RIGOL



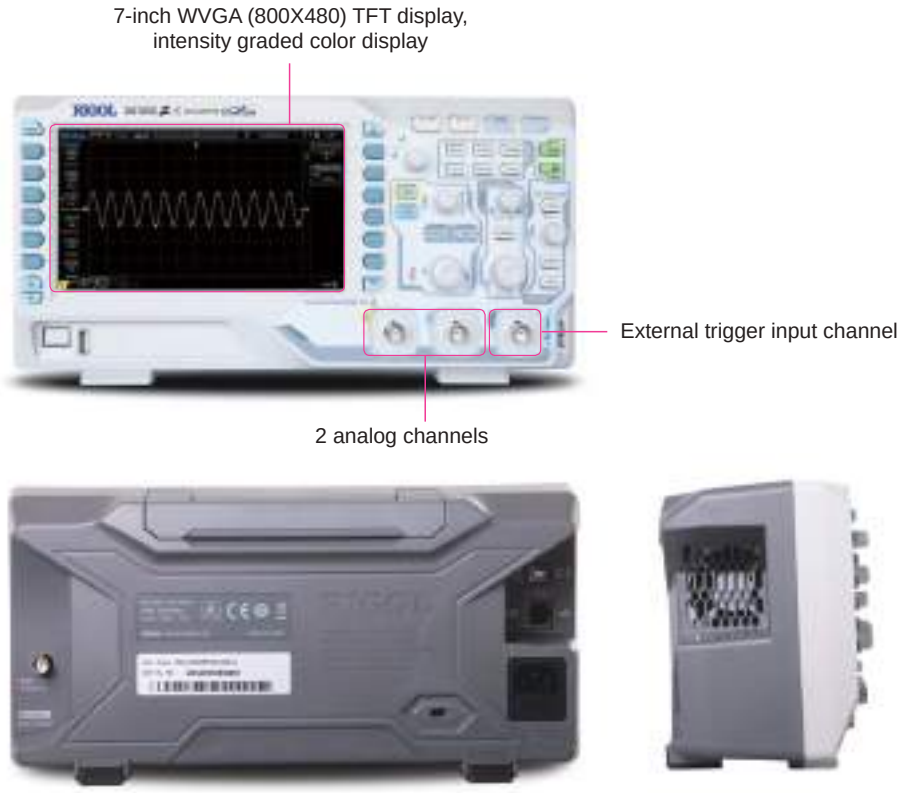
DS1000Z-E Series Digital Oscilloscope

UltraVision

- Analog channel bandwidth: 200 MHz (DS1202Z-E): 100 MHz (DS1102Z-E)
- 2 analog channels
- Real-time sample rate up to 1 GSa/s
- Memory depth up to 24 Mpts(Std.)
- Up to 30,000 wfms/s waveform capture rate
- Up to 60,000 frames hardware real-time waveform recording and playback functions
- Innovative "UltraVision" technology
- Various trigger and bus decoding functions
- Low noise floor, vertical scale range: 500 uV/div to 10 V/div
- Various interfaces: USB Host&Device, LAN (LXI), AUX
- Novel and delicate industrial design, easy to use
- 7-inch WVGA (800x480) TFT LCD, intensity graded color display

DS1000Z-E series is a high-performance and economic digital oscilloscope designed for the designing, debugging and educational requirements of the mainstream digital oscilloscope market. This manual takes DS1202Z-E as an example to introduce DS1000Z-E series.

DS1000Z-E Series Digital Oscilloscope



Product Dimensions: Width×Height×Depth=313.1 mm×160.8 mm×122.4 mm
Weight: 2.9 kg ± 0.2 kg(Without Package)

▶ Innovative UltraVision Technology(Analog Channel)

- Deep Memory Depth (up to 24 Mpts, std.)
- Higher Waveform Capture Rate (up to 30,000 wfms/s)
- Real-time Waveform Recording&Playback (up to 60,000 frames)
- Intensity Graded Color Display

