

# DS1000Z Series Digital Oscilloscope

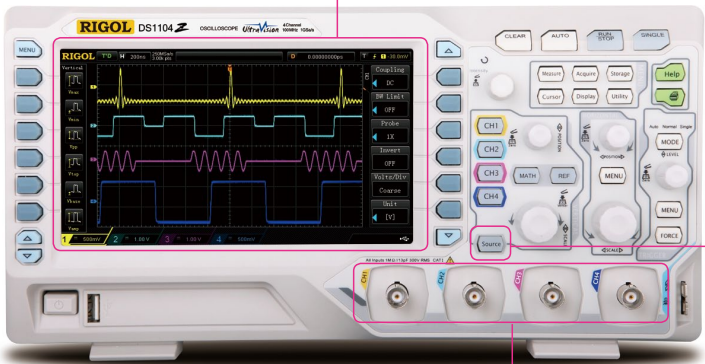
- 100MHz, 70MHz Bandwidth, 4 channels
- 1G Sa/s Real-time Sample Rate
- 12Mpts (Std.) and 24Mpts (Opt.) Memory Depth
- Innovative "UltraVision" technology
- Up to 30,000wfms/s Waveform Capture Rate
- Up to 60,000frames Real-time Waveform Record(Opt.)
- Low noise floor, Dynamic Range: 1mV/div to 10V/div
- Optional Serial Buses Triggering and Decoding(RS232, I2C, SPI)
- Multi- Levels intensity grading waveform display
- Built in 2 channels 25MHz waveform Generator(DS1000Z-S)
- Complete Connectivity: LAN(LXI Core Device 2011), USB Host & Device, AUX, USB-GPIB(Opt.)
- Compact size, light weight, easy to use
- 7 Inch WVGA (800x480), multiple intensity levels waveform display

DS1000Z Series is the new economic level Digital Oscilloscope to meet the customer's applications with its innovative technology, industry leading specifications, powerful trigger functions and broad analysis capabilities.



# DS1000Z Series Digital Oscilloscope

7 inch WVGA(800X480) TFT, Multiple intensity Level waveform display



Built-in Source control button  
( DS1000Z-S )

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



- 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 |
|---|---|-----------|---------|-----------|
| Analog BW   | 70 MHz  |           | 100MHz  |           |
| Channels  | 4   |           |         |           |
| Max. Sample rate  | 1GSa/s (Single-channel), 500MSa/s(Dual-channel), 250MSa/s(Full-channel) |           |         |           |
| Max. Memory Depth                                       | 12Mpts(std.), 24Mpts(option)  |           |         |           |
| 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                                   |           |         |           |
| Built in 2 Ch Source                                    | No  | Yes       | No      | Yes       |

## ► Features and Benefits

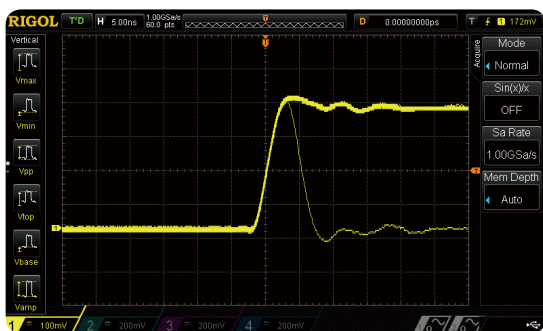
### 4 Channels



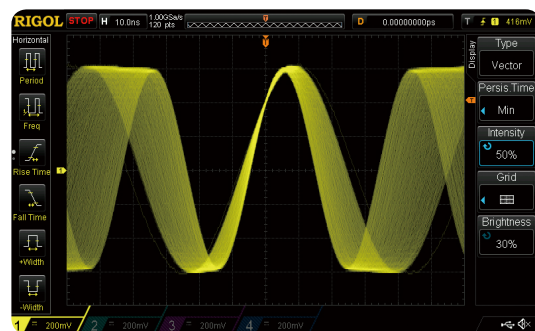
### UltraVision: Deeper memory(Std.12Mpts,Opt.24Mpts)



