



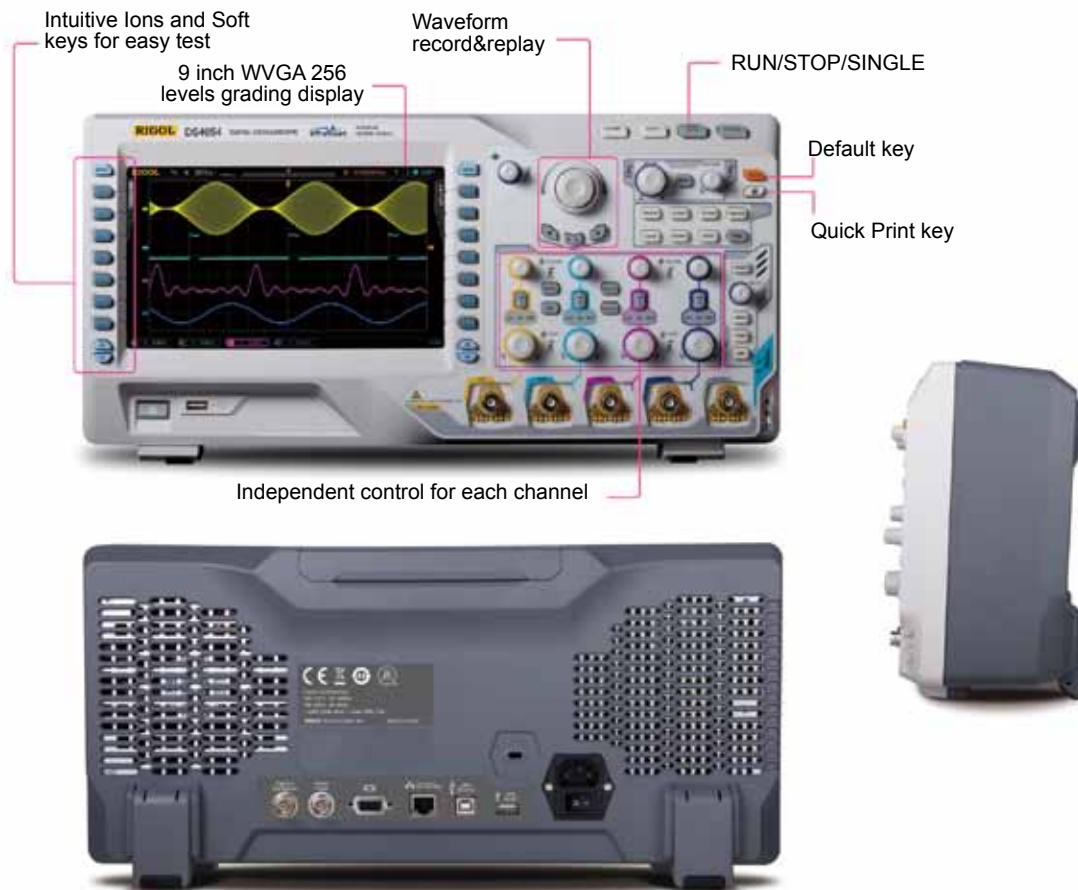
DS4000 Series Digital Oscilloscope

- Bandwidth 500MHz, 350MHz,200MHz,100MHz
- Sample Rate Up to 4GSa/s
- Channels 2 or 4
- Memory 140 Mpts(Std.)
- Waveform capture rate Up to 110,000 waveforms per second,
- Real Time Waveform Record, Replay & Analysis(Std. up to 200,000 frames)
- Lower noise floor, the Min. vertical sensitivity is 1mV/div
- Innovative "UltraVision" technology
- A variety of Trigger functions and Automatic measurements with statistics
- Support serial bus trigger(Std.) and decoding(Opt.)
- Complete Connectivity: USB, LAN(LXI-C), VGA, AUX
- 9 inch WVGA(800X480) Display with 256 level intensity grading display

UltraVision

DS4000 Series is the new mainstream digital scope to meet the customer's applications with its innovative technology,industry leading specifications,powerful trigger functions and broad analysis capabilities.

