

# SDS2000X HD

## Digital Storage Oscilloscope

Data Sheet

EN02A

**TELONIC**  
TEST INSTRUMENTS & POWER SUPPLIES



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**SIGLENT TECHNOLOGIES CO.,LTD**

# SDS2354X HD SDS2204X HD

## Product Overview

SIGLENT's SDS2000X HD series high resolution digital storage oscilloscopes are based on 2 GSa/s, 12-bit Analog-Digital Converters and front ends with excellent noise floor performance. They are available in bandwidths of 350 MHz and 200 MHz, have maximum record length of 200 Mpts/ch, and display 4 analog channels + 16 digital channels mixed signal analysis ability.

The SDS2000X HD series employs Siglent's SPO technology with a maximum waveform capture rate of up to 100,000 wfm/s (normal mode, up to 500,000 wfm/s in Sequence mode), 256-level intensity grading display function plus a color temperature display mode. It also employs an innovative digital trigger system with high sensitivity and low jitter. The trigger system supports multiple powerful triggering modes including serial bus triggering. Tools such as History waveform recording, Search and Navigate functions, Mask Test, Bode Plot, Power Analysis and Histogram allow for extended waveform records to be captured, stored, and analyzed. An impressive array of measurement and math capabilities, options for a 25 MHz arbitrary waveform generator, as well as serial decoding are also features of the SDS2000X HD.

The large 10.1" display capacitive touch screen supports multi-touch gestures, with the addition of user-friendly UI design, can greatly improve the operation efficiency. It also supports mouse control, and remote web control over LAN.

## Key Features

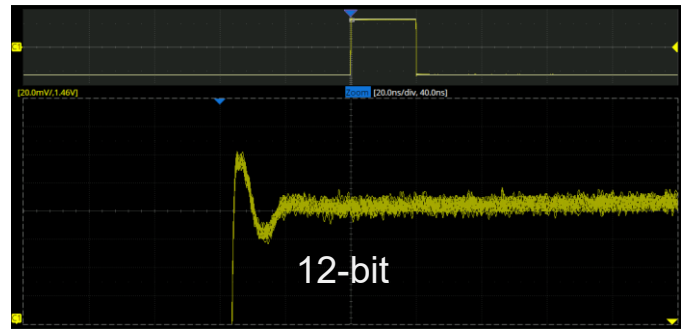
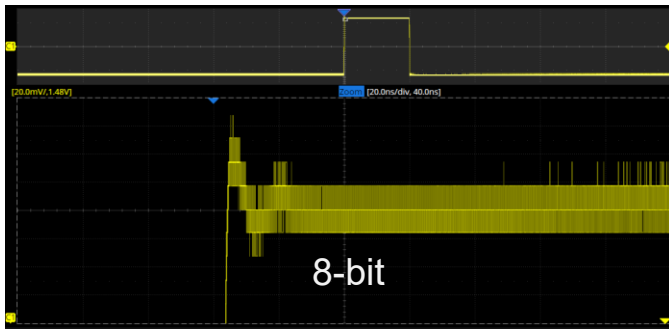
- 12-bit High Resolution
  - 12-bit Analog-Digital Convertors with sample rate up to 2 GSa/s
  - Front ends with 70  $\mu$ Vrms noise floor @ 500 MHz bandwidth and 0.5% DC gain accuracy
- 4 analog channels, up to 350 MHz bandwidth (upgradable to 500 MHz)
- SPO technology
  - Waveform capture rate up to 100,000 wfm/s (normal mode), and 500,000 wfm/s (sequence mode)
  - Supports 256-level intensity grading and color temperature display modes
  - Up to 200 Mpts/ch record length
  - Digital trigger system
- Intelligent trigger: Edge, Slope, Pulse, Window, Runt, Interval, Dropout, Pattern, Qualified, Nth edge, Setup/hold, Delay and Video (HDTV supported). Zone Trigger simplifies advanced triggering
- Serial bus triggering and decoder, supports protocols I<sup>2</sup>C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I<sup>2</sup>S, MIL-STD-1553B, SENT, Manchester and ARINC429
- Segmented acquisition (Sequence) mode, dividing the maximum record length into multiple segments (up to 80,000), according to trigger conditions set by the user, with a very small dead time between segments to capture the qualifying event
- History waveform record (History) function, the maximum recorded waveform length is 80,000 frames
- Automatic measurements on 50+ parameters, supports statistics with histogram, track, trend, Gating measurement, and measurements on Math, History and Ref
- 4 Math traces (2 Mpts FFT, addition, subtraction, multiplication, division, integration, differential, square root, etc.), supports formula editor
- Abundant data analysis functions such as Search, Navigate, Digital Voltmeter, Counter, Waveform Histogram, Bode plot and Power Analysis
- High Speed hardware-based Average, ERES; High Speed hardware-based Mask Test function, with Mask Editor tool for creating user-defined masks
- 16 digital channels (optional)
- Built-in 25 MHz waveform generator
- Large 10.1" TFT-LCD display with 1024 \* 600 resolution; Capacitive touch screen supports multi-touch gestures
- Interfaces include: USB Hosts, USB Device (USBTMC), LAN (LXI/VXI-11/Telnet/Socket), Pass/Fail, Trigger Out
- Built-in web server supports remote control over the LAN port using a web browser. Supports SCPI remote control commands. Supports external mouse and keyboard

