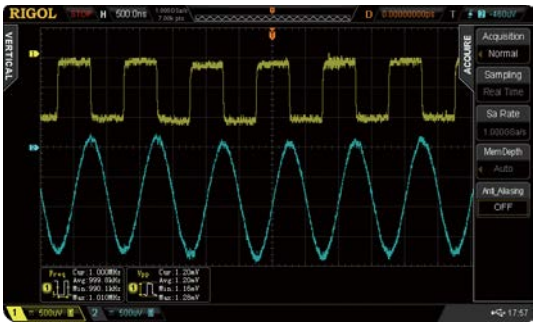
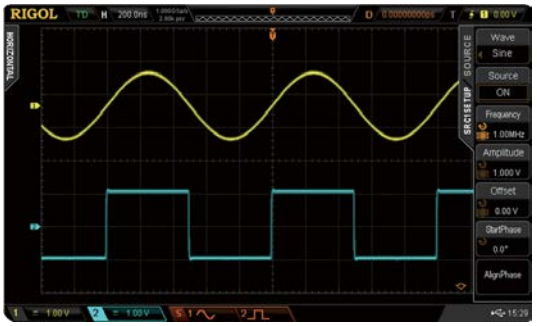
Features and Benefits

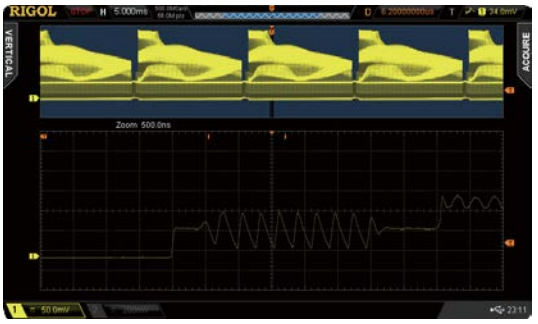
Wider vertical range (500 uV/div~10 V/div), lower noise floor, better for small signal capturing



Built-in dual-channel 25 MHz source (MSO/DS2000A-S)



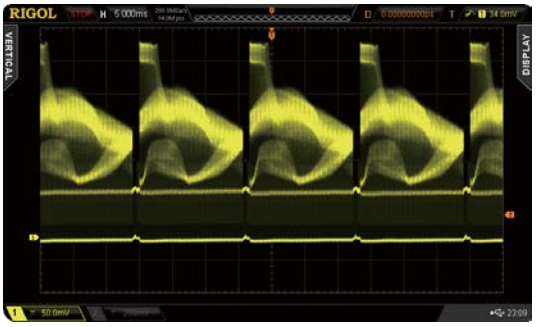
UltraVision: deeper memory (analog channel up to 14 Mpts (standard)/56 Mpts (optional))



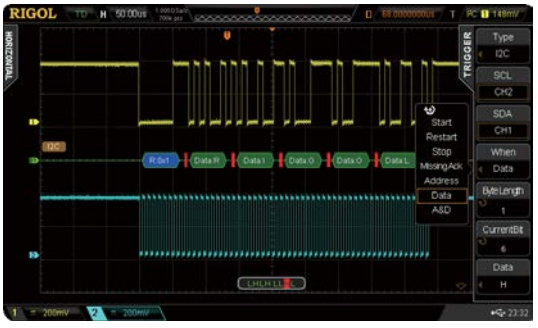
UltraVision: up to 50,000 wfms/s waveform capture rate

UltraVision: real-time waveform record, playback and analysis functions

UltraVision: multi-level intensity grading display (up to 256 levels)