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



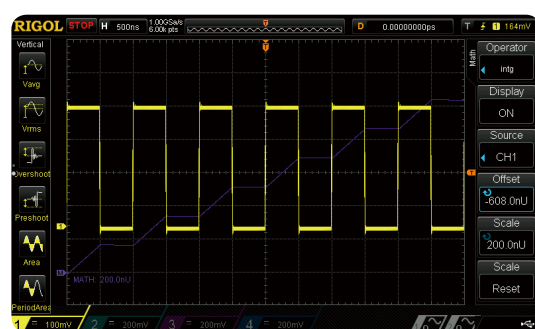
### UltraVision: Multi-Level intensity grading display



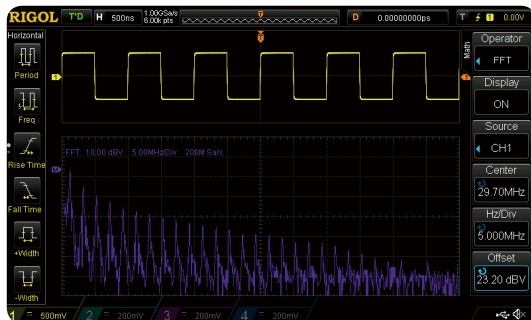
### UltraVision:Realtime waveform Record,Replay, function (Opt.)



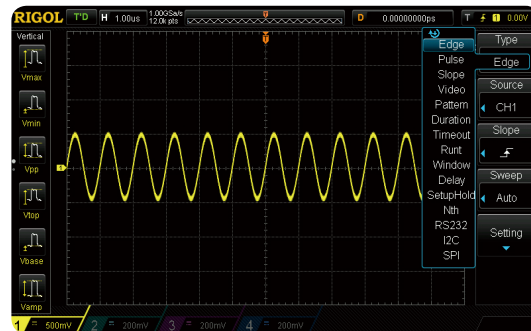
### A variety of Math Functions



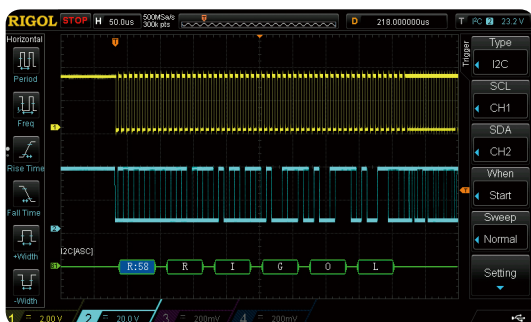
### FFT function



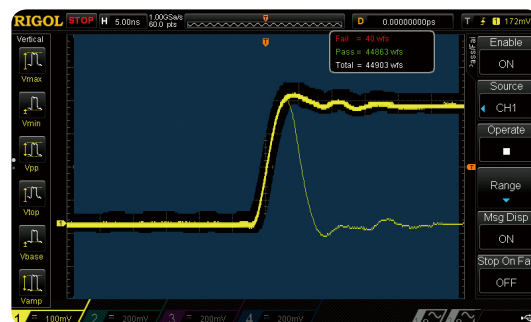
### A variety of Trigger Functions



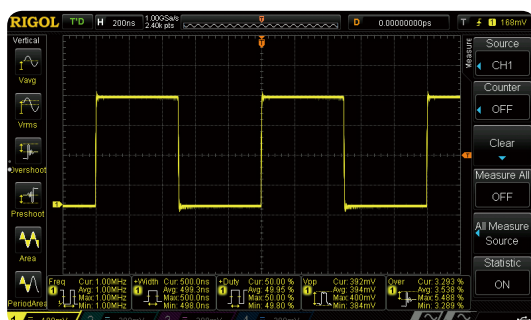
### Optional Serial Bus Triggering and Decoding functions(RS232,I2C,SPI)