DS4000 Series Digital Oscilloscope



Product Dimensions: Width X Height X Depth = 440.0mm X 218.0 mm X 130.0 mm Weight: 4.8 kg ± 0.2 kg (Without Package)

► Innovative UltraVision technology



- Deeper Memory Depth(Std.140M pts)
- Higher Waveform capture rate (Up to 110,000wfms/s)
- Real Time waveform record & replay(Up to 200,000 frames)
- Multi-level intensity grading display(Up to 256 levels)

► Models and key Specs

Models	DS4054	DS4052	DS4034	DS4032	DS4024	DS4022	DS4014	DS4012
Bandwidth	500 MHz		350 MHz		200 MHz		100 MHz	
Channels	4	2	4	2	4	2	4	2
Sample rate	4 GSa/s (Max.)							
Max. Memory Depth	140 Mpts (Standard)							
Waveform Capture rate	110,000 wfms/s (Max.)							
Real Time waveform Record, Replay and Analysis function	Max. 200,000 Frames (Std.)							
Standard probes	2 or 4 sets RP3500(500MHz BW probe) for DS40X2 or DS40X4							

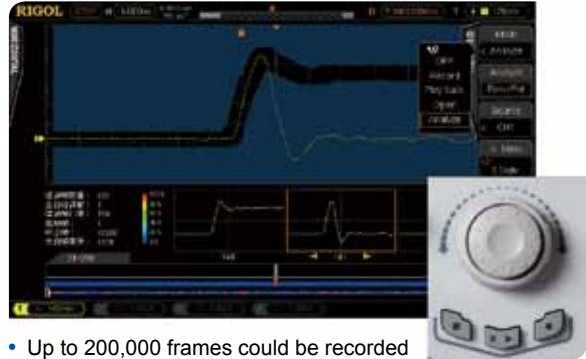
► Features and Benefits

UltraVision: Up to 110K Waveforms/s Waveform capture rate



Find the infrequent problem easily

UltraVision: Realtime waveform record, replay, analysis function (std.)



- Up to 200,000 frames could be recorded
- “WaveFinder”-Dedicated data search knob
- Replay and analyze the recorded waveforms

UltraVision: Deeper Memory with up to 256-Level intensity grading display



Provide the capability to see both the panorama and detail simultaneously

Advanced math function (user defined)

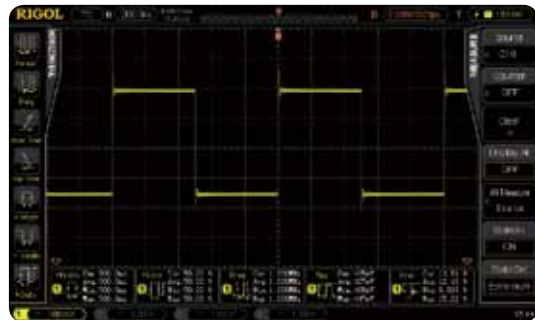


Mask test functions



User defined Mask, Pass/Fail counts, Stop on Fail, Fail Alarm

Automatic measurements with statistics

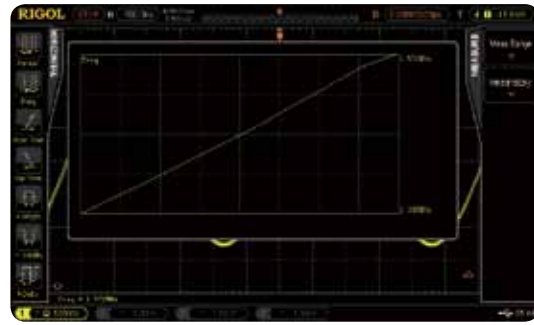


- Automatic measurements for Horizontal and vertical parameters
- Display up to 5 measurement items with statistics simultaneously
- Display all measurement items with the current value in the screen
- Intuitive icon and soft key operation for simplified testing

Serial bus decoding functions



Measurement History: Show the trend of the parameters



► The probes supported by DS4000 series:

