RIGOL
Beyond Measure

MSO/DS1000Z Series
Digital Oscilloscope

UltraVision

- Analog channel Bandwidth: 100MHz,70MHz
- 4 Analog channels,16 Digital channels
- Max. Sample Rate up to 1G Sa/s
- Memory Depth up to12Mpts /24Mpts(Opt.)
- Innovative "UltraVision" technology
- Up to 30,000wfms/s Waveform Capture Rate
- Up to 60,000frames Real-time Waveform Record(Opt.)
- Low noise floor, Dynamic Range: 1mV/div to 10V/div
- Optional Serial Buses Triggering and Decoding(RS232,I2C,SPI)
- Multi- Levels intensity grading waveform display
- Built in 2 channels 25MHz waveform Generator(MSO/DS1000Z-S)
- Complete Connectivity: LAN(LXI),USB Host & Device,AUX, USB-GPIB(Opt.)
- Compact size, light weight, easy to use
- 7 Inch WVGA (800x480), multiple intensity levels waveform display

MSO/DS1000Z Series is the new mainstream digital scope to meet the customer's applications with its innovative technology. MSO1000Z Series has 16channels, target for the embedded design and test market with its industry leading specifications, powerful trigger functions and broad analysis capabilities.

RIGOL TECHNOLOGIES, INC.

MSO/DS1000Z Series Digital Oscilloscope

7 inch WVGA(800X480) TFT, Multiple intensity Level waveform display
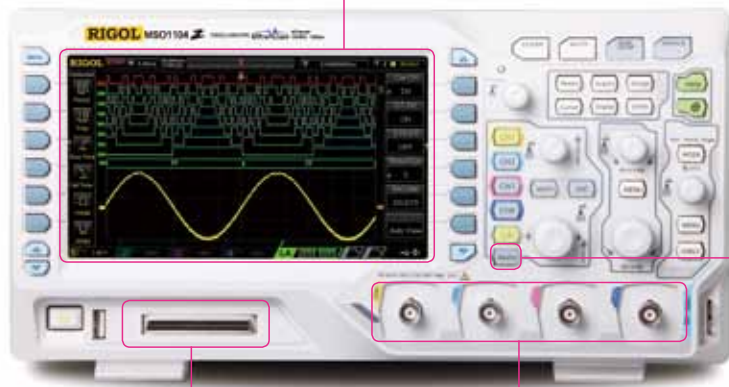
Built-in Source control button(MSO/DS1000Z-S)

16 Digital channels (MSO)

4 Channels

Product Dimensions: Width X Height X Depth=313.1 mm×160.8 mm×122.4 mm Weight: 3.2 kg ± 0.2 kg(Without Package)

▶ Innovative UltraVision technology(Analog Channel)

UltraVision

- Deeper Memory Depth (Std.12Mpts,Opt.24Mpts)
- Higher Waveform Capture Rate (Up to 30,000 wfms/s)
- Real Time Waveform Record&Replay (Up to 60,000 frames, opt.)
- Multi-level Intensity Grading Display

▶ Models and key Specifications

| Model Number	DS1074Z	DS1074Z-S	DS1104Z	DS1104Z-S
	MSO1074Z	MSO1074Z-S	MSO1104Z	MSO1104Z-S
Analog BW	70 MHz		100MHz	
Analog Channels	4			
Digital Channel(MSO)	16			
Max. Sample rate	Analog Channel:1GSa/s (1 CH),500MSa/s(2 CH),250MSa/s(3/4 CH); Digital Channel: 1GSa/s (8 CH),500MSa/s(16 CH)			
Max. Memory Depth	Analog Channel: 12Mpts(1 CH), 6Mpts(2 CH), 3Mpts(3/4 CH)Std.; 24Mpts(1 CH), 12Mpts(2 CH), 6Mpts(3/4 CH) Opt. Digital Channel: 12Mpts(8 CH) / 6Mpts(16 CH) Std.; 24Mpts(8 CH) / 12Mpts(16 CH) Opt.			
Max. Waveform Capture rate	Up to 30,000 wfms/s			
Real Time waveform Record, Replay and Analysis function	Up to 60, 000 Frames(Opt.)			
Std. Probes	RP2200 150MHz BW Passive Probe:4 sets;1 set RPL1116 LA Probe(MSO only)			
Built-in 2Ch 25MHz Source	No	Yes	No	Yes