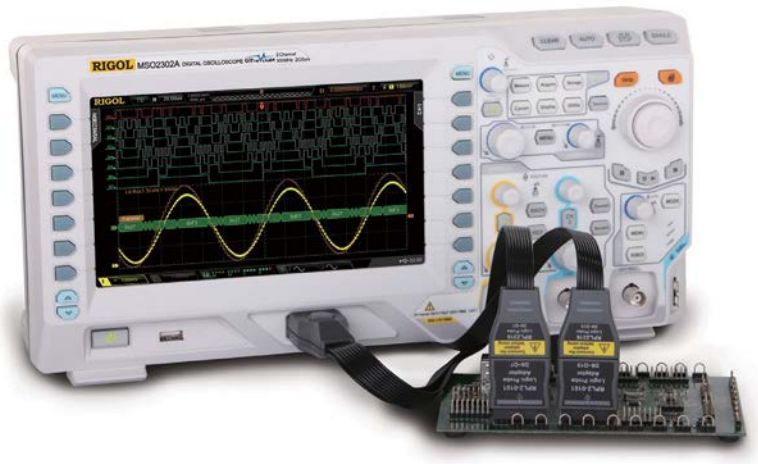


Serial bus trigger&decoding functions (RS232, I2C, SPI, CAN)



Versatile trigger functions (Runt, Nth Edge, Setup/Hold…)

➤ MSO2000A Series Mixed Signal Oscilloscope



Besides the powerful functions of DS2000A, you could get more from MSO2000A with:

- 16 digital channels
- Sample rate of digital channel up to 1 GSa/s
- Memory depth of digital channel up to 28 Mpts
- Waveform capture rate of digital channel up to 50,000 wfms/s
- Hardware real-time waveform record and playback functions, up to 65,000 frames can be recorded
- Triggering and decoding across analog and digital channels
- Easy grouping and group operation of the digital channels
- Supports a variety of logic levels
- Up to 2+16 channels; trigger across the analog and digital channels
- Time correlated display and analysis for both the analog and digital channel waveforms

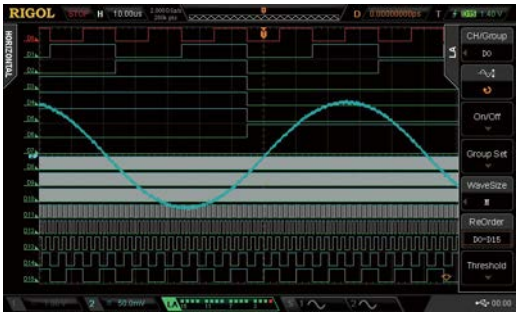
Innovative UltraVision Technology (Digital Channel)

UltraVision

- Deeper memory depth (up to 28 Mpts)
- Higher waveform capture rate (up to 50,000 wfms/s)
- Real-time waveform record and playback functions (up to 65,000 frames)
- Multi-level intensity grading display

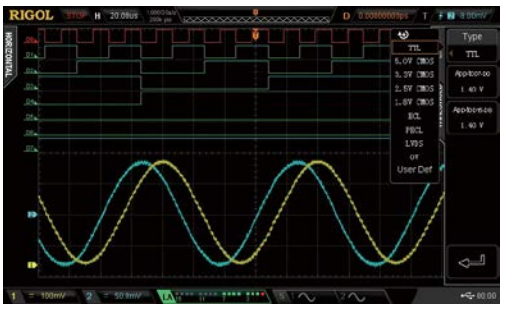
Mixed signal analysis with analog and digital channels

Easy to be grouped and labeled for digital channels



Deeper memory depth for the digital channels, serial bus triggering and decoding on digital channels