▶ Models and Key Specifications

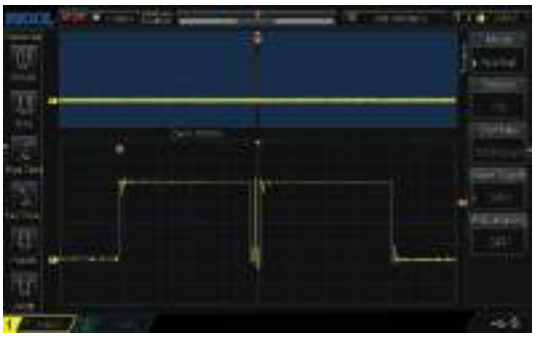
Model	DS1202Z-E	DS1102Z-E
Analog BW	200 MHz	100 MHz
Number of Analog Channels	2	
Max. Real-time Sample Rate	1 GSa/s (single-channel), 500 MSa/s (dual-channel)	
Max. Memory Depth	standard 24 Mpts (single-channel), 12 Mpts (dual-channel)	
Max. Waveform Capture Rate	30,000 wfms/s	
Hardware Real-time Waveform Recording and Playback Functions	Up to 60,000 frames	
Standard Probes	Two PVP2350 350 MHz passive HighZ probes	Two PVP3150 150 MHz passive HighZ probes

Features and Benefits

UltraVision: up to 30,000 wfms/s waveform capture rate



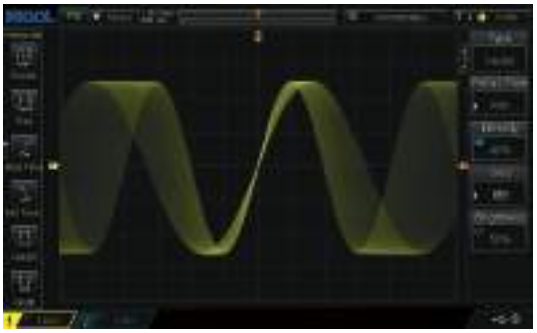
UltraVision: deep memory (up to 24 Mpts, std.)



UltraVision: waveform recording and playback functions



UltraVision: intensity graded color display



Serial bus trigger and decoding functions (RS232/ UART, I2C, SPI)



A variety of trigger functions



RIGOL Probes and Accessories Supported by DS1000Z Series

RIGOL Passive Probes

Model Number	Type	Description
 PVP2150	High Z Probe	1X: DC to 35 MHz 10X: DC to 150 MHz Compatibility: all **RIGOL** scopes.
 PVP3150	HighZ Probe	1X: DC to 20 MHz 10X: DC to 150 MHz Compatibility: all **RIGOL** scopes.
 PVP2350	High Z Probe	1X: DC to 35 MHz 10X: DC to 350 MHz Compatibility: all **RIGOL** scopes.
 RP3500A	High Z Probe	DC to 500 MHz Compatibility: all **RIGOL** scopes.
 RP1300H	High Voltage Probe	DC to 300 MHz CAT I 2000 V (DC+AC), CAT II 1500 V (DC+AC) Compatibility: all **RIGOL** scopes.
 RP1010H	High Voltage Probe	DC to 40 MHz DC: 0 to 10 kV DC, AC: pulse ≤20 kVp-p, AC: sine wave ≤7 kVrms Compatibility: all **RIGOL** scopes.
 RP1018H	High Voltage Probe	DC to 150 MHz DC+AC Peak: 18 kV CAT II AC RMS: 12 kV CAT II Compatibility: all **RIGOL** scopes.
 RT50J	Adapter	50 Ω impedance adapter (2 W, 1 GHz)