► Features and Benefits

4 Channels

UltraVision: Deeper memory(Std.12Mpts,Opt.24Mpts)

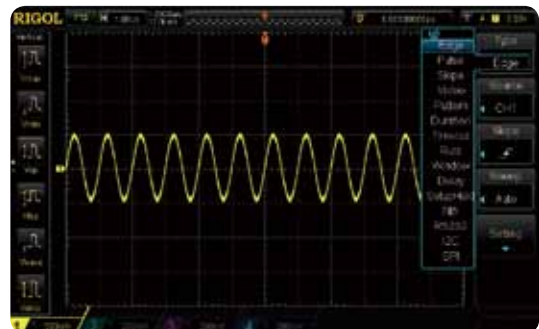UltraVision: Up to 30,000 wfms/s Waveform capture rate

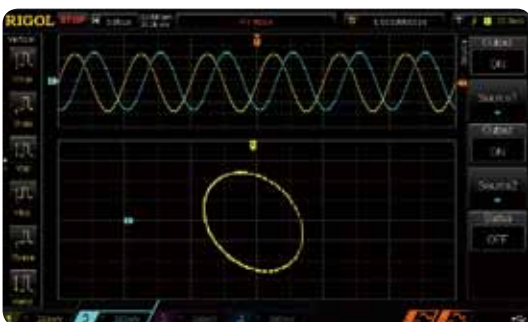UltraVision: Multi-Level intensity grading display
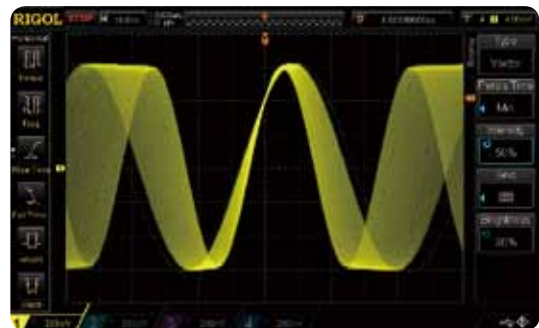
UltraVision:Realtime waveform Record,Replay, function (Opt.)

A variety of Trigger Functions

Built in 2 channel 25MHz Signal Source(MSO/ DS1000Z-S)

Optional Serial Bus Triggering and Decoding functions(RS232,I2C,SPI)

▶ MSO1000Z Series Mixed Signal Oscilloscope

### Besides the powerful functions of DS1000Z, you could get more from MSO1000Z with:

- 16 Digital channels
- Sample rate of Digital channel up to 1 GSa/s
- Memory depth of Digital channel up to 24Mpts
- Waveform capture rate of Digital channel up to 30,000wfms/s
- Real Time Waveform Record, Replay and analysis functions, up to 60,000 frames
- Triggering and Decoding across Analog and Digital channels
- Easy to be grouped for digital channels
- Support a variety of logic levels
- Time correlation display for both analog and digital signals

Innovative UltraVision technology(Digital Channel)

- Deeper Memory Depth(Up to 24Mpts)
- Higher Waveform capture rate(Up to 30,000wfms/s)
- Real Time waveform record & replay(Up to 60,000 frames)
- Multi-level intensity grading display

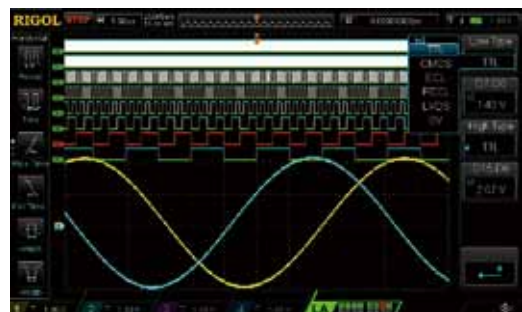Mixed Signal Analysis with analog and digital channels
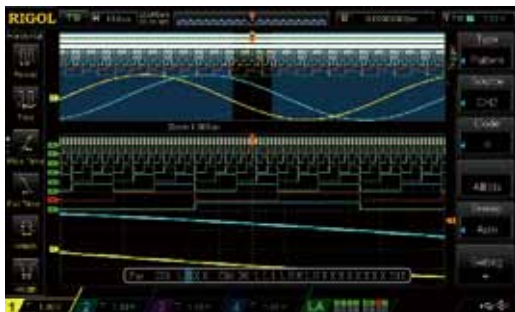
Easy to be grouped and labeled for digital channels