## Models and Key Specifications

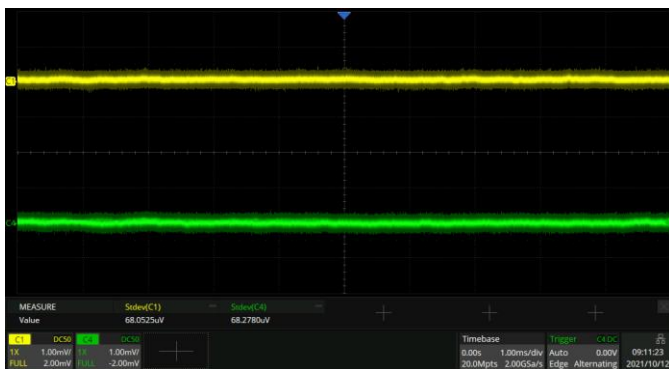
Model	SDS2354X HD	SDS2204X HD
Analog channels	4 + EXT	
Bandwidth	350 MHz	200 MHz
	(Upgradable to 500 MHz max.)	
Vertical resolution	12-bit	
Sample rate (Max.)	2 GSa/s (interleaving mode) , 1 GSa/s (non-interleaving mode)	
Memory depth (Max.)	200 Mpts/ch (interleaving mode) , 100 Mpts/ch (non-interleaving mode)	
Waveform capture rate (Max.)	Normal mode: 100,000 wfm/s;	
	Sequence mode: 500,000 wfm/s	
Trigger type	Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video, Qualified, Nth edge, Setup/hold, Delay, Serial	
Serial trigger and decode	Standard: I <sup>2</sup> C, SPI, UART, CAN, LIN	
	Optional: CAN FD, FlexRay, I <sup>2</sup> S, MIL-STD-1553B, SENT, Manchester (decode only), ARINC429 (decode only)	
Measurement	50+ parameters, statistics, histogram, trend, and track supported	
Math	4 traces	
	2 Mpts FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation, Absolute, Sign, e <sup>x</sup> , 10 <sup>x</sup> , ln, lg, Interpolation, MaxHold, MinHold, ERES, Average, Filter. Supports formula editor	
Data analysis	Search, Navigate, History, Mask Test, Digital Voltmeter, Counter, Waveform Histogram, Bode plot, and Power Analysis	
Digital channel (optional)	16-channel; maximum sample rate up to 500 MSa/s; record length up to 50 Mpts	
Waveform generator (optional)	Single-channel built-in waveform generator, frequency up to 25 MHz, 125 MSa/s sample rate, 16 kpts waveform memory	
I/O	USB 2.0 Host x3, USB 2.0 Device, 10 M / 100 M LAN, External trigger, Auxiliary output (TRIG OUT, PASS/FAIL)	
Probe (Standard)	One 500 MHz passive probe supplied for each channel	
Display	10.1 TFT-LCD with capacitive touch screen (1024*600)	

## Functions & Characteristics

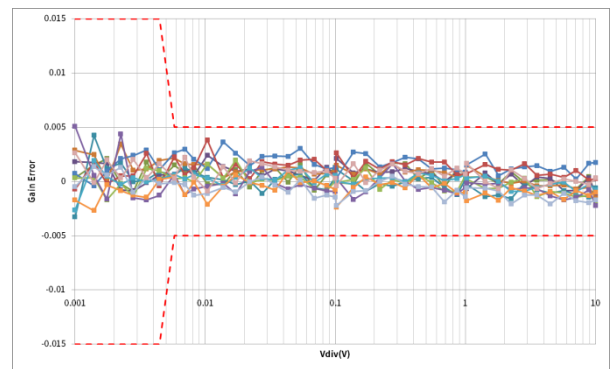
### 12-bit High Resolution



12-bit resolution shows you more details and less noise on the waveform.



Low noise floor: Only 70  $\mu$ Vrms at 500 MHz bandwidth



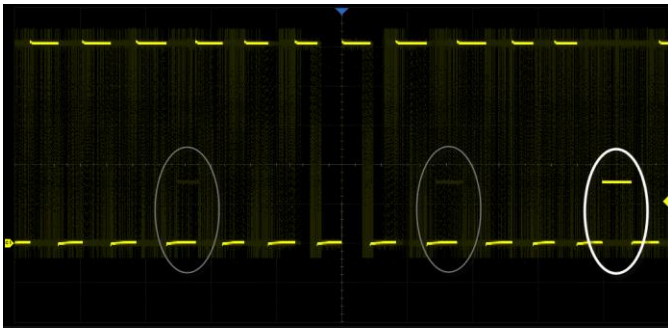
0.5% DC gain accuracy

### Excellent User Interface and User Experience



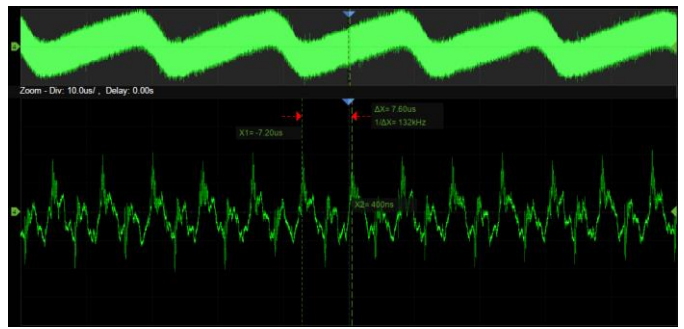
- 10.1" display with 1024x600 resolution
- Capacitive touch screen, supporting multi-touch gestures, can move or scale the waveform traces quickly by finger-touch movements, which greatly improves the operation efficiency
- Built-in WebServer supports remote control on a web page over LAN
- Supports external mouse and keyboard

### High Waveform Update Rate



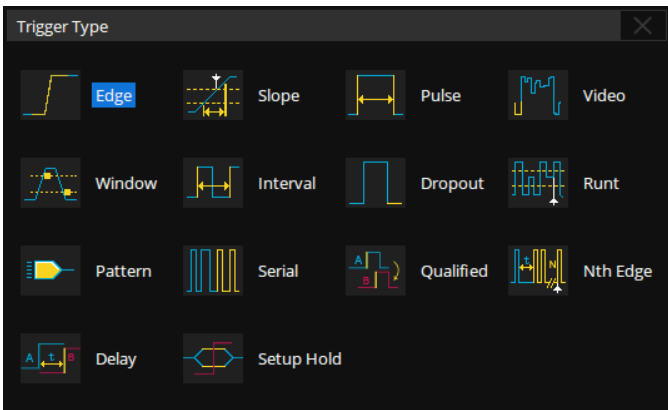
With a waveform update rate of up to 100,000 wfms/s, the oscilloscope can easily capture unusual or low-probability events. In Sequence mode, the waveform capture rate can reach 500,000 wfms/s