Model Number	Attenuation Ratio	Bandwidth	Input R	Max. Input voltage	Recommended applications
RP2200	1:1 or 10:1	1X: DC~7 MHz 10X: DC~150 MHz	1X: 1MΩ ±2% 10X: 10 MΩ±2%	1X: CAT II 150 V AC 10X: CAT II 300V AC	Small signal test (1X) General purpose test
RP3300	1:1 or 10:1	1X: DC~8 MHz 10X: DC~350 MHz	1X: 1 MΩ ±2% 10X: 10 MΩ±2%	1X: CAT II 150 V AC 10X: CAT II 300V AC	Small signal test (1X) General purpose test
RP3500	10:1	DC~500 MHz	10 MΩ±2%	CAT II 300VAC	General purpose test
RP5600A	10:1	DC~600 MHz	10 MΩ±2%	CAT II 300VAC	General purpose test
RP6150A	10:1	DC~1.5 GHz	500 Ω±10 Ω	CAT I 10VAC	High frequency single ended small signal test
RP1300H	100:1	DC~300 MHz	100 MΩ	CAT I 2000V (DC+AC), CAT II 1500 V (DC+AC)	High voltage test
RP1050H	1000:1	DC~50 MHz	10 MΩ±0.5%	DC: 0~15KV DC AC: pulse <=30 KVp-p AC: sine wave <=10 KVrms	High voltage test
RP7150	10:1	DC~1.5 GHz	Differential mode: 50 kΩ ± 2% Single ended mode: 24 kΩ ± 2%	30V Peak, CAT I	Differential /Single ended high frequency signal test

RP2200 150MHz Passive Probe



RP3300 350MHz Passive Probe



RP6150A 1.5GHz Passive Probe



RP3500 500MHz Passive Probe



RP5600A 600MHz Passive Probe



- 10:1 passive probe
- Shipped with probe positioner and its accessories

RP7150 1.5GHz Active Probe



- Active probe supports both differential and single-ended measurements
- Shipped with the browser probe head
- Provides many kinds of probe connection accessories

RP1300H 300MHz High Voltage Probe



RP1050H 50MHz High Voltage Probe



RT50J 50ohm Impedance adapter (2W,1GHz)



► Specifications

All the specifications are guaranteed except the 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	4.0 GSa/s (single-channel)
Sample Rate	2.0 Gsa/s (dual-channel)
Peak Detect	250 ps (single-channel) 500 ps (dual-channel)
Averaging	After all the channels finish N samples at the same time, N can be 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096 or 8192.
High Resolution	12 bits of resolution when $\geq 5 \mu\text{s}/\text{div}$ @ 4 GSa/s (or $\geq 10 \mu\text{s}/\text{div}$ @ 2 GSa/s).
Memory Depth	single-channel: Auto, 14k pts, 140k pts, 1.4M pts, 14M pts and 140M pts are available Dual-channel: Auto, 7k pts, 70k pts, 700k pts, 7M pts and 70M pts are available

Input	
Number of Channels	DS40X4: four channels DS40X2: two channels
Input Coupling	DC, AC or GND
Input Impedance	(1 M Ω ±1%) (14 pF±3 pF) or 50 Ω ±1.5%
Probe	0.01X-1000X 1-2-5 step
Attenuation Coefficient	
Maximum Input Voltage (1M Ω)	Maximum Input Voltage of the Analog Channel CAT I 300 Vrms, CAT II 100 Vrms, Transient Overvoltage 1000V pk with RP2200 10:1 probe: CAT II 300 Vrms with RP3300 10:1 probe: CAT II 300 Vrms with RP3500 10:1 probe: CAT II 300 Vrms with RP5600 10:1 probe: CAT II 300 Vrms

Horizontal	
Time Base Scale	DS405x: 1 ns/div to 1000 s/div DS403x/DS402x: 2 ns/div to 1000 s/div DS401x: 5 ns/div to 1000 s/div
Time Base Accuracy	$\leq \pm 4$ ppm
Time Base Drift	$\leq \pm 2$ ppm/Year
Delay Range	Pre-trigger (negative delay): ≥ 1 screen width Post-trigger (positive delay): 1 s to 100,000 s
Time Base Mode	Y-T, X-Y, Roll, Delayed
Number of X-Ys	2 paths at the same time (four-channel model)
Waveform Capture Rate ¹	110,000 wfms/s (dots display)