Supports a variety of logic levels



➤ Specifications

Sample

Sample Mode	Real-time Sample
Real-time Sample Rate	Analog channel: 2 GSa/s (single-channel), 1 Gsa/s (dual-channel) Digital channel: 1 GSa/s (8-channel), 500 MSa/s (16-channel)
Peak Detect	Analog channel: 500 ps (single-channel), 1 ns (dual-channel) Digital channel: 1 ns (8-channel), 2 ns (16-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 ≥5 μs/div @ 1 GSa/s (or ≥10 μs/div @ 500 MSa/s).
Minimum Detectable Pulse Width	Digital channel: 5 ns
Memory Depth	Analog channel: Single-channel: Auto, 14 kpts, 140 kpts, 1.4 Mpts, 14 Mpts and 56 Mpts (optional) are available Dual-channel: Auto, 7 kpts, 70 kpts, 700 kpts, 7 Mpts and 28 Mpts (optional) are available Digital channel: 14 Mpts (8-channel), 7 Mpts (16-channel) standard; 28 Mpts (8-channel), 14 Mpts (16-channel) optional

Input

Number of Channels	MSO2XX2A/2XX2A-S: 2 analog channels+16 digital channels DS2XX2A/2XX2A-S: 2 analog channels
Input Coupling	DC, AC or GND
Input Impedance	Analog channel: (1 MΩ±1%) || (16 pF±3 pF) or 50 Ω±1.5% Digital channel: (101 kΩ±1%) || (9 pF±1 pF)
Probe Attenuation Coefficient	Analog channel: 0.01X to 1000X, in 1-2-5 step
Maximum Input Voltage (1 MΩ)	Analog channel: CAT I 300 Vrms, CAT II 100 Vrms, transient overvoltage 1000 Vpk Digital channel: CAT I 40 Vrms, transient overvoltage 800 Vpk

Horizontal

Time Base Scale	MSO/DS2302A/2302A-S: 1.000 ns/div to 1.000 ks/div MSO/DS2202A/2202A-S: 2.000 ns/div to 1.000 ks/div MSO/DS2102A/2102A-S/2072A/2072A-S: 5.000 ns/div to 1.000 ks/div
Channel to Channel Skew	1 ns (typical), 2 ns (maximum)
Maximum Record Length	14 Mpts (standard), 56 Mpts (optional)
Time Base Accuracy	≤±25 ppm
Time Base Drift	≤±5 ppm/year
Maximum Delay Range	Memory Depth/Sample Rate
Time Base Mode	Y-T, X-Y, Roll
Number of X-Ys	1 path
Waveform Capture Rate[2]	50,000 wfms/s (dots display)

Vertical

Bandwidth (-3 dB) (50 Ω)	MSO/DS2302A/2302A-S: DC to 300 MHz MSO/DS2202A/2202A-S: DC to 200 MHz MSO/DS2102A/2102A-S: DC to 100 MHz MSO/DS2072A/2072A-S: DC to 70 MHz
Single Bandwidth (50 Ω)	MSO/DS2302A/2302A-S: DC to 300 MHz MSO/DS2202A/2202A-S: DC to 200 MHz MSO/DS2102A/2102A-S: DC to 100 MHz MSO/DS2072A/2072A-S: DC to 70 MHz
Vertical Resolution	Analog channel: 8 bit Digital channel: 1 bit
Vertical Scale	When the input impedance is 50 Ω: 500 μV/div to 1 V/div When the input impedance is 1 MΩ: 500 μV/div to 10 V/div
Offset Range	When the input impedance is 50 Ω: 500 μV/div to 50 mV/div: ±2 V 51 mV/div to 200 mV/div: ±10 V 205 mV/div to 1 V/div: ±12 V When the input impedance is 1 MΩ: 500 μV /div to 50 mV/div: ±2 V 51 mV/div to 200 mV/div: ±10 V 205 mV/div to 2 V/div: ±50 V 2.05 V/div to 10 V/div: ±100 V
Bandwidth Limit	MSO/DS2302A/2302A-S/2202A/2202A-S: 20 MHz/100 MHz MSO/DS2102A/2102A-S/2072A/2072A-S: 20 MHz
Low Frequency Response (AC Coupling, -3 dB)	≤5 Hz (on BNC)
Calculated Rise Time	MSO/DS2302A/2302A-S: 1.2 ns MSO/DS2202A/2202A-S: 1.8 ns MSO/DS2102A/2102A-S: 3.5 ns MSO/DS2072A/2072A-S: 5 ns
DC Gain Accuracy	±2% full scale
DC Offset Accuracy	±0.1 div ± 2 mV ± 1% offset value
Channel to Channel Isolation	DC to maximum bandwidth: >40 dB