### Deep Record Length



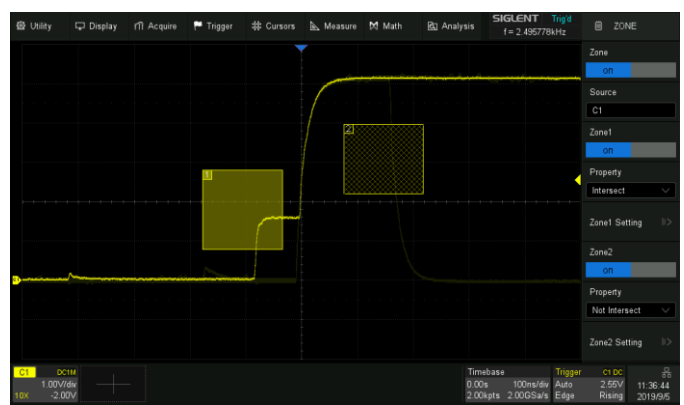
Using hardware-based Zoom technique and record length of up to 200 Mpts, users can select a slower timebase without compromising the sample rate, and then quickly zoom in to focus on the area of interest

### Multiple Trigger Functions



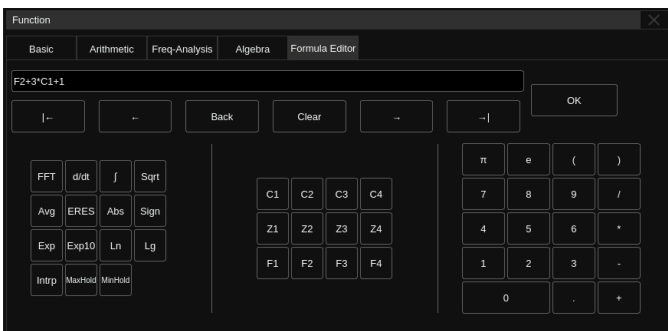
Edge, Slope, Pulse, Video, Windows, Runt, Interval, Dropout, Pattern, Qualified, Nth edge, Setup/hold, Delay, and serial trigger

### Trigger Zone

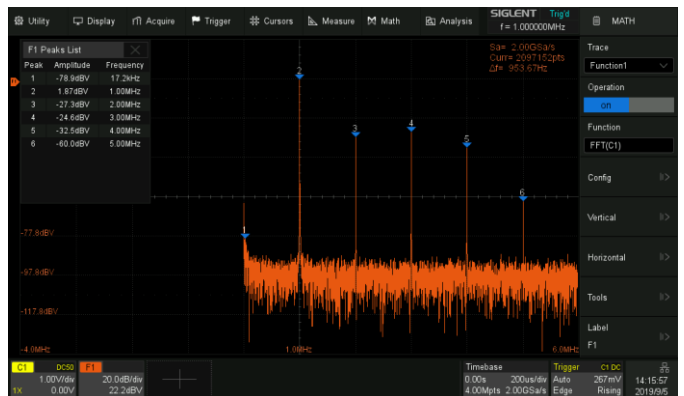


Trigger Zone is available for advanced triggering

### Advanced Math Function

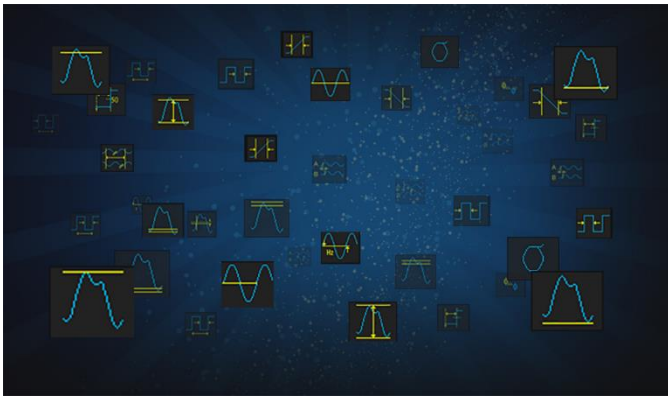


In addition to the traditional (+, -, X, /) operations, FFT, integration, differential, square root, and more are supported. Formula Editor is available for more complex operations. 4 math traces are available.



Hardware-accelerated FFT supports up to 2 Mpts operation. This provides high-frequency resolution with a fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs. Three modes (Normal, Average, and Max hold) can satisfy different requirements for observing the power spectrum. Auto peak detection and markers are supported.

### Measurements of a Variety of Parameters



Parameter measurements include 4 categories: horizontal, vertical, miscellaneous, and CH delay providing a total of 50+ different types of measurements. Measurements can be performed within a specified gate period. Measurements on Math, Reference, and History frames are supported

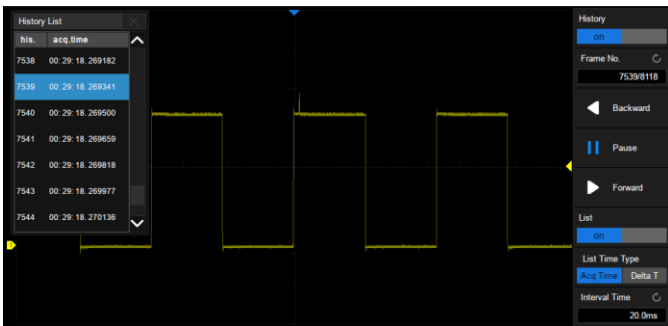
### Parameter Statistics Function



Statistics show the current value, maximum value, minimum value, standard deviation, and mean value of up to 12 parameters simultaneously. A histogram is available to show the probability distribution of a parameter. Trend and Track are available to show the parameter value vs. time.

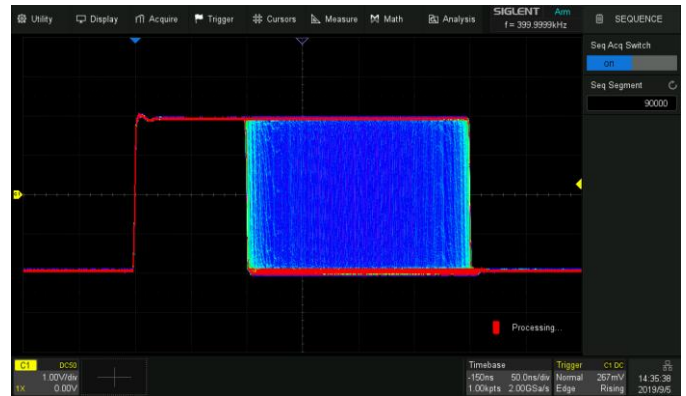
For horizontal parameters such as period, all results are extracted from a frame, instead of just calculating the first one. This accelerates statistics on horizontal measurements much more and enables distribution observation in a frame using Histogram and Track