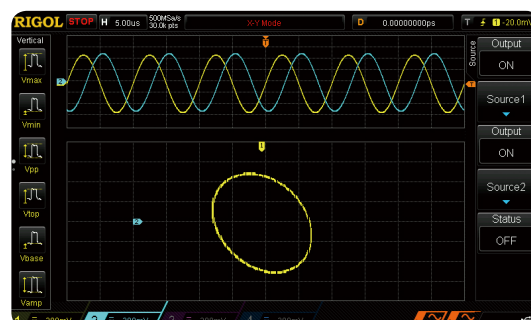
### Standard Mask test function



### Automatic Measurements with Statistics








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














## RIGOL Probes and Accessories supported by DS1000Z Series:

### ► RIGOL Passive Probes

| Model Number   | Type               | Description   |
|--|--------------------|---|
| <br>RP2200    | High Z Probe       | 1X: DC~7MHz<br>10X:DC~150MHz<br>Compatibility: All RIGOL Scopes.  |
| <br>RP3300A   | High Z Probe       | 1X: DC~8MHz<br>10X:DC~350MHz<br>Compatibility: All RIGOL Scopes.  |
| <br>RP3500A  | High Z Probe       | DC~500MHz<br>Compatibility: All RIGOL Scopes.   |
| <br>RP1300H | High Voltage Probe | DC~300MHz<br>CATI 2000V(DC+AC),<br>CATII 1500 V(DC+AC)<br>Compatibility: All RIGOL Scopes.                    |
| <br>RP1050H | High Voltage Probe | DC~50MHz<br>DC:0~15KV<br>DC,AC:pulse <=30KVp-p,<br>AC:sine wave <=10KVrms<br>Compatibility: All RIGOL Scopes. |
| <br>RT50J   |                    | 50ohm Impedance adapter(2W,1GHz)  |

### ► RIGOL Active & Current Probes

| Model Number  | Type                            | Description  |
|---|---------------------------------|--|
| <br>RP1001C   | Current Probe                   | BW:DC~300kHz,<br>Max.DC: ± 100A,<br>AC P-P:200A,AC RMS:70A<br>Compatibility: All RIGOL Scopes.   |
| <br>RP1002C   | Current Probe                   | BW:DC~1MHz,<br>Max.DC: ± 70A,<br>AC P-P:140A,AC RMS:50A<br>Compatibility: All RIGOL Scopes.  |
| <br>RP1003C   | Current Probe                   | BW:DC~50MHz,<br>Max.AC RMS:30A<br>AC Peak:50A(Noncontinuous)<br>Compatibility: All RIGOL Scopes.<br>Must order RP1000P Power supply.                                       |
| <br>RP1004C  | Current Probe                   | BW:DC~100MHz,<br>Max. AC RMS:30A,<br>AC Peak:50A(Noncontinuous)<br>Compatibility: All RIGOL Scopes.<br>Must order RP1000P Power supply.                                    |
| <br>RP1005C | Current Probe                   | BW:DC~10MHz,<br>Max.150 A rms,<br>300 A peak (Noncontinuous),<br>500 A peak (@pulse width <=30 ms)<br>Compatibility: All RIGOL Scopes.<br>Must order RP1000P Power supply. |
| <br>RP1000P | Power Supply                    | Power supply for<br>RP1003C,RP1004C,RP1005C,<br>support 4 channels.  |
| <br>RP1025D | High Voltage Differential Probe | BW:25MHz;<br>Max. Voltage ≤ 1400Vpp<br>Compatibility: All RIGOL Scopes.  |
| <br>RP1050D | High Voltage Differential Probe | BW:50MHz;<br>Max. Voltage ≤ 7000Vpp<br>Compatibility: All RIGOL Scopes.  |
| <br>RP1100D | High Voltage Differential Probe | BW:100MHz;<br>Max. Voltage ≤ 7000Vpp<br>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)<br>500 MSa/s (dual-channel)<br>250 MSa/s (four-channel)   |
| Peak Detect           | 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   |
| Memory Depth          | Single-channel: Auto, 12k pts, 120k pts, 1.2M pts, 12M pts and 24M pts (option) are available<br>Dual-channel: Auto, 6k pts, 60k pts, 600k pts, 6M pts and 12M pts (option) are available<br>Four-channel: Auto, 3k pts, 30k pts, 300k pts, 3M pts and 6M pts (option) are available |