Vertical (Digital Channel)

Threshold	1 group with 8 channels adjustable threshold
Threshold Selection	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	±20.0 V, in 10 mV step
Threshold Accuracy	±(100 mV + 3% of threshold setting)
Dynamic Range	±10 V + threshold
Minimum Voltage Swing	500 mVpp
Input Impedance	//101 kΩ
Probe Loading	≈8 pF
Vertical Resolution	1 bit

Trigger

Trigger Level Range	Internal: ±5 div from center of the screen EXT: ±4 V
Trigger Mode	Auto, Normal, Single
Holdoff Range	100 ns to 10 s
High Frequency Rejection[1]	75 kHz
Low Frequency Rejection	75 kHz
Trigger Sensitivity	1 div (below 10 mV or noise rejection is enabled) 0.3 div (above 10 mV and noise rejection is disabled)
Edge Trigger	
Edge Type	Rising, Falling,
Pulse Trigger	
Pulse Condition	Positive Pulse Width (greater than, lower than, within specific interval) Negative Pulse Width (greater than, lower than, within specific interval)
Pulse Width Range	2 ns to 4 s
Runt Trigger	
Pulse Condition	None, >, <, <>
Pulse Polarity	Positive, Negative
Pulse Range	2 ns to 4 s
Windows Trigger (Optional)	
Windows Type	Rising, Falling, Rising/Falling
Trigger Position	Enter, Exit, Time
Windows Time	16 ns to 4 s
Nth Edge Trigger (Optional)	
Edge Type	Rising, Falling
Idle Time	16 ns to 4 s
Number of Edges	1 to 65535
Slope Trigger	
Slope Condition	Positive Slope (greater than, lower than, within specific interval) Negative Slope (greater than, lower than, within specific interval)
Time Setting	10 ns to 1 s
Video Trigger (Optional)	
Signal Standard	NTSC, PAL/SECAM, 480P, 576P (standard) 720P, 1080P and 1080I (optional)
Pattern Trigger	
Pattern Setting	H, L, X, Rising Edge, Falling
Delay Trigger (Optional)	
Edge Type	Rising, Falling
Delay Type	>, <, <>, ><
Delay Time	2 ns to 4 s
TimeOut Trigger (Optional)	
Edge Type	Rising, Falling, Rising/Falling
Timeout Time	16 ns to 4 s
Duration Trigger (Optional)	
Pattern Setting	H, L, X
Trigger Condition	>, <, <>
Duration Time	2 ns to 4 s
Setup/Hold Trigger	
Edge Type	Rising, Falling

Data Type	H, L
Setup Time	2 ns to 1 s
Hold Time	2 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, 230400 bps, 460800 bps, 921600 bps, 1 Mbps, 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	Timeout
Timeout Value	100 ns to 1 s
Data Bits	4 bit to 32 bit
Data Setting	H, L, X
CAN Trigger (Optional)	
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, Over Load
Error Type	Bit Fill, Answer Error, Check Error, Format Error, Random Error
USB Trigger (Optional)	
Signal Speed	Low Speed, Full Speed
Trigger Condition	SOP, EOP, RC, Suspend, Exit Suspend

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	Analog channel: Maximum, Minimum, Peak-Peak Value, Top Value, Bottom Value, Amplitude, Average, Vrms-N, Vrms-1, 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, Delay A→B, Delay A→B, Phase A→B, Phase A→B, Phase A→B, Phase A→B Digital channel: Frequency, Period, Positive Pulse Width, Negative Pulse Width, Positive Duty Cycle, Negative Duty Cycle, Delay A→B, Delay A→B, Delay A→B, Delay A→B, Phase A→B, Phase 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	Current, Average, Max, Min, Standard Deviation, Number of Measurements	
Frequency Counter	Hardware 6 bits frequency counter (channels are selectable)	