### History Mode



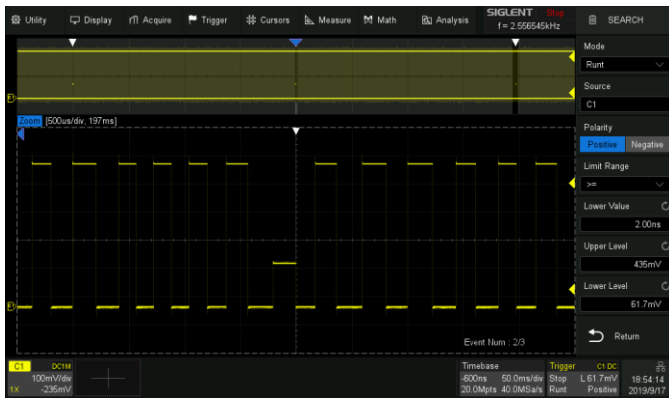
History function can record up to 80,000 frames of waveforms. The recording is executed automatically so that the customer can playback the history waveforms at any time to observe unusual events and quickly locate the area of interest using the cursors or measurements. The failed frames of the Mask Test can be stored as history

### Sequence Mode



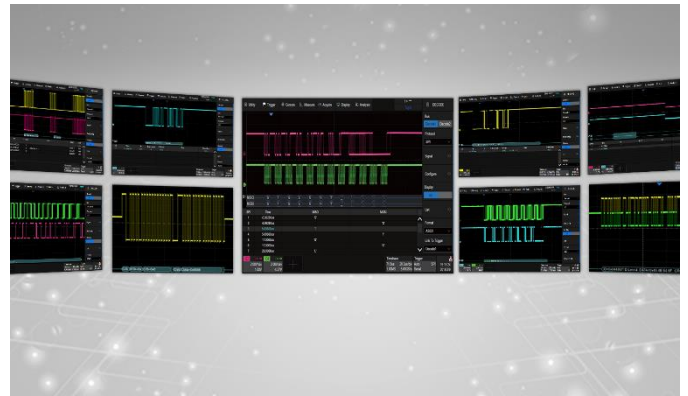
Segmented memory collection will store the waveform into multiple memory segments (up to 80,000) and each segment will store a triggered waveform as well the dead time information. The interval between segments can be as small as 2 μs. All of the segments can be played back using the History function

## Search and Navigate



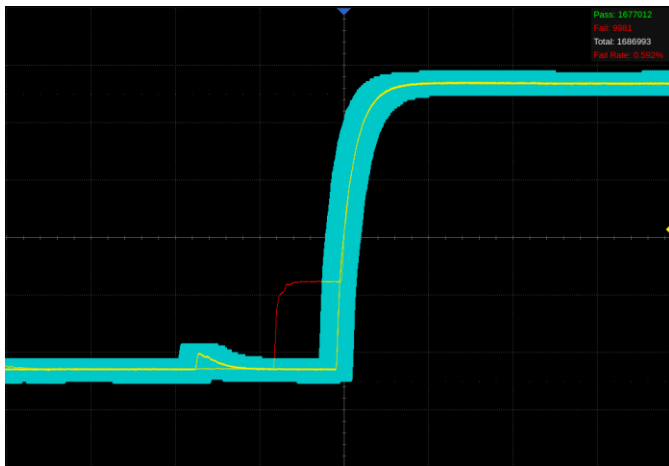
The oscilloscope can search events specified by the user in a frame. Events flagged by the Search can be recalled automatically using Navigate. It can also navigate by time (delay position) and history frames

## Serial Bus Decode

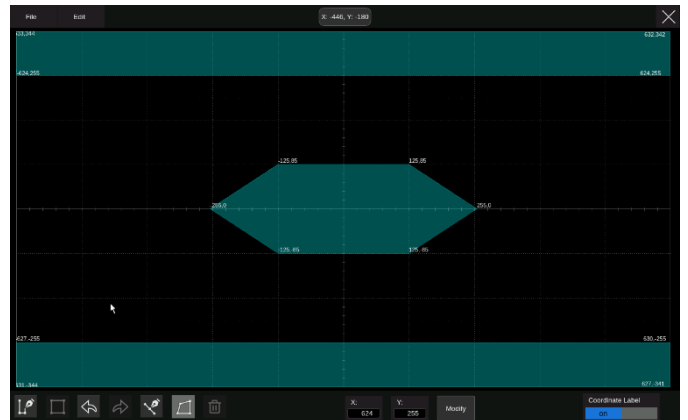


Display the decoded characters through the events list. Bus protocol information can be quickly and intuitively displayed in tabular form. I<sup>2</sup>C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I<sup>2</sup>S, MIL-STD-1553B, SENT, Manchester and ARINC429 are supported

## Hardware-based High-Speed Mask Test Function



The oscilloscope utilizes a hardware-based Mask Test function, performing up to 14,000 Pass / Fail decisions each second. It is easy to generate user-defined test templates to provide trace mask comparisons, making it suitable for long-term signal monitoring or automated production line testing



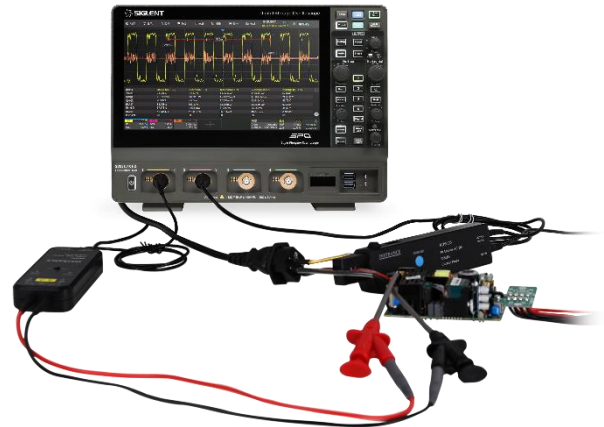
Built-in Mask Editor application helps to create custom masks

### Bode Plot



The oscilloscope can control the built-in waveform generator or a stand-alone SIGLENT generator, to scan the amplitude and phase-frequency response of the DUT, and display the data as a Bode Plot. This makes it possible to replace expensive network analyzers in some applications