RIGOL Active & Current Probes

Model Number	Type	Description
 RP1001C	Current Probe	BW: DC to 300 kHz Max. input DC: ±100 A, AC P-P: 200 A, AC RMS: 70 A Compatibility: all **RIGOL** scopes.
 RP1002C	Current Probe	BW: DC to 1 MHz Max. input DC: ±70 A, AC P-P: 140 A, AC RMS: 50 A Compatibility: all **RIGOL** scopes.
 RP1003C	Current Probe	BW: DC to 50 MHz Max. input AC P-P: 50 A (Noncontinuous), AC RMS: 30 A Compatibility: all **RIGOL** scopes. Must order RP1000P power supply.
 RP1004C	Current Probe	BW: DC to 100 MHz Max. input AC P-P: 50 A (Noncontinuous), AC RMS: 30 A Compatibility: all **RIGOL** scopes. Must order RP1000P power supply.
 RP1005C	Current Probe	BW: DC to 10 MHz Max. input AC P-P: 300 A (Noncontinuous), 500 A (@pulse width ≤30 us), AC RMS: 150 A Compatibility: all **RIGOL** scopes. Must order RP1000P power supply.
 RP1000P	Power Supply	Power supply for RP1003C, RP1004C and RP1005C, support 4 channels.
 RP1025D	High Voltage Differential Probe	BW: 25 MHz Max. Voltage ≤1400 Vpp Compatibility: all **RIGOL** scopes.
 RP1050D	High Voltage Differential Probe	BW: 50 MHz Max. Voltage ≤7000 Vpp Compatibility: all **RIGOL** scopes.
 RP1100D	High Voltage Differential Probe	BW: 100 MHz Max. Voltage ≤7000 Vpp Compatibility: all **RIGOL** scopes.

▶ Specifications

All the specifications are guaranteed except parameters marked with “Typical” and the oscilloscope needs to operate for more than 30 minutes under the specified operation temperature.

Sample

Sample Mode	Real-time sample
Real-time Sample Rate	1 GSa/s (single-channel), 500 MSa/s (dual-channel)
Peak Detect	4 ns
Averaging	After all the channels finish N samples at the same time, N can be 2, 4, 8, 16, 32, 64, 128, 256, 512 or 1024
High Resolution	12 bits (max.)
Interpolation	Sin(x)/x
Memory Depth	24 Mpts (single-channel), 12 Mpts (dual-channel)

Input

Number of Channels	2 analog channels
Input Coupling	DC, AC or GND
Input Impedance	(1 MΩ±1%) || (15 pF±3 pF)
Probe Attenuation Coefficient	0.01X to 1000X, in 1-2-5 step
Maximum Input Voltage (1 MΩ)	CAT I 300 Vrms, CAT II 100 Vrms, transient overvoltage 1000 Vpk

Horizontal

Timebase Scale	2 ns/div to 50 s/div
Maximum Record Length	24 Mpts
Timebase Accuracy[1]	≤±25 ppm
Clock Drift	≤±5 ppm/year
Maximum Delay Range	Negative delay: ≥1/2 screen width Positive delay: 1 s to 500 s
Timebase Mode	YT, XY, Roll
Number of X-Ys	1
Waveform Capture Rate[2]	30,000 wfms/s (dots display)
Zero Offset	±0.5 div*minimum timebase scale

Vertical

Bandwidth (-3 dB)	DS1202Z-E: DC to 200 MHz DS1102Z-E: DC to 100 MHz
Single-shot Bandwidth	DS1202Z-E: DC to 200 MHz DS1102Z-E: DC to 100 MHz
Vertical Resolution	8 bits
Vertical Scale (Probe ratio is 1X)	500 uV/div to 10 V/div
Offset Range (Probe ratio is 1X)	500 uV/div to 499 mV/div: ±2 V 500 mV/div to 10 V/div: ±100 V
Bandwidth Limit[1]	20 MHz
Low Frequency Response (AC Coupling, -3 dB)	≤5 Hz (on BNC)
Calculated Rise Time[1]	DS1202Z-E: 1.75 ns DS1102Z-E: 3.5 ns
DC Gain Accuracy	<10 mV: ±4% full scale ≥10 mV: ±3% full scale
DC Offset Accuracy	±0.1 div ± 2 mV ± 1% offset value
Channel to Channel Isolation	DC to maximum bandwidth: >40 dB