Vertical	
Bandwidth (-3dB)	DS405x: DC to 500 MHz DS403x: DC to 350 MHz DS402x: DC to 200 MHz DS401x: DC to 100 MHz
Single Bandwidth	DS405x: DC to 500 MHz DS403x: DC to 350 MHz DS402x: DC to 200 MHz DS401x: DC to 100 MHz
Vertical Resolution	8bits, two channels sample at the same time
Vertical Scale	1 mV/div to 5 V/div (1 M Ω) 1 mV/div to 1 V/div (50 Ω)

Offset Range	1 mV/div to 124 mV/div: ± 1.2 V(50 Ω) 126 mV/div to 1 V/div: ± 12 V(50 Ω) 1 mV/div to 225 mV/div: ± 2 V(1 M Ω) 230 mV/div to 5 V/div: ± 40 V (1 M Ω)
Bandwidth Limit ²	DS405x/ DS403x: 20 MHz/100 MHz/200 MHz DS402x: 20 MHz/100 MHz DS401x: 20 MHz
Low Frequency Response (AC coupling -3dB)	≤ 5 Hz (on BNC)
Rise Time ^[2]	DS405x: 700 ps DS403x: 1ns DS402x: 1.8 ns DS401x: 3.5 ns
DC Gain Accuracy	$\pm 2\%$ full scale
DC Offset Accuracy	200 mV/div to 5 V/div: 0.1 div ± 2 mV ± 0.5 offset 2 mV/div to 195 mV/div: 0.1 div ± 2 mV ± 1.5 offset
ESD Tolerance	± 2 kV
Channel to Channel Isolation	DC to maximum bandwidth: >40 dB

Trigger		
Trigger Level Range	Internal	± 6 div from the center of the screen
	EXT	± 0.8 V
Trigger Mode	Auto, Normal, Single	
Holdoff Range	100 ns to 10 s	
High Frequency Rejection ^[2]	50 kHz	
Low Frequency Rejection ²	5 kHz	
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	4 ns to 4 s	
Runt Trigger		
Pulse Condition	None, > (greater than), < (lower than), <> (within the specified interval)	
Polarity	Positive, Negative	
Pulse Width Range	4 ns to 4 s	
Nth Edge Trigger		
Edge Type	Rising, Falling	
Idle Time	40 ns to 1 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	10 ns to 1 s	
Video Trigger		
Signal Standard	Support standard NTSC, PAL and SECAM broadcasting standards Support 480P, 576P, 720P, 1080P and 1080I HDTV standards	
Pattern Trigger		
Pattern Setting	H, L, X, Rising Edge, Falling Edge	

RS232/UART Trigger	
Trigger Condition	Start, Error, Check Error, Data
Polarity	Normal, Invert
Baud	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, User
Data Bits	5 bit, 6 bit, 7 bit, 8 bit

I2C Trigger	
Trigger Condition	Start, Restart, Stop, Missing ACK, Address, Data, A&D
Address Bits	7 bit, 8 bit, 10 bit
Address Range	0 to 127, 0 to 255, 0 to 1023
Byte Length	1 to 5

SPI Trigger	
Trigger Condition	CS, Timeout
Timeout Value	100 ns to 1 s
Data Bits	4 bit to 32 bit
Data Line Setting	H, L, X
Clock Edge	Rising Edge, Falling Edge

CAN Trigger	
Signal Type	Rx, Tx, CAN_H, CAN_L, Differential
Trigger Condition	SOF, EOF, Frame Type, Frame Error
Baud	10 kbps, 20 kbps, 33.3 kbps, 50 kbps, 62.5 kbps, 83.3 kbps, 100 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps, User
Sample Point	5% to 95%
Frame Type	Data, Remote, Error, OverLoad
Error Type	Bit Fill, Answer Error, Check Error, Format Error, Random Error

FlexRay Trigger	
Baud	2.5 Mb/s, 5 Mb/s, 10 Mb/s
Trigger Condition	Frame, Symbol, Error, TSS

USB Trigger	
Signal Speed	Low Speed, Full Speed
Trigger condition	SOP, EOP, RC, Suspended, ExitSuspend

Measure		
Cursor	Manual mode	Voltage deviation between cursors (ΔV)
		Time deviation between cursors (ΔT)
	Track mode	Reciprocal of ΔT (Hz) ($1/\Delta T$)
		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 \downarrow , Delay A~B \uparrow , Phase A~B \downarrow , Phase A~B \uparrow	
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, AxB, A/B, FFT, Editable Advanced Operation, Logic Operation
FFT Display	Rectangle, Hanning, Blackman, Hamming
FFT Vertical Scale	Split, Full Screen
Logic Operation	dB, Vrms
Math Function	AND, OR, NOT, XOR
Number of Buses for Decoding	Intg, Diff, Log, Exp, Sqrt, Sine, Cosine, Tangent
Decoding Type	2
	Parallel (standard), RS232 /UART (option), I2C /SPI (option), CAN (option), FlexRay (option)

Display	
Display Type	9 inches (229 mm) TFT LCD display
Display Resolution	800 horizontalxRGBx480 vertical pixel
Display Color	160,000 color
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
Real-time Clock	Time and Date (user adjustable)

I/O	
Standard Ports	Dual USB HOST, USB DEVICE, LAN, VGA output, 10MHz input/output, Aux output (TrigOut, Fast, GND, pass/fail, calibration)

General Specifications

Probe Compensation	
Output Voltage ^[2]	About 3 V, peak-peak
Frequency ²	1 kHz
Power	
Power Voltage	100-120 V/50Hz/60Hz/400Hz 100-240 V/50 Hz/60Hz
Power	Maximum 120 W
Fuse	3 A, T degree, 250 V

Environment	
Temperature Range	In operation: 0 °C to +50 °C Out of operation: -20 °C to +70 °C
Cooling Method	Fan
Humidity Range	Under +35 °C: $\leq 90\%$ relative humidity +35 °C to +50 °C: $\leq 60\%$ relative humidity
Altitude	In operation: under 3,000 meters Out of operation: under 15,000 meters

Mechanical		
Dimensions ^[3]	WidthxHightxDepth =440.0 mmx 218.0 mmx130.0 mm	
Weight ^[4]	Without package	4.8 kg \pm 0.2 kg
	With package	7.1 kg \pm 1.0kg

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]: Maximum value. In single-channel mode, sine signal with 10 ns horizontal scale, 4 div input amplitude and 10 MHz frequency, edge trigger.

Note^[2]: Typical.

Note^[3]: Tilt tabs and handle folded, knob height included, front panel cover excluded.

Note^[4]: DS4054 model, standard configuration.

► Ordering Information

Model	Description	Order Number
	DS4012 (100MHz, 2-channel)	DS4012
	DS4014 (100MHz, 4-channel)	DS4014
	DS4022 (200MHz, 2-channel)	DS4022
	DS4024 (200MHz, 4-channel)	DS4024
	DS4032 (350MHz, 2-channel)	DS4032
	DS4034 (350MHz, 4-channel)	DS4034
	DS4052 (500MHz, 2-channel)	DS4052
	DS4054 (500MHz, 4-channel)	DS4054
Standard Accessories	Power Cord conforming to the standard of the country	-
	Front Panel Cover	FPC-DS-4
	USB Data Cable	CB-USB-150
	2 or 4 Passive Probes (500 MHz)	RP3500
	Quick Guide	-
	Resource CD (User's Guide and Application Software)	-
Optional Accessories	Active Differential Probe (1.5 GHz)	RP7150
	Rack Mount Kit	RM-DS-4
Decoding Options	RS232/UART Decoding Kit	SD-RS232-DS4
	I2C/SPI Decoding Kit	SD-I2C/SPI-DS4
	CAN Decoding Kit	SD-CAN-DS4
	FlexRay Decoding Kit	SD-FlexRay-DS4

NOTE: All the options or accessories can be ordered from you local RIGOL Office.

Warranty

Three –year warranty, excluding probes and accessories.

RIGOL

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