### Power Analysis (Optional)



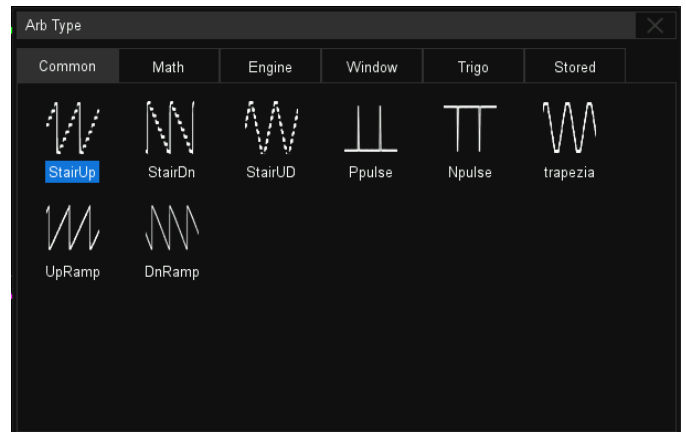
The Power Analysis option provides a full suite of power measurements and analysis, which greatly improve the measurement efficiency in switching power supplies and power devices design

### Digital Channels / MSO (Optional)



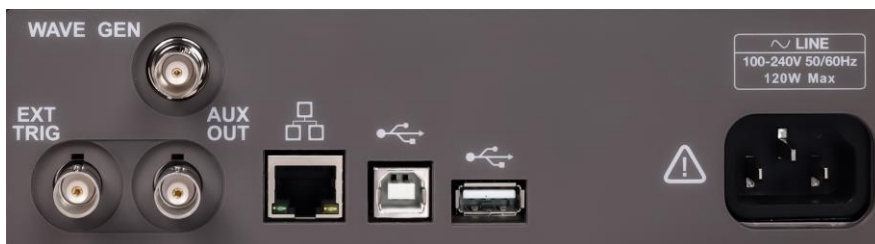
Four analog channels plus 16 digital channels enable users to acquire and trigger the waveforms then analyze the pattern, simultaneously with one instrument

### Built-in 25 MHz Waveform Generator (Optional)



The built-in waveform generator can output waveforms with up to 25 MHz frequency and  $\pm 3$  V amplitude. Six basic waveforms together with multiple types of predefined waveforms and as user-defined arbitrary waveforms are supported.

### Complete Connectivity



USB Host 2.0 x3, USB Device 2.0 (USBTMC), LAN (VXI-11/Telnet/Socket), Auxiliary output (Pass/Fail, Trigger Out), etc.



## Specifications

All specifications are not guaranteed unless the following conditions are met:

- The oscilloscope calibration period is current
- The oscilloscope has been working continuously for at least 30 minutes at the specified temperature (18°C ~ 28°C)

Acquire (analog)	
Sample rate	2 GSa/s (interleaving mode <sup>*1</sup> ) , 1 GSa/s (non-interleaving mode <sup>*2</sup> )
Memory depth	200 Mpts/ch (interleaving mode) , 100 Mpts/ch (non-interleaving mode) <sup>*3</sup>
Memory management mode	Auto, Fixed sample rate, Fixed memory length
Waveform update rate	Normal mode: up to 100,000 wfm/s Sequence mode: up to 500,000 wfm/s
Intensity grading	256-level
Peak detect	1 ns
Average	4, 16, 32, 64, 128, 256, 512, 1024
ERES	Enhanced bit: 0.5, 1, 1.5, 2, 2.5, 3 bits
Sequence	Up to 80,000 segments, interval between triggers = 2 $\mu$ s min.
History	Up to 80,000 frames
Interpolation	sinx/x, x

\* 1: Interleaving mode: only one of C1/C2 and/or only one of C3/C4 activated

\* 2: Non-interleaving mode: both C1/C2 and/or both C3/C4 activated

\* 3: In Average and ERES modes, the memory depth is 20 Mpts/ch (interleaving mode), 10 Mpts/ch (non-interleaving mode)

Vertical (analog)	SDS2354X HD	SDS2204X HD
Channel	4 + EXT	
Bandwidth (-3 dB) @ 50 $\Omega$	350 MHz (Upgradable to 500 MHz max.) <sup>*1</sup>	200 MHz
Flatness@50 $\Omega$	10 kHz ~ BW/10: $\pm$ 0.5 dB BW/10 ~ BW/3: $\pm$ 0.8 dB BW/3 ~ BW/2/3: +1.0 dB, -1.2 dB BW/2/3 ~ BW: +2.0 dB, -2.5 dB	
Rise time@50 $\Omega$ (typical)	1 ns	1.7 ns
Resolution	12-bit	
ENOB <sup>*2</sup> (typical)	8.4-bit	8.6-bit
Noise floor <sup>*3</sup> (rms, @50 $\Omega$ , typical, 1 mV/div)	65 $\mu$ V	55 $\mu$ V
Range	8 divisions	
Vertical scale (probe 1X)	1 M $\Omega$ : 0.5 mV/div – 10 V/div 50 $\Omega$ : 0.5 mV/div – 1 V/div	
DC gain accuracy	0.5 mV/div ~ 4.95 mV/div: $\pm$ 1.5 %; 5 mV/div ~ 10 V/div: $\pm$ 1.0 % maximum, $\pm$ 0.5 % typical;	
Offset accuracy	$\pm$ (0.5% of the offset setting + 0.5% of full scale + 1 mV)	
Offset range (probe 1X)	1 M $\Omega$ : 0.5 mV/div ~ 5 mV/div: $\pm$ 1.6 V; 5.1 mV/div ~ 10 mV/div: $\pm$ 4 V; 10.2 mV/div ~ 20 mV/div: $\pm$ 8 V; 20.5 mV/div ~ 100 mV/div: $\pm$ 16 V; 102 mV/div ~ 200 mV/div: $\pm$ 80 V; 205 mV/div ~ 1 V/div: $\pm$ 160 V; 1.02 V/div ~ 10 V/div: $\pm$ 400 V	50 $\Omega$ : 0.5 mV/div ~ 5 mV/div: $\pm$ 1.6V; 5.1 mV/div ~ 10 mV/div: $\pm$ 4 V; 10.2 mV/div ~ 20 mV/div: $\pm$ 8 V; 20.5 mV/div ~ 1 V/div: $\pm$ 10 V
Bandwidth limit	Hardware Bandwidth limit: 20 MHz, 200 MHz	
Low frequency	5 Hz (typical)	

response (AC coupling -3 dB)		
Overshoot (100 mV/div, 150 ps edge @50 Ω, typical)	12%	3%
Coupling	DC, AC, GND	
Impedance	1 MΩ: (1 MΩ±2%)    (16 pF±2 pF) 50 Ω: 50 Ω±1%	
Max. input voltage	1 MΩ ≤ 400 Vpk (DC + AC), DC~10 kHz 50 Ω ≤ 5V rms	
SFDR	≥ 45dBc	
CH to CH Isolation (@50Ω)	> 60 dBc, < 500 MHz > 70 dBc, < 350 MHz	
Probe Attenuation	1X, 10X, 100X, custom	