Trigger

Trigger Level Range	Internal	±5 div from center of the screen
	External	EXT ±4 V
Trigger Mode	Auto, Normal, Single	
Holdoff Range	16 ns to 10 s	
High Frequency Rejection[1]	75 kHz	
Low Frequency Rejection[1]	75 kHz	
Trigger Sensitivity[1]	1.0 div (below 5 mV or noise rejection is enabled) 0.3 div (above 5 mV and noise rejection is disabled)	
Edge Trigger		
Edge Type	Rising, Falling, Rising/Falling	
Pulse Trigger		
Pulse Condition	Positive Pulse Width (greater than, lower than, within specified interval) Negative Pulse Width (greater than, lower than, within specified interval)	
Pulse Width	8 ns to 10 s	
Runt Trigger		
Pulse Width Condition	None, >, <, <>	
Polarity	Positive, Negative	
Pulse Width Range	8 ns to 10 s	
Window Trigger		
Window Type	Rising, Falling, Rising/Falling	
Trigger Position	Enter, Exit, Time	
Window Time	8 ns to 10 s	
Nth Edge Trigger		
Edge Type	Rising, Falling	
Idle Time	16 ns to 10 s	
Edge Number	1 to 65535	
Slope Trigger		
Slope Condition	Positive Slope (greater than, lower than, within specified interval) Negative Slope (greater than, lower than, within specified interval)	
Time Setting	8 ns to 10 s	
Video Trigger		
Signal Standard	NTSC, PAL/SECAM, 480P, 576P	
Pattern Trigger		
Pattern Setting	H, L, X, Rising, Falling	
Delay Trigger		
Edge Type	Rising, Falling	
Delay Type	>, <, <>, ><	

Delay Time	8 ns to 10 s
TimeOut Trigger	
Edge Type	Rising, Falling, Rising/Falling
Timeout time	16 ns to 10 s
Duration Trigger	
Pattern	H, L, X
Trigger Condition	>, <, <>
Duration Time	8 ns to 10 s
Setup/Hold Trigger	
Edge Type	Rising, Falling
Data Pattern	H, L
Setup Time	8 ns to 1 s
Hold Time	8 ns to 1 s
RS232/UART Trigger	
Polarity	Normal, Invert
Trigger Condition	Start, Error, Check Error, Data
Baud Rate	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, 230400 bps, 460800 bps, 921600 bps, 1 Mbps and User
Data Bits	5 bits, 6 bits, 7 bits, 8 bits
I2C Trigger	
Trigger Condition	Start, Restart, Stop, MissedAck, Address, Data, A&D
Address Bits	7 bits, 8 bits, 10 bits
Address Range	0 to 127, 0 to 255, 0 to 1023
Byte Length	1 to 5
SPI Trigger	
Trigger Condition	Timeout, CS
Timeout Value	100 ns to 1 s
Data Bits	4 bits to 32 bits
Data Line Setting	H, L, X

Measure

Cursor	Manual mode	Voltage deviation between cursors (△V) Time deviation between cursors (△T) Reciprocal of △T (Hz) (1/△T)
	Track mode	Voltage and time values of the waveform point
	Auto mode	Allow to display cursors during auto measurement
Auto Measurement	Period, Frequency, Rise Time, Fall Time, Positive Pulse Width, Negative Pulse Width, Positive Duty Cycle, Negative Duty Cycle, tVmax, tVmin, Positive Rate, Negative Rate, Delay 1→2↓, Delay 1→2↑, Phase 1→2↓, Phase 1→2↑, Maximum, Minimum, Peak-Peak Value, Top Value, Bottom Value, Amplitude, Upper Value, Middle Value, Lower Value, Average, Vrms, Overshoot, Pre-shoot, Area, Period Area, Period Vrms, Variance	
Number of Measurements	Display 5 measurements at the same time.	
Measurement Range	Screen or cursor	
Measurement Statistic	Average, Max, Min, Standard Deviation, Number of Measurements	

Counter	Hardware 6-digit counter (channels are selectable)

Math Operation

Waveform Operation	A+B, A-B, A×B, A/B, FFT, A&&B, A||B, A^B, !A, Intg, Diff, Sqrt, Lg, Ln, Exp, Abs, Filter
FFT Window	Rectangle, Hanning, Blackman, Hamming, Flat Top, Triangle
FFT Mode	Trace, Memory
FFT Display	Half, Full
FFT Vertical Scale	dB/dBm, Vrms
Filter	Low Pass Filter, High Pass Filter, Band Pass Filter, Band Stop Filter
Number of Buses for Decoding	2
Decoding Type	Parallel, RS232/UART, I2C, SPI

Display

Screen Type	7.0-inch TFT LCD display
Display Resolution	800 horizontal × RGB × 480 vertical pixel
Display Color	16 million color (24-bit true color)
Persistence Time	Min, 100 ms, 200 ms, 500 ms, 1 s, 5 s, 10 s, Infinite
Display Type	Dots, Vector