Serial bus triggering and decoding on digital channels

Support a variety of logic levels

RIGOL Probes and Accessories supported by MSO/DS1000Z Series:

▶ RIGOL Passive Probes

Model Number	Tpye	Description
RP2200	High Z Probe	1X: DC~7MHz 10X:DC~150MHz Compatibility: All RIGOL Scopes.
RP3300A	High Z Probe	10X:DC~350MHz Compatibility: All RIGOL Scopes.
RP3500A	High Z Probe	DC~500MHz Compatibility: All RIGOL Scopes.
RP1300H	High Voltage Probe	DC~300MHz CATI 2000V(DC+AC), CATII 1500 V(DC+AC) Compatibility: All RIGOL Scopes.
RP1010H	High Voltage Probe	DC~50MHz DC:0~10KV DC,AC:pulse <=20KVp-p, AC:sine wave <=7KVrms Compatibility: All RIGOL Scopes.
RP1018H	High Voltage Probe	DC~150MHz DC+AC Peak:18KV CAT II AC RMS : 12KVrms CAT II Compatibility: All RIGOL Scopes.
RPL1116	Logic analysis Probe	Logic analysis Probe(For MSO1000Z)
RT50J	Adapter	50ohm Impedance adapter(2W,1GHz)

▶ RIGOL Active & Current Probes

Model Number	Tpye	Description
RP1001C	Current Probe	BW:DC~300kHz, Max.DC:±100A, AC P-P:200A,AC RMS:70A Compatibility: All RIGOL Scopes.
RP1002C	Current Probe	BW:DC~1MHz, Max.DC:±70A, AC P-P:140A,AC RMS:50A Compatibility: All RIGOL Scopes.
RP1003C	Current Probe	BW:DC~50MHz, Max.AC RMS:30A AC Peak:50A(Noncontinuous) Compatibility: All RIGOL Scopes. Must order RP1000P Power supply.
RP1004C	Current Probe	BW:DC~100MHz, Max. AC RMS:30A, AC Peak:50A(Noncontinuous) Compatibility: All RIGOL Scopes. Must order RP1000P Power supply.
RP1005C	Current Probe	BW:DC~10MHz, Max.150 A rms, 300 A peak (Noncontinuous), 500 A peak (@pulse width <=30 ms) Compatibility: All RIGOL Scopes. Must order RP1000P Power supply.
RP1000P	Power Supply	Power supply for RP1003C,RP1004C,RP1005C, support 4 channels.
RP1025D	High Voltage Differential Probe	BW:25MHz; Max. Voltage ≤1400Vpp Compatibility: All RIGOL Scopes.
RP1050D	High Voltage Differential Probe	BW:50MHz; Max. Voltage ≤7000Vpp Compatibility: All RIGOL Scopes.
RP1100D	High Voltage Differential Probe	BW:100MHz; Max. Voltage ≤7000Vpp 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	**Analog channel**: 1 GSa/s (single-channel), 500 MSa/s (dual-channel), 250 MSa/s (four-channel) **Digital channel**: 1 GSa/s (8-channel),500 MSa/s (16-channel)
Peak Detect	**Analog channel**: 4 ns **Digital channel**: 4 ns
Averaging	After both the channels finish N samples at the same time, N can be 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024.
High Resolution	The highest resolution is 12 bit
Interpolation	Sin(x)/x (selectable)
Minimum Detectable Pulse Width	**Digital channel**: 10 ns
Memory Depth	**Analog channel**: Single-channel: Auto, 12k pts, 120k pts, 1.2M pts, 12M pts and 24M pts (opt.) are available Dual-channel: Auto, 6k pts, 60k pts, 600k pts, 6M pts and 12M pts (opt.) are available Four-channel: Auto, 3k pts, 30k pts, 300k pts, 3M pts and 6M pts (opt.) are available **Digital Channel**: 12Mpts(8 CH) / 6Mpts(16 CH) Std.; 24Mpts(8 CH) / 12Mpts(16 CH) Opt.

