RIGOL

Data Sheet

DS1000E, DS1000D Series Digital Oscilloscopes

DS1102E, DS1052E, DS1102D, DS1052D

Product Overview

DS1000E, DS1000D series are kinds of economical digital oscilloscope with high-performance.

DS1000E series are designed with dual channels and 1 external trigger channel.

DS1000D series are designed with dual channels and 1 external trigger channel as well as 16 channels logic analyzer.

Applications

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

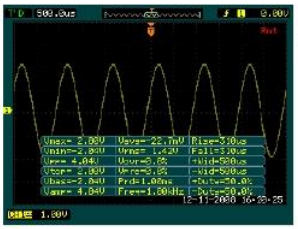
Main Features

- Dual analog channels and 16 channels logic analyzer, 100MHz maximum bandwidth, 1GSa/s maximum real-time sample rate and 25GSa/s maximum equivalent sample rate
- 5.6 inch 64k TFT LCD makes the waveform displays more clear and vivid
- Abundant trigger types: Edge, Pulse Width, Video, Slope, Alternate, Pattern and Duration
- Unique adjustable trigger sensitivity enables to meet different demands
- Enable to measure 22 types of wave parameters and track measurements via cursor automatically
- Unique waveform record and replay

Easy to Use Design

- Built-in help menu enables information acquisition more convenient
- Multiple language menu and Chinese & English input
- Can store files in USB storage device or local the internal memory
- Analog waveform intensity can be adjusted
- To display a signal automatically by AUTO
- Pop-up menu makes it easy to read and use function
- Fine delayed scan function
- Built-in FFT function, hold practical digital filters
- Pass/Fail detection function enables to output testing results
- Multiple math operations for waveforms
- Powerful PC application software UltraScope
- Standard configuration interface: USB Device, USB Host , RS-232 and support USB storage device storage and PictBridge print standards
- The new function "Key Lock" can meet the needs of industrial production
- Support for remote command control

Automatically Measure 22 Waveform Parameters

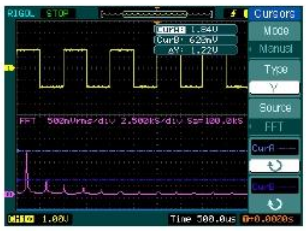


Automatic measure

DS1000E, DS1000D series oscilloscopes can measure 20 types of waveform parameters automatically, which contains 10 voltage and 12 time parameters.

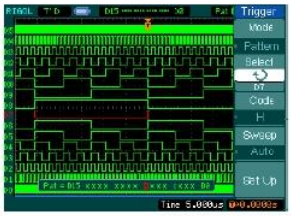
In cursor mode, users can easily measure by moving cursor. 3 types of cursor measurement are optional: Manual, Track and Auto.

Cursor Measure



FFT cursor measure

Multiple Trigger



Pattern trigger

Both DS1000E and DS1000D series contain abundant triggers:

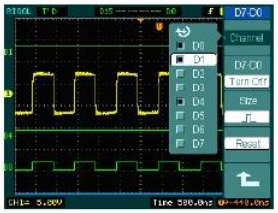
- Edge trigger, Pulse Width trigger, Video trigger, Slope trigger
- Alternate trigger, Pattern trigger (DS1000D), Duration trigger (DS1000D)

Especially the duration trigger is a new type from perfect combination of patten 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, DS1000D series mixed signal oscilloscopes achieve mixed signal measure coordinating with 2 analog channels.

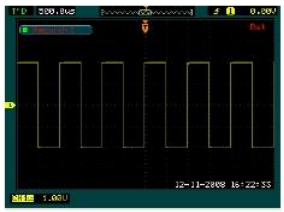
Each channel can be turned on or off independently, or in groups of 8(D7-D0 and D15-D8); also, you can set waveform size and threshold types or change the display position on screen for digital channel.



Digital channels setup

Waveform Recording

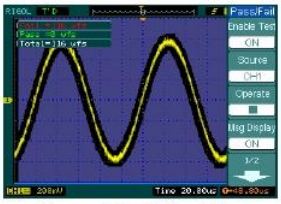
In virtue of waveform recording function from DS1000E and DS1000D, not only the outputs from two channels could be recorded, but also the waveforms outputted by Pass/Fail test could be easily recorded. Totally, up to 1000 frames of wavefoms can be recorded. Besides, users can playback and save the waveforms to get better waveform analyzing result.



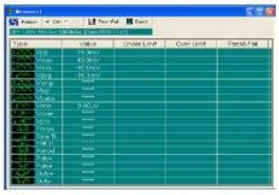
Waveform recording

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 according to turn on system sound.



Pass/Fail testing



Measurement window

UltraScope Software

RIGOL provides powerful PC application software, UltraScope, which enables to capture and measure waveforms, to perform local or remote operation, to save waves as ".bmp" format, to save files as ".txt" or ".xls" format as well as to print waveforms.

Key Lock function

Key Lock

This function is widely used in productions. All keys are locked except F1 to F5 and MENU ON/OFF in this mode.

To lock the keyboard, use menu; to unlock, correct password has to be input. Also, you can reset a new password if necessary.

Specifications

All specifications apply to DS1000E, DS1000D Series Oscilloscopes unless otherwise noted. To come up to these specifications, two conditions must be met firstly:

- The instrument must have been operated continuously for 30 minutes under the specified operating temperature.
- Do perform Self-Calibration operation through the Utility menu if the range of operating temperature variations up to or more than 5°C.

NOTE: All specifications are guaranteed unless where marked "typical".

Specifications

<table>
<tr><td colspan="5">Bandwidth</td></tr>
<tr><td>DS1102E</td><td colspan="2">DS1052E</td><td>DS1102D</td><td>DS1052D</td></tr>
<tr><td>100MHz</td><td colspan="2">50MHz</td><td>100MHz</td><td>50MHz</td></tr>
<tr><td colspan="5">Acquisition</td></tr>
<tr><td>Sample Modes</td><td colspan="2">Real-Time Sample</td><td colspan="2">Equivalent Sample</td></tr>
<tr><td rowspan="2">Sample Rate</td><td colspan="2" rowspan="2">1GSa/s[1], 500MSa/s</td><td>DS1102X</td><td>DS1052X</td></tr>
<tr><td>25GSa/s</td><td>10GSa/s</td></tr>
<tr><td>Averages</td><td colspan="4">The waveform will be displayed one time when all the channels finish N times sample. Wherein, N could be selectable from 2, 4, 8, 16, 32, 64, 128 and 256.</td></tr>
<tr><td colspan="5">Inputs</td></tr>
<tr><td>Input Coupling</td><td colspan="4">DC, AC, GND</td></tr>
<tr><td>Input Impedance</td><td colspan="4">1MΩ±2%, the input capacity is 18pF±3pF</td></tr>
<tr><td>Probe Attenuation Factors</td><td colspan="4">1X, 5X, 10X, 50X, 100X, 500X,1000X</td></tr>
<tr><td rowspan="2">Maximum Input Voltage</td><td colspan="4">400V (DC＋AC Peak, 1MΩ input impedance)</td></tr>
<tr><td colspan="4">40V (DC+AC Peak) [2]</td></tr>
<tr><td>Time Delay between Channels (typical)</td><td colspan="4">500ps</td></tr>
<tr><td colspan="5">Horizontal</td></tr>
<tr><td>Sample Rate Range</td><td colspan="4">Real-Time: 13.65Sa/s-1GSa/s
Equivalent: 13.65Sa/s-25GSa/s</td></tr>
<tr><td>Waveform Interpolation</td><td colspan="4">Sin(x)/x</td></tr>
<tr><td rowspan="5">Memory Depth</td><td>Channel Mode</td><td>Sample rate</td><td>Memory Depth (normal)</td><td>Memory Depth (long memory)</td></tr>
<tr><td>Single channel</td><td>1GSa/s</td><td>16kpts</td><td>N.A.</td></tr>
<tr><td>Single channel</td><td>500MSa/s or lower</td><td>16kpts</td><td>1Mpts</td></tr>
<tr><td>Dual channel</td><td>500MSa/s or lower</td><td>8kpts</td><td>N.A.</td></tr>
<tr><td>Dual channel</td><td>250MSa/s or lower</td><td>8kpts</td><td>512kpts</td></tr>
<tr><td>Scanning Speed Range (Sec/div)</td><td colspan="4">2ns/div~50s/div, DS1102X
5ns/div~50s/div, DS1052X
1-2-5 Sequence</td></tr>
<tr><td>Sample Rate and Delay Time Accuracy</td><td colspan="4">±50ppm (any interval ≥1ms)</td></tr>
<tr><td colspan="5">Vertical</td></tr>
</table>

A/D Converter	8-bit resolution, all channels sample simultaneously	
Volts/div Range	2mV/div~10V/div (at the input terminal connecting to BNC)	
Maximum Input	Maximum input voltage on analog channel CAT I 300Vrms, 1000Vpk; instantaneous overvoltage 1000Vpk CAT II 100Vrms, 1000Vpk RP2200 10:1：CAT II 300Vrms RP3300A 10:1：CAT II 300Vrms	
Offset Range	±40V (250mV/div~10V/div) ±2V (2mV/div~245mV/div)	
Analog Bandwidth	100MHz (DS1102D, DS1102E) 50MHz (DS1052D, DS1052E)	
Single-shot Bandwidth	100MHz (DS1102D, DS1102E) 50MHz (DS1052D, DS1052E)	
Selectable Analog Bandwidth Limit (typical)	20MHz	
Lower Frequency Response (AC, –3dB)	≤5Hz (at input BNC)	
Rise Time (typical at BNC, equivalent sample)	<3.5ns, <7ns, respectively at 100MHz, 50MHz	
DC Gain Accuracy	2mV/div-5mV/div: ±4% (In Normal or Average acquisition mode) 10mV/div-10V/div: ±3% (In Normal or Average acquisition mode)	
DC Measurement Accuracy (Average Acquisition Mode)	When vertical position is zero and N ≥16: ±(DC Gain Accuracy×reading+0.1div+1mV) When vertical position is not zero and N ≥16: ±[DC Gain Accuracy×(reading+vertical position)+(1% of vertical position) + 0.2div] When vertical scale is between 2mV/div and 245mV/div, add 2mV more for setting value. When vertical scale is between 250mV/div and 10V/div, add 50mV more for setting value.	
Delta Volts Measurement Accuracy (Average Acquisition Mode)	Under same setting and condition, the voltage difference (△V) between any two points in the waveforms coming from the average of more than 16 waves have been acquired: ±(DC Gain Accuracy×reading + 0.05 div)	
Trigger		
Trigger Sensitivity	0.1div~1.0div (adjustable)	
Trigger Level Range	Internal	±6 div from center of screen
	EXT	±1.2V
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 + 200 mV)
Trigger Offset	In Normal mode: pre-trigger (memory depth/ 2*Sample rate), delayed trigger 1s	
	In Slow Scan mode: pre-trigger 6div, delayed trigger 6div	
Trigger Holdoff Range	500ns~1.5s	
Set Level to 50% (typical)	When input signal frequency ≥50Hz	
Edge Trigger		
Edge trigger slope	Rising, Falling, Rising + Falling	
Pulse WidthTrigger		
Trigger Condition	(>, <, =) Positive pulse width, (>, <, =) Negative pulse width	
Pulse Width Range	20ns ~10s	

Video Trigger		
Video Standard Line Frequency		Support for standard NTSC, PAL and SECAM broadcast systems. Line number range: 1~525 (NTSC) and 1~625 (PAL/SECAM)
Slope Trigger		
Trigger Condition		(>, <, =) Positive slope, (>, <, =) Negative slope
Time Setting		20ns~10s
Alternate Trigger		
Trigger on CH1		Edge, Pulse Width, Video, Slope
Trigger on CH2		Edge, Pulse Width, Video, Slope
Pattern Trigger[2]		
Pattern Type		D0~D15 select H, L, X, ⊥, ⊤
Duration Trigger[2]		
Pattern Type		D0~D15 select H, L, X
Qualifier		>, <, =
Time Setting		20ns~10s
Measurements		
Cursor	Manual	Voltage difference between cursors (ΔV) Time difference between cursors (ΔT) Reciprocal of ΔT in Hertz (1/ΔT)
	Track	Voltage value and time value of waveform point
	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→2⊥, Delay1→2⊤

Remarks:

[1] Only one channel is available when the Sample rate is 1GSa/s.

[2] For DS1000D Series.

General Specifications

Display		
Display Type	145mm (5.6 inch) diagonal TFT Liquid Crystal Display	
Display Resolution	320 horizontal ×RGB×234 vertical pixels	
Display Color	64k color	
Display Contrast (typical)	150:1	
Backlight Brightness (typical)	300 nit	
Probe Compensator Output		
Output Voltage (typical)	Approximately 3Vpp (peak to peak value)	
Frequency (typical)	1kHz	
Power Supply		
Supply Voltage	100 ~ 240VAC_{RMS}, 45~440Hz, CAT II	
Power Consumption	Less than 50W	
Fuse	2A, T level, 250 V	
Environmental		
Ambient Temperature	Operating 10℃~ 40℃	
	Non-operating -20℃~ +60℃	
Cooling Method	fan cooling	
Humidity	below +35℃: ≤90% relative humidity	
	+35℃~ +40℃: ≤60% relative humidity	
Altitude	Operating at 3,000 m or below	
	Non-operating at 15,000 m or below	
Mechanical		
Dimensions	Width	303mm
	Height	154mm
	Depth	133mm
Weight	Without package	2.3kg
	Packaged	3.5kg
IP Protection		
IP2X		
Calibration Interval		
The recommended calibration interval is one year		