Math Operation

Waveform Operation	A+B, A-B, A×B, A÷B, FFT, Digital Filter, Editable Advanced Operation, Logic Operation
FFT Window	Rectangle, Hanning, Blackman, Hamming
FFT Display	Split, Full Screen
FFT Vertical Scale	Vrms, dB
Logic Operation	AND, OR, NOT, XOR
Math Function	Intg, Diff, Lg, Exp, Sqrt, Sine, Cosine, Tangent
Number of Buses for Decoding	2
Decoding Type	Parallel (standard), RS232 (optional), I2C (optional), SPI (optional), CAN (optional)

Display

Display Type	8.0 inches (203 mm) TFT LCD display
Display Resolution	800 horizontal×RGB×480 Vertical Pixel
Display Color	160,000 Color (TFT)
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)

Signal Source (MSO2000A-S/DS2000A-S)

Channels	2	
Sample Rate	200 MSa/s	
Vertical Resolution	14 bits	
Max. Frequency	25 MHz	
Standard Waveform	Sine, Square, Pulse, Ramp, Noise, DC	
Built-in Waveform	Sinc, Exponential Rise, Exponential Fall, ECG, Gauss, Lorentz, Haversine	
Sine	Frequency Range	100 mHz to 25 MHz
	Flatness	±0.5 dB (relative to 1 kHz)
	Harmonic Distortion	-40 dBc
	Stray (Non-harmonic)	-40 dBc
	Total Harmonic Distortion	1%
	S/N Ratio	40 dB
Square/Pulse	Frequency Range	Square: 100 mHz to 15 MHz Pulse: 100 mHz to 1 MHz
	Rise/Fall Time	<15 ns
	Overshoot	<5%
	Duty Cycle	Square: 50% Pulse: 10% to 90% (user adjustable)
	Duty Cycle Resolution	1% or 10 ns (the larger of the two)
	Min. Pulse Width	20 ns
	Pulse Width Resolution	10 ns or 5 bits (the larger of the two)
	Jitter	500 ps
Ramp	Frequency Range	100 mHz to 100 kHz
	Linearity	1%
	Symmetry	0 to 100%
Noise	Bandwidth	25 MHz (typical)
Built-in Waveform	Frequency Range	100 mHz to 1 MHz

Arbitrary Waveform	Frequency Range	100 mHz to 10 MHz
	Waveform Length	1 to 16k points
	Internal Storage Location	10
Frequency	Accuracy	100 ppm (lower than 10 kHz) 50 ppm (higher than 10 kHz)
	Resolution	100 mHz or 4 bits, the larger of the two
Amplitude	Output Range	20 mVpp to 5 Vpp, HighZ 10 mVpp to 2.5 Vpp, 50 Ω
	Resolution	100 µV or 3 bits, the larger of the two
	Accuracy	2% (1 kHz)
DC Offset	Range	±2.5 V, HighZ ±1.25 V, 50 Ω
	Resolution	100 µV or 3 bits, the larger of the two
	Accuracy	Offset setting value ± 2%
Modulation	AM, FM	

I/O

Standard Ports	USB Host (support USB-GPIB), USB Device, LAN, Aux Output (TrigOut/PassFail)
Printer Compatibility	PictBridge

General Specifications

Probe Compensation Output		
Output Voltage	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 +70℃	
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	
Physical Characteristics		
Size	Width×Height×Depth = 361.6 mm×179.6 mm×130.8 mm	
Weight	Package Excluded	3.9 kg±0.5 kg
	Package Included	4.5 kg±0.5 kg
Calibration Interval		
The recommended calibration interval is one year.		
Regulatory Information		
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	