### Input

|                               |   |
|-------------------------------|---|
| Number of Channels            | four-channel  |
| Input Coupling                | DC, AC or GND   |
| Input Impedance               | (1 MΩ±2%)    (13 pF±3 pF)   |
| Probe Attenuation Coefficient | 0.01X-1000X, 1-2-5 step   |
| Max Input Voltage (1MΩ)       | Maximum input voltage of the analog channel<br>CAT I 300 Vrms, CAT II 100 Vrms, transient overvoltage 1000 Vpk<br>With RP2200 10:1 probe: CAT II 300 Vrms |

### Horizontal

|                                      |  |
|--------------------------------------|--|
| Time Base Scale                      | 5 ns/div to 50 s/div   |
| Time Base Accuracy <sup>[1]</sup>    | ≤ ± 25 ppm   |
| Time Base Drift                      | ≤ ± 5 ppm/year   |
| Max Delay Range                      | Pre-trigger (negative delay): ≥1 screen width<br>Post-trigger (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 <sup>[2]</sup> | 30,000 wfms/s (dots display)   |

### Vertical

|  |  |
|--|--|
| Bandwidth (-3dB)                           | DS1104Z: DC to 100 MHz<br>DS1074Z: DC to 70 MHz                  |
| Single Bandwidth                           | DS1104Z: DC to 100 MHz<br>DS1074Z: DC to 70 MHz                  |
| Vertical Resolution                        | 8 bit  |
| Vertical Scale                             | 1 mV/div to 10 V/div   |
| Offset Range                               | 1 mV/div to 499 mV/div: ± 2 V<br>500 mV/div to 10 V/div: ± 100 V |
| Bandwidth Limit <sup>[1]</sup>             | 20 MHz   |
| Low Frequency Response (AC coupling, -3dB) | ≤5 Hz (on BNC)   |
| Rise Time <sup>[1]</sup>                   | DS1104Z: 3.5 ns<br>DS1074Z: 5 ns                                 |
| DC Gain Accuracy <sup>[3]</sup>            | <10 mV: ±4% full scale<br>≥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                                  |

## 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 <sup>[1]</sup> | 75 kHz   |
| Low Frequency Rejection <sup>[1]</sup>  | 75 kHz   |
| Trigger Sensitivity <sup>[1]</sup>      | 1.0div (below 5mV or noise rejection is enabled)<br>0.3div (above 5mV and noise rejection is disabled)   |
| <b>Edge Trigger</b>                     |  |
| Edge Type                               | Rising, Falling, Rising&Falling  |
| <b>Pulse Trigger</b>                    |  |
| Pulse Condition                         | Positive Pulse Width (greater than, lower than, within specified interval)<br>Negative Pulse Width (greater than, lower than, within specified interval) |
| Pulse Width Range                       | 8 ns to 10 s   |
| <b>Runt Trigger</b>                     |  |
| Pulse Condition                         | None, > (greater than), < (lower than), <> (within the specified interval)   |
| Polarity                                | Positive, Negative   |
| Pulse Width Range                       | 8 ns to 4 s  |
| <b>Windows Trigger</b>                  |  |
| Windows Type                            | Rising, Falling, Rising&Falling  |
| Trigger Position                        | Enter, Exit, Time  |
| Windows Time                            | 8 ns to 10 s   |
| <b>Nth Edge Trigger</b>                 |  |
| Edge Type                               | Rising, Falling  |
| Idle Time                               | 16 ns to 10 s  |
| Number of Edges                         | 1 to 65535   |
| <b>Slope Trigger</b>                    |  |
| Slope Condition                         | Positive Slope (greater than, lower than, within specified interval)<br>Negative Slope (greater than, lower than, within specified interval)             |
| Time Setting                            | 8 ns to 10 s   |
| <b>Video Trigger</b>                    |  |
| Signal Standard                         | Support standard NTSC, PAL and SECAM broadcasting standards<br>Support 480P, 576P HDTV standards   |
| <b>Pattern Trigger</b>                  |  |
| Pattern Setting                         | H, L, X, Rising Edge, Falling Edge   |
| <b>Delay Trigger</b>                    |  |
| 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   |
| <b>TimeOut Trigger</b>                  |  |
| Edge Type                               | Rising, Falling, Rising&Falling  |
| TimeOut Value                           | 16 ns to 10 s  |
| <b>Duration Trigger</b>                 |  |
| Pattern Setting                         | H, L, X  |
| Trigger Condition                       | > (greater than), < (lower than), <> (within the specified interval)   |
| Duration Time                           | 8 ns to 10 s   |
| <b>Setup/Hold Trigger</b>               |  |
| Edge Type                               | Rising, Falling  |
| Data Pattern                            | H, L, X  |
| Setup Time                              | 8 ns to 1 s  |
| Hold Time                               | 8 ns to 1 s  |
| <b>RS232/UART Trigger</b>               |  |
| 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   |
| <b>I2C Trigger</b>                      |  |
| 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   |
| <b>SPI Trigger</b>                      |  |
| 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 ( $\Delta V$ )<br>Time deviation between cursors ( $\Delta T$ )<br>Reciprocal of $\Delta T$ (Hz) (1/ $\Delta T$ ) |
|                        | 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 $\overline{f}$ , Delay A→B $\overline{t}$ , Phase A→B $\overline{f}$ , Phase A→B $\overline{t}$ |   |
| 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×480 vertical pixels                                      |
| 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 (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 ration                                    | 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) |
| Triangle            | Jitter  | 500 ps                                   |
|                     | Frequency Range   | 0.1 Hz to 100 kHz                        |
|                     | Linearity   | 1%                                       |
|                     | Symmetry  | 0 to 100%                                |



|                              |                 |  |
|------------------------------|-----------------|--|
| Noise <sup>[1]</sup>         | 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)<br>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<br>10 mVpp to 2.5 Vpp, 50 $\Omega$ |
|                              | Resolution      | 100 $\mu$ V or 3 bit, select the greater one                         |
|                              | Accuracy        | 2% (1 kHz)   |
| DC Offset                    | Range           | $\pm 2.5$ V, High-resistance<br>$\pm 1.25$ V, 50 $\Omega$            |
|                              | Resolution      | 100 $\mu$ V or 3 bit, select the greater one                         |
|                              | Accuracy        | 2% (1 kHz)   |

## General Specifications

|   |   |                 |
|---|---|-----------------|
| Probe Compensation Output                         |   |                 |
| Output Voltage <sup>[1]</sup>                     | About 3 V, peak-peak  |                 |
| Frequency <sup>[1]</sup>                          | 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 <sup>[4]</sup>                         | Width×Height×Depth =313.1 mm× 160.8 mm×122.4 mm                                       |                 |
| Weight <sup>[4]</sup>                             | 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<br>Execution standard EN 61326-1:2006 EN 61326-2-1:2006                   |                 |
| Safety  | UL 61010-1:2004; CAN/CSA-C22.2 NO. 61010-1-2004;<br>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 + 25MHz,2 CH Source)         | DS1074Z-S           |
|                            | DS1104Z (100MHz,4 CH Scope)                              | DS1104Z             |
|                            | DS1104Z-S (100MHz,4 CH Scope + 25MHz,2 CH Source)        | DS1104Z-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              |
|                            | 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 | 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**



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