I/O

Standard Ports	USB Host, USB Device, LAN, Aux Output (TrigOut/PassFail)

General Specifications

Probe Compensation Output		
Output Voltage[1]	About 3 V, peak-peak	
Frequency[1]	1 kHz	
Power		
Power Voltage	100 V to 240 V, 45 Hz to 440 Hz	
Power	Maximum 50 W	
Fuse	2 A, T degree, 250 V	
Environment		
Temperature Range	Operating: 0℃ to +50℃	
	Non-operating: -40℃ to +60℃	
Cooling Method	Fan cooling	
Humidity Range	0℃ to +30℃: ≤95% relative humidity	
	+30℃ to +40℃: ≤75% relative humidity	
	+40℃ to +50℃: ≤45% relative humidity	
Altitude	Operating: under 3,000 meters	
	Non-operating: under 15,000 meters	
Mechanical		
Dimensions[3]	Width × Height × Depth = 313.1 mm × 160.8 mm × 122.4 mm	
Weight[4]	Without Package	2.9 kg ± 0.2 kg
	With Package	3.5 kg ± 0.5 kg
Calibration Interval		
The recommended calibration interval is 18 months.		

Regulation Standards		
Electromagnetic Compatibility	Compliant with EMC DIRECTIVE 2014/30/EU, compliant with or higher than the standards specified in IEC 61326-1:2013/EN 61326-1:2013 Group 1 Class A	
	CISPR 11/EN 55011	
	IEC 61000-4-2:2008/EN 61000-4-2	±4.0 kV (contact discharge), ±8.0 kV (air discharge)
	IEC 61000-4-3:2002/EN 61000-4-3	3 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)
	IEC 61000-4-4:2004/EN 61000-4-4	1 kV power line
	IEC 61000-4-5:2001/EN 61000-4-5	0.5 kV (phase-to-neutral voltage); 1 kV (phase-to-earth voltage); 1 kV (neutral-to-earth voltage)
	IEC 61000-4-6:2003/EN 61000-4-6	3 V, 0.15-80 MHz
	IEC 61000-4-11:2004/EN 61000-4-11	voltage dip: 0% UT during half cycle; 0% UT during 1 cycle; 70% UT during 25 cycles short interruption: 0% UT during 250 cycles
Safety	IEC 61010-1:2010 (Third Edition)/EN 61010-1:2010, UL 61010-1:2012 R4.16 and CAN/CSA-C22.2 NO. 61010-1-12+ GI1+ GI2	
Vibration	Meets GB/T 6587; class 2 random Meets MIL-PRF-28800F and IEC60068-2-6; class 3 random	
Shock	Meets GB/T 6587-2012; class 2 random Meets MIL-PRF-28800F and IEC60068-2-27; class 3 random (in non-operating conditions: 30 g, half sine, 11 ms duration, 3 shocks along the main axis, a total of 18 vibrations)	

Note[1]: Typical.
Note[2]: Maximum value. 50 ns, single-channel mode, dots display, auto memory depth.
Note[3]: Supporting legs and handle folded, knob height included.
Note[4]: Standard configuration.

Ordering Information

	Description	Order Number
Models	DS1202Z-E (200 MHz, 2 analog channels)	DS1202Z-E
	DS1102Z-E (100 MHz, 2 analog channels)	DS1102Z-E
Standard Accessories	Power cord conforming to the standard of the destination country	-
	USB cable	CB-USBA-USBB-FF-150
	2 passive probes (350 MHz PVP2350, only available for DS1202Z-E)	PVP2350
	2 passive probes (150 MHz PVP3150, only available for DS1102Z-E)	PVP3150
Optional Accessory	Rack mount kit	RM-DS1000Z

Standard Software

Ultra Sigma



- **RIGOL** general PC software platform
- Multi-instrument and multi-interface resource management
- With SCPI remote command tool

Ultra Scope



- Real-time monitoring of waveform and status; supports multi-instrument and multi-window display
- With virtual panel feature
- Supports multi-interface remote control

Warranty

Three -year warranty, excluding probes and accessories.

HEADQUARTER

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PCX01100-2020-04