\* 1: In interleaving mode bandwidth is 500 MHz; in non-interleaving mode bandwidth is 350 MHz

\* 2: 99.99 MHz input, -0.5 dBFS, 20 mV/div, 50 Ω input impedance

\* 3: Use the "Stdev" measurement @ 2 GSa/s, 10 Mpts/ch

### Horizontal

Time scale	1 ns/div – 1000 s/div
Range	10 divisions
Display mode	Y-T, X-Y, Roll
Roll mode	≥ 50 ms/div
Skew (C1~C4)	< 100 ps
Time base Accuracy	±2 ppm initial (0~50°C); ±0.5 ppm 1st year aging; ±3 ppm 20-year aging

### Trigger

Mode	Auto, Normal, Single			
Level	Internal: ±4.1 div from the center of the screen EXT: ± 0.61 V EXT/5: ± 3.05 V			
Ext Trigger input voltage	1 MΩ ≤ 42 Vpk 50 Ω ≤ 5V rms			
Hold off range	By time: 8 ns ~ 30 s (8 ns step) By event: 1 ~ 10 <sup>8</sup>			
Coupling	C1~C4 DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 7 Hz LFRJ: Attenuates the frequency components below 1.17 MHz HFRJ: Attenuates the frequency components above 660 kHz Noise RJ: Increases the trigger hysteresis  EXT DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 18 Hz LFRJ: Attenuates the frequency components below 7.5 kHz HFRJ: Attenuates the frequency components above 250 kHz			
Accuracy (typical)	C1 ~ C4: ±0.2 div EXT: ±0.3 div			
Sensitivity	C1 ~ C4:		Noise RJ = OFF	Noise RJ = ON
		>10 mV/div:	±0.26 div	±0.33 div
		5 mV/div~10 mV/div:	±0.26 div	±0.33 div
	≤ 2 mV/div:	±0.5 div	±0.5 div	
EXT:	200 mVpp, DC ~ 200 MHz 500 mVpp, 200 MHz ~ bandwidth (300 MHz)			
EXT/5:	1 Vpp, DC ~ 200 MHz 1.5 Vpp, 200 MHz ~ bandwidth (300 MHz)			
Jitter	C1 ~ C4: < 10 ps rms (typical) , ≥ 6 div Vpp sine , 2.5 mV/div ~ 10 V/div			

	EXT: < 200 ps rms
Displacement	Pre-Trigger: 0 ~ 100% memory Delay-Trigger: 0 ~ 10,000 div
Zone	Up to 2 zones Source: C1~C4 Property: Intersect, Not Intersect
<b>Edge Trigger</b>	
Source	C1~C4/EXT/(EXT/5)/AC Line/D0~D15
Slope	Rising, Falling, Rising & Falling
<b>Slope Trigger</b>	
Source	C1~C4
Slope	Rising, Falling
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
<b>Pulse Width Trigger</b>	
Source	C1~C4/D0~D15
Polarity	+width, -width
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
<b>Video Trigger</b>	
Source	C1~C4
Standard	NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom
Synchronization	Any, Select
Trigger Condition	Line, Field
<b>Window Trigger</b>	
Source	C1~C4
Window type	Absolute, Relative
<b>Interval Trigger</b>	
Source	C1~C4/D0~D15
Slope	Rising, Falling
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
<b>Dropout Trigger</b>	
Source	C1~C4/D0~D15
Timeout type	Edge, State
Slope	Rising, Falling
Time range	2 ns ~ 20 s, Resolution = 1 ns
<b>Runt Trigger</b>	
Source	C1~C4
Polarity	Positive, Negative
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
<b>Pattern Trigger</b>	
Source	C1~C4/D0~D15
Pattern Setting	Don't Care, Low, High
Logic	AND, OR, NAND, NOR
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
<b>Qualified Trigger</b>	
Type	State, State with Delay, Edge, Edge with Delay
Qualified Source	C1~C4/D0~D15
Edge Trigger Source	C1~C4/D0~D15
<b>Nth Edge Trigger</b>	
Source	C1~C4/D0~D15
Slope	Rising, Falling
Idle time	8 ns ~ 20 s, Resolution = 1 ns
Edge Number	1 ~ 65535
<b>Delay Trigger</b>	
Source A	C1~C4/D0~D15
Source B	C1~C4/D0~D15

Slope	Rising, Falling
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
<b>Serial Trigger</b>	
Source	C1~C4/D0~D15
Protocol	Standard: I <sup>2</sup> C, SPI, UART, CAN, LIN Optional: CAN FD, FlexRay, I <sup>2</sup> S, MIL-STD-1553B, SENT
I <sup>2</sup> C	Type: Start, Stop, Restart, No Ack, EEPROM, Address & Data, Data Length
SPI	Type: Data
UART	Type: Start, Stop, Data, Parity Error
CAN	Type: All, Remote, ID, ID+Data, Error
LIN	Type: Break, Frame ID, ID+Data, Error
CAN FD (Optional)	Type: Start, Remote, ID, ID+Data, Error
FlexRay (Optional)	Type: TSS, Frame, Symbol, Errors
I <sup>2</sup> S (Optional)	Type: Data, Mute, Clip, Glitch, Rising Edge, Falling Edge
MIL-STD-1553B (Optional)	Type: Transfer, Word, Error, Timing
SENT (Optional)	Type: Start, Slow channel, Fast channel, Error

### Serial Decoder

Decoders	2
Threshold	-4.1 ~ 4.1 div
List	1 ~ 7 lines
Decoder type	Full duplex
<b>I<sup>2</sup>C</b>	
Source	C1~C4/D0~D15
Signal	SCL, SDA
Address	7-bit, 10-bit
<b>SPI</b>	
Source	C1~C4/D0~D15
Signal	CLK, MISO, MOSI, CS
Edge Select	Rising, Falling
Chip select	Active high, Active low, Clock timeout
Bit Order	LSB, MSB
<b>UART</b>	
Source	C1~C4/D0~D15
Signal	RX, TX
Data Width	5-bit, 6-bit, 7-bit, 8-bit
Parity Check	None, Odd, Even, Mark, Space
Stop Bit	1-bit, 1.5-bit, 2-bit
Idle Level	Low, High
Bit Order	LSB, MSB
<b>CAN</b>	
Source	C1~C4/D0~D15
<b>LIN</b>	
LIN Version	Ver 1.3, Ver 2.0
Source	C1~C4/D0~D15
Baud Rate	600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, Custom
<b>CAN FD (Optional)</b>	
Source	C1~C4/D0~D15
Nominal Baud Rate	10 kbps, 25 kbps, 50 kbps, 100 kbps, 250 kbps, 1 Mbps, Custom
Data Baud Rate	500 kbps, 1 Mbps, 2 Mbps, 5 Mbps, 8 Mbps, 10 Mbps, Custom
<b>FlexRay (Optional)</b>	
Source	C1~C4/D0~D15
Baud Rate	2.5 Mbps, 5 Mbps, 10 Mbps, Custom
<b>I<sup>2</sup>S (Optional)</b>	
Source	C1~C4/D0~D15
Signal	BCLK, WS, DATA
Audio Variant	Audio-I2S, Audio-LJ, Audio-RJ
Start Bits	0~31

Data Bits	1~32
<b>MIL-STD-1553B (Optional)</b>	
Source	C1~C4
<b>SENT (Optional)</b>	
Source	C1~C4/D0~D15
<b>Manchester (Optional)</b>	
Source	C1~C4
Baud Rate	500 bps~5 Mbps
<b>ARINC429 (Optional)</b>	
Source	C1~C4
Baud Rate	12.5 kbps~100 kbps, tolerance 1%~20%
Word format	L/SDI/D/SSM, L/D/SSM, L/D

## Measurement

### Automatic Measurement

Source	C1~C4, D0~D15, Z1~Z4, F1~F4, M1~M4, Ref, History
Mode	Simple, Advanced
Range	Screen Gated: inside screen, definable with separate Gate cursors
Custom Threshold	Upper, Middle, Lower
No. of Measurements	Display 12 measurements at the same time (Display mode = M2)
Vertical Parameters	Max, Min, Pk-Pk, Top, Base, Amplitude, Mean, Cycle Mean, Stdev, Cycle Stdev, RMS, Cycle RMS, Median, Cycle Median, FOV, FPPE, ROV, RPRE, Level@Trigger
Horizontal Parameters	Period, Frequency, Time@max, Time@min, +Width, -Width, 10-90%Rise time, 90-10%Fall time, Rise time, Fall time, +Burst Width, -Burst Width, +Duty Cycle, -Duty Cycle, Delay, Time@Middle, Cycle-Cycle jitter
Miscellaneous Parameters	+Area@DC, -Area@DC, Area@DC, Absolute Area@DC, +Area@AC, -Area@AC, Area@AC, Absolute Area@AC, Cycles, Rising Edges, Falling Edges, Edges, Positive pulses, Negative pulses, Positive Slope, Negative Slope
Delay Parameters	Phase, FRFR, FRFF, FFFR, FFFF, FRLR, FRLF, FFLR, FFLF, Skew, Tsu@R, Tsu@F, Th@R, Th@F
Statistics	Current, Mean, Min, Max, Sdev, Count, Histogram, Trend, Track
Statistics Count	Unlimited, 1~1024
Statistics Count in one frame	Up to 25,000

### Cursors

Source	C1~C4, D0~D15, F1~F4, M1~M4, Ref, Histogram
Type	Manual : Time X1, X2, (X1-X2), (1/ΔT); Vertical Y1, Y2, (Y1-Y2) Track: Time X1, X2, (X1-X2) Measure: indicates the measurement on specific parameter

## Math

Trace	F1~F4
Source	C1~C4, M1~M4, F1~F4
Operation	FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation,  x , Sign, e <sup>x</sup> , 10 <sup>x</sup> , ln, lg, Interpolation, Max hold, Min hold, ERES, Average, Filter, Formula Editor
FFT	Length: 2 Mpts, 1 Mpts, 512 kpts, 256 kpts, 128 kpts, 64 kpts, 32 kpts, 16 kpts, 8 kpts, 4 kpts, 2 kpts Window: Rectangular, Blackman, Hanning, Hamming, Flattop Display: Full Screen, Split, Exclusive Mode: Normal, Max hold, Average Tools: Peaks, Markers

## Analysis

### Search

Source	C1~C4, History
Mode	Edge, Slope, Pulse, Interval, Runt
Copy setting	Copy from trigger, Copy to trigger

### Navigate

Type	Search event, Time, History frame
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### Mask Test

Source	C1~C4, Z1~Z4
Mask creating	Auto (Create mask), Customized (Mask Editor)
Mask test speed	Up to 14,000 frames/s

<b>DVM</b>	
Source	C1~C4
Mode	DC mean, DC RMS, AC RMS, Peak-peak, Amplitude
Plot	Bar, Histogram, Trend
Gate	20 ms
<b>Bode Plot</b>	
Source	C1~C4
Supported signal sources	Built-in waveform generator SAG1021I (Connection: USB), SDG series waveform generators (Connection: USB, LAN)
Sweep type	Simple, Vari-level
Frequency	Mode: Linear, Logarithmic Range: 10 Hz ~ 120 MHz
Measure	Upper cutoff frequency, Lower cutoff frequency, Bandwidth, Gain margin, Phase margin
<b>Power Analysis (optional)</b>	
Measure	Power quality, Current Harmonics, Inrush current, Switching loss, Slew rate, Modulation, Output ripple, Turn on/turn off, Transient response, PSRR, Efficiency, SOA
<b>Histogram</b>	
Source	C1~C4
Type	Horizontal, Vertical, Both
<b>Counter</b>	
Source	C1~C4
Frequency resolution	7 digits
Totalizer	Counter on edges, supports Gate and Trigger

**Digital Channels (optional)**

Max. Sampling Rate	500 MSa/s
Memory Depth	50 Mpts/ch
Min. Detectable Pulse Width	3.3 ns
Level Group	D0~D7, D8~D15
Level Range	-10 V~10 V
Logic Type	TTL, CMOS, LVCMOS3.3, LVCMOS2.5, Custom
Skew	D0~D15: $\pm 1$ sampling interval Digital to Analog: $\pm (1 \text{ sampling interval} + 1 \text{ ns})$

**Waveform Generator (optional)**

Channels	1
Max. Output Frequency	25 MHz
Sampling Rate	125 MSa/s
Frequency Resolution	1 $\mu$ Hz
Frequency Accuracy	$\pm 50$ ppm
Vertical Resolution	14 bit
Amplitude Range	-1.5 V ~ +1.5 V (into 50 $\Omega$ ) -3 V ~ +3 V (into High-Z)
Waveforms	Sine, Square, Ramp, Pulse, DC, Noise, 45 Arbitrary
Output Impedance	50 $\Omega \pm 2\%$
Protection	Over voltage protection, Current limit
<b>Sine</b>	
Frequency	1 $\mu$ Hz ~ 25 MHz
Offset accuracy (10 kHz)	$\pm(1\% \cdot \text{offset setting value} + 3 \text{ mVpp})$
Amplitude flatness	$\pm 0.3$ dB, compare to 10 kHz, 2.5 Vpp into 50 $\Omega$
SFDR	DC ~ 1 MHz -60 dBc 1 MHz ~ 5 MHz -55 dBc 5 MHz ~ 25 MHz -50 dBc
Harmonic distortion	DC ~ 5 MHz -50 dBc 5 MHz ~ 25 MHz -45 dBc
<b>Square/Pulse</b>	
Frequency	1 $\mu$ Hz ~ 10 MHz
Duty cycle	1% ~ 99%
Edge	< 24 ns (10% ~ 90%)
Overshoot	< 3% (typical, 1 kHz, 1 Vpp)

## SDS2000X HD Series Digital Storage Oscilloscope

Pulse width	> 50 ns
Jitter (cycle-cycle)	< 500 ps + 10 ppm
<b>Ramp</b>	
Frequency	1 $\mu$ Hz ~ 300 kHz
Linearity	< 0.1% of Pk-Pk (typical, 1 kHz, 1 Vpp, 50% symmetry)
Channels	0% ~ 100%
<b>DC</b>	
Offset range	$\pm 1.5$ V (into 50 $\Omega$ ) $\pm 3$ V (into Hi-Z)
Accuracy	$\pm( \text{setting value} *1\% + 3 \text{ mV})$
<b>Noise</b>	
Bandwidth (-3 dB)	>25 MHz
<b>Arb</b>	
Frequency	1 $\mu$ Hz ~ 5 MHz
Waveform memory	16 kpts
Sample rate	125 MSa/s
Wave import	From EasyWaveX, from U-disk, directly from waveform data of analog channels

<b>I/O</b>	
Front	USB 2.0 Host x2, Calibration Signal: 1 kHz, 3 V Square
Rear	USB 2.0 Host, USB 2.0 Device, LAN: 10/100MbaseT (RJ45), External Trigger, EXT: $\leq 1.5$ Vrms, EXT/5: $\leq 7.5$ Vrms, Auxiliary Output: TRIG OUT(3.3 V LVCMOS), PASS/FAIL OUT(3.3 V TTL)

<b>Display</b>	
Display Type	10.1 TFT LCD with capacitive touch screen
Resolution	1024 $\times$ 600
Contrast (typical)	500:1
Backlight (typical)	500 nit

<b>Display Setting</b>	
Range	8 x 10 grid
Display Type	Dot, Vector
Persistence Time	OFF, 0.1 s, 0.2 s, 0.5 s, 1 s, 5 s, 10 s, 30 s, infinite
Color Display	Normal, Color; Supports customer trace color
Language	Simplified Chinese, Traditional Chinese, English, French, Japanese, German, Spanish, Russian, Italian, Portuguese
Built-in Help System	Simplified Chinese, English

<b>Environmental</b>		
Temperature	Operating: 0 $^{\circ}$ C ~ 50 $^{\circ}$ C Non-operating: -30 $^{\circ}$ C ~ 70 $^{\circ}$ C	
Humidity	Operating: 5% ~ 90%RH, 30 $^{\circ}$ C, degraded to 50%RH at 50 $^{\circ}$ C Non-operating: 5% ~ 95%	
Altitude	Operating: $\leq 3,000$ m, 25 $^{\circ}$ C Non-operating: $\leq 15,000$ m	
Electromagnetic Compatibility	Meets EMC directive (2014/30/EU), meets or exceeds IEC 61326-1:2012/EN61326-1:2013 (Basic)	
	Conducted disturbance	CISPR 11/EN 55011 CLASS A group 1 150 kHz-30 MHz
	Radiated disturbance	CISPR 11/EN 55011 CLASS A group 1 30 MHz-1 GHz
	Electrostatic discharge (ESD)	IEC 61000-4-2/EN 61000-4-2 4.0 kV (Contact), 8.0 kV (Air)
	Radio-frequency electromagnetic field Immunity	IEC 61000-4-3/EN 61000-4-3 10 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)
	Electrical fast transients (EFT)	IEC 61000-4-4/EN 61000-4-4 2kV (Input AC Power Ports)
	Surges	IEC 61000-4-5/EN 61000-4-5 1kV (Line to line) 2kV (Line to ground)
	Radio-frequency continuous conducted Immunity	IEC 61000-4-6/EN 61000-4-6 3 V, 0.15-80 MHz
Voltage dips and interruptions	IEC 61000-4-11/EN 61000-4-11 Voltage Dips:	

		0% UT during 1 cycle; 40% UT during 10/12 cycles; 70% UT during 25/30 cycles Voltage interruptions: 0% UT during 250/300 cycles
Safety	UL 61010-1:2012/R: 2018-11; CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11. UL 61010-2-030:2018; CAN/CSA-C22.2 No. 61010-2-030:2018.	
RoHS	EU 2015/863	

### Power Supply

Input Voltage & Frequency	100 ~ 240 Vrms 50/60 Hz
Power consumption	120 W max., 70 W typical, 4 W typical in standby mode

### Mechanical

Dimensions	Length × Height × Width = 317.2 mm × 236.0 mm × 149.0 mm (including knobs and supporting legs)
Weight	Net Weