
	In Slow Scan mode: pre-trigger 6div, delayed trigger 6div	
Trigger Holdoff Range	100ns-1.5s	
HF Reject	120kHz±20%	
LF Reject	8kHz±20%	
Set Level to 50% (typical)	When input signal frequency ≥50Hz	
<b>Edge Trigger</b>		
Edge trigger slope	Rising, Falling, Rising + Falling	
<b>Pulse Width Trigger</b>		
Trigger Condition	(>, <, =) Positive pulse, (>, <, =) Negative pulse	
Range of Pulse Width	20ns – 10s	
<b>Video Trigger</b>		
Video Standard Line Frequency	Support for standard NTSC, PAL and SECAM broadcast systems. Line number range: 1-525 (NTSC) and 1-625 (PAL/SECAM)	
<b>Slope Trigger</b>		
Trigger Condition	(>, <, =) Positive slope, (>, <, =) Negative slope	
Time Setting	20ns – 10s	
<b>Alternate Trigger</b>		
Trigger on CH1	Edge, Pulse Width, Video, Slope	
Trigger on CH2	Edge, Pulse Width, Video, Slope	
<b>Pattern Trigger</b> <sup>[2]</sup>		

Pattern Type	D0 – D15 select H, L, X, $\bar{f}$ , $\bar{t}$	
<b>Duration Trigger<sup>[2]</sup></b>		
Pattern Type	D0 – D15 select H, L, X	
Qualifier	>, <, =	
Time Setting	20ns – 10s	
<b>Measurements</b>		
Cursor	Manual	Voltage difference between cursors ( $\Delta V$ ) Time difference between cursors ( $\Delta T$ ) Reciprocal of $\Delta T$ in Hertz ( $1/\Delta T$ )
	Track	Voltage value for Y-axis waveform Time value for Y-axis waveform
	Auto	Cursors are visible for Automatic Measurement
Auto Measure	Vpp, Vamp, Vmax, Vmin, Vtop, Vbase, Vavg, Vrms, Overshoot, Preshoot, Freq, Period, Rise Time, Fall Time, +Width, -Width, +Duty, -Duty, Delay1 $\rightarrow 2\bar{f}$ , Delay1 $\rightarrow 2\bar{t}$	

**Remarks:**

[1] Only one input channel is available when sample rate is 400MSa/s.

[2] Specification of DS1000xD series Logic Analyzer.

[3] Different types have different sample rate:

DS1102C, DS1102CD, DS1102M, DS1102MD: 25GSa/s

DS1062C, DS1062CD, DS1062M, DS1062MD: 10GSa/s

DS1042C, DS1042CD, DS1042M, DS1042MD: 5GSa/s

DS1022C, DS1022CD, DS1022M, DS1022MD: 2.5GSa/s

## General Specifications

<b>Display</b>		
Display Type	5.7inch. (145mm) diagonal TFT Liquid Crystal Display	
Display Resolution	320 horizontal×RGB×234 vertical pixels	
Display Color	64K color (DS1000C, DS1000CD) Mono (DS1000M, DS1000MD)	
Display Contrast (typical)	150:1	
Backlight Brightness (typical)	300nit	
<b>Probe Compensator Output</b>		
Output Voltage (typical)	3Vp-p into $\geq 1 \text{ M}\Omega$ load	
Frequency (typical)	1kHz	
<b>Power Supply</b>		
Supply Voltage	100-240VACRMS, 45-440Hz, CAT II	
Power Consumption	Less than 50VA	
Fuse	2A, T rating, 250 V	
<b>Environmental</b>		
Ambient Temperature	Operating 10°C ~ 40°C	
	Non-operating: -20°C ~ +60°C	
Cooling Method	Fan force air flow	
Humidity	+35°C or below: $\leq 90\%$ relative humidity	
	+35°C ~ +40°C: $\leq 60\%$ relative humidity	
Altitude	Operating 3,000 m or below	
	Non-operating 15,000 m or below	
<b>Mechanical</b>		
Dimensions	Width	303mm
	Height	154mm
	Depth	133mm
Weight	Without package	2.4kg
	Packaged	3.8kg
<b>IP Protection</b>		
IP2X		
<b>Calibration Interval</b>		
The recommended calibration interval is one year		

## Ordering Information

### Name of Product

**RIGOL** DS1000 series digital oscilloscopes

### Standard Accessories

- Probex×2 (1.5m), 1:1, (10:1) Passive Probes
- A set of Digital probe components (DS1000XD) include:
  - A data cable (Model: FC1868)
  - An active logic head (Model: LH1116)
  - Twenty test wire (Model: LC1150)
  - Twenty logic clips (Model: TC1100)
- A Power Cord that fits the standard of destination country
- An User's Guide
- UltraScope for WIN98/2000/XP software

### Optional Accessories

- DS1000 soft carrying case

## Warranty

Thank you for choosing **RIGOL** products!

**RIGOL** Technologies, Inc. warrants that this product will be free from defects in materials and workmanship from the date of shipment. If a product proved defective within the respective period, **RIGOL** will provide repair or replacement as described in the complete warranty statement.

For the copy of complete warranty statement or maintenance, please contact with your nearest **RIGOL** sales and service office.

**RIGOL** do not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hint guarantee items related to tradable characteristic and any particular purpose. **RIGOL** will not take any responsibility in cases regarding to indirect, particular and ensuing damage.

## Contact Us

If you have any problem or requirement during using our products, please contact **RIGOL** Technologies, Inc. or the local distributors.

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Fax: (86-10) 8070 5070

### Service & Support Hotline: 800 810 0002

9:00 am – 5: 00 pm from Monday to Friday

Or by e-mail:

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