Input

Number of Channels	MSO1XX4Z/1XX4Z-S: 1,2 analog-channel + 16-digital-channel DS1XX4Z/1XX4Z-S: 4-analog-channel
Input Coupling	DC, AC or GND
Input Impedance	**Analog channel**: (1 MΩ±1%) || (15 pF±3 pF) **Digital channel**: (100 kΩ±1%) || 8 pF±3 pF)
Probe Attenuation Coefficient	**Analog channel**: 0.01X-1000X, 1-2-5 step
Max Input Voltage (1MΩ)	**Analog channel**: CAT I 300 Vrms, CAT II 100 Vrms, transient overvoltage 1000 Vpk With RP2200 10:1 probe: CAT II 300 Vrms **Digital channel**: CAT I 40 Vrms, transient overvoltage 800 Vpk

Horizontal

Time Base Scale	5 ns/div to 50 s/div
Time Base Accuracy[1]	≤ ± 25 ppm
Time Base Drift	≤ ± 5 ppm/year
Max Delay Range	negative delay: ≥1 screen width positive delay: 1 s to 100,000 s
Time Base Mode	Y-T, X-Y, Roll, Delayed
Number of X-Ys	1 path
Waveform Capture Rate[2]	30,000 wfms/s (dots display)

Vertical

Bandwidth (-3dB)	MSO1104Z/1104Z-S/DS1104Z/1104Z-S: DC to 100 MHz MSO1074Z/1074Z-S/DS1074Z/1074Z-S: DC to 70 MHz
Single Bandwidth	MSO1104Z/1104Z-S/DS1104Z/1104Z-S: DC to 100 MHz MSO1074Z/1074Z-S/DS1074Z/1074Z-S: DC to 70 MHz
Vertical Resolution	**Analog channel**: 8 bits **Digital channel**: 1 bit
Vertical Scale	1 mV/div to 10 V/div
Offset Range	1 mV/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, -3dB)	≤5 Hz (on BNC)
Rise Time[1]	MSO1074Z/1074Z-S/DS1074Z/1074Z-S: 3.5 ns MSO1074Z/1074Z-S/DS1074Z/1074Z-S: 5 ns
DC Gain Accuracy[3]	<10 mV: ±4% full scale ≥10 mV: ±3% full scale
DC Offset Accuracy	±0.1 div ± 2 mV ± 1% offset

Channel to Channel Isolation	DC to maximum bandwidth: >40 dB

Vertical (Digital Channel)

Threshold	1 group with 8 channels adjustable threshold
LevelType	TTL (1.4 V) 5.0 V CMOS (+2.5 V), 3.3 V CMOS (+1.65 V) 2.5 V CMOS (+1.25 V), 1.8 V CMOS (+0.9 V) ECL (-1.3 V) PECL (+3.7 V) LVDS (+1.2 V) 0 V User
Threshold range	±15.0 V, in 10 mV step
Threshold accuracy	±(100 mV + 3% of threshold setting)
Dynamic range	±10 V + threshold
Min Voltage Swing	500 mVpp
Vertical resolution	1 bit

Trigger

Trigger Level Range	±5 div from the center of the screen
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]	1.0div (below 5mV or noise rejection is enabled) 0.3div (above 5mV 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 Range	8 ns to 10 s
Runt Trigger	
Pulse Condition	None, > (greater than), < (lower than), <> (within the specified interval)
Polarity	Positive, Negative
Pulse Width Range	8 ns to 4 s
Windows Trigger	
Windows Type	Rising, Falling, Rising/Falling
Trigger Position	Enter, Exit, Time
Windows Time	8 ns to 10 s
Nth Edge Trigger	
Edge Type	Rising, Falling
Idle Time	16 ns to 10 s
Number of Edges	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	Support standard NTSC, PAL and SECAM broadcasting standards Support 480P, 576P HDTV standards
Pattern Trigger	
Pattern Setting	H, L, X, Rising Edge, Falling Edge
Delay Trigger	
Edge Type	Rising, Falling
Delay Type	> (greater than), < (lower than), <> (within the specified interval), >< (outside the specified interval)
Delay Time	8 ns to 10 s
TimeOut Trigger	
Edge Type	Rising, Falling, Rising&Falling
TimeOut Value	16 ns to 10 s
Duration Trigger	
Pattern Setting	H, L, X
Trigger Condition	> (greater than), < (lower than), <> (within the specified interval)
Duration Time	8 ns to 10 s
Setup/Hold Trigger	
Edge Type	Rising, Falling
Data Pattern	H, L,X
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	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, User
Data Bits	5 bits, 6 bits, 7 bits, 8 bits
I2C Trigger	
Trigger Condition	Start, Restart, Stop, Missing Ack, Address, Data, A&D
Address Bits	7 bits, 8 bits, 10 bits
Address Range	0x0 to 0x7F, 0x0 to 0xFF, 0x0 to 0x3FF
Byte Length	1 to 5
SPI Trigger	
Trigger Condition	TimeOut, CS
Timeout Value	16 ns to 10 s
Data Bits	4 bit to 32 bit
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		Measurements of Maximum, Minimum, Peak-Peak Value, Top Value, Bottom Value, Amplitude, Average, Mean Square Root, Overshoot, Pre-shoot, Area, Period Area, Frequency, Period, Rise Time, Fall Time, Positive Pulse Width, Negative Pulse Width, Positive Duty Cycle, Negative Duty Cycle, Delay A→B↯, Delay A→B↯, Phase A→B↯, Phase A→B↯
Number of Measurements		Display 5 measurements at the same time
Measurement Range		Screen Region or Cursor Region
Measurement Statistic		Average, Max, Min, Standard Deviation, Number of Measurements
Counter		Hardware 6 bits counter (channels are selectable)

Math

Waveform Operation	A+B, A-B, A×B, A/B, FFT, &&, ||, ^, !, intg, diff, sqrt, lg, ln, exp, abs
FFT Window	Rectangle, Hanning, Blackman, Hamming,Flat Top,Triangle
FFT Display	Split, Full Screen
FFT Vertical Scale	dB/dBm, Vrms
Number of Buses for Decoding	2
Decoding Type	Parallel (standard), RS232/UART (option), I2C (option), SPI (option)

Display

Display Type	7.0 inches TFT LCD display
Display Resolution	800 horizontal×RGB×480 vertical pixel
Display Color	160,000 Color (TBD)
Persistence Time	Min, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, Infinite
Display Type	Dots, Vectors

I/O

Standard Ports	USB HOST, USB DEVICE, LAN, Aux (TrigOut /PassFail)

Signal Source (MSO/DS1000Z-S)

Number of Channels	2	
Sample Rate	200 MSa/s	
Vertical Resolution	14 bits	
Highest Frequency	25 MHz	
Standard Waveform	Sine, Square, Pulse, Triangle, Noise, DC	
Arbitrary Waveform	Since, Exp.Rise, EXP.Fall, ECG, Gauss, Lorentz, Haversine	
Sine	Frequency Range	0.1 Hz to 25 MHz
	Flatness	±0.5 dB (relative to 1 kHz)
	Harmonic Distortion	-40 dBc
	Stray (Non-Harmonic)	-40 dBc
	Total Harmonic Distortion	1%
	Signal-to-Noise ratio	40 dB

Square /Pulse	Frequency Range	0.1 Hz to 15 MHz
	Rise/Fall time	<15 ns
	Overshoot	<5%
	Duty Cycle	10% to 90%
	Duty Cycle Resolution	1% to 10 ns (select the greater one)
	Minimum Pulse Width	20 ns
	Pulse Width Resolution	10 ns or 5 bits (select the greater one)
	Jitter	500 ps
Triangle	Frequency Range	0.1 Hz to 100 kHz
	Linearity	1%
	Symmetry	0 to 100%
Noise[1]	Bandwidth	25 MHz
Internal Generated waveforms	Frequency Range	0.1 Hz to 1 MHz
Arbitrary Waveforms	Frequency Range	0.1 Hz to 10 MHz
	Waveform Length	2 to 16k pts
Frequency	Accuracy	100 ppm (lower than 10 kHz) 50 ppm (greater than 10 kHz)
	Resolution	0.1 Hz or 4 bit, select the greater one
Amplitude	Output Range	20 mVpp to 5 Vpp, High-resistance 10 mVpp to 2.5 Vpp, 50 Ω
	Resolution	100 µV or 3 bit, select the greater one
	Accuracy	2% (1 kHz)
DC Offset	Range	±2.5 V, High-resistance ±1.25 V, 50 Ω
	Resolution	100 µV or 3 bit, select the greater one
	Accuracy	2% (1 kHz)
Modulation	AM, FM	

General Specifications

Probe Compensation Output		
Output Voltage[1]	About 3 V, peak-peak	
Frequency[1]	1 kHz	
Power		
Power Voltage	100-240 V, 45-440 Hz	
Power	Maximum 50 W	
Fuse	2 A, T degree, 250 V	
Environment		
Temperature Range	In operation: 0°C to +50°C	
	Out of operation: -40°C to +70°C	
Cooling Method	Fan	
Humidity Range	0°C to +30°C : ≤95°C relative humidity	
	+35°C to +40°C : ≤75°C relative humidity	
	+40°C to +50°C : ≤45°C relative humidity	
Altitude	In operation: under 3,000 meters	
	Out of operation: under 15,000 meters	
Mechanical		
Dimensions[4]	Width×Height×Depth =313.1 mm× 160.8 mm×122.4 mm	
Weight[4]	Without package	3.2 kg ± 0.2 kg
	With package	3.8 kg ± 0.5 kg
Adjustment Interval		
The recommended calibration interval is one year.		
Regulation Standards		
Electromagnetic Compatibility	2004/108/EC Execution standard EN 61326-1:2006 EN 61326-2-1:2006	
Safety	UL 61010-1:2004; CAN/CSA-C22.2 NO. 61010-1-2004; EN 61010-1:2001; IEC 61010-1:2001	

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

▶ Ordering Information

	Description	Order Number
Model	DS1074Z (70MHz, 4 CH Scope)	DS1074Z
	DS1074Z-S (70MHz, 4 CH Scope + 2 CH Source)	DS1074Z-S
	MSO1074Z (70MHz, 2+16 MSO)	MSO1074Z
	MSO1074Z-S (70MHz, 2+16 MSO + 2 CH Source)	MSO1074Z-S
	DS1104Z (100MHz, 4 CH Scope)	DS1104Z
	DS1104Z-S (100MHz, 4 CH Scope + 2 CH Source)	DS1104Z-S
	MSO1104Z (70MHz, 2+16 MSO)	MSO1104Z
	MSO1104Z-S (70MHz, 2+16 MSO + 2 CH Source)	MSO1104Z-S
Standard Accessories	Power Cord conforming to the standard of the country	-
	USB Data Cable	CB-USBA-USBB-FF-150
	4 Passive Probes (150 MHz)	RP2200
	1 Set LA probe(MSO only)	RPL1116
	Quick Guide	-
	Resource CD (User's Guide and Application Software)	-
Optional Accessories	Rack Mount Kit	RM-DS1000Z
Deep Memory Option	24Mpts (1 CH) /12Mpts (2 CH) /6Mpts (4 CH) Memory	MEM-DS1000Z
Waveform record option	Real Time Waveform Record and Replay function	REC-DS1000Z
Advanced Trigger option	RS232/UART,I2C,SPI,Runt,Windows,Nth Edge, Delay,Time Out,Setup/Hold Time	AT-DS1000Z
Serial Bus Analysis Option	RS232/UART,I2C,SPI Trigger and Decoding function	SA-DS1000Z

Warranty

Three –year warranty, excluding probes and accessories.

RIGOL

www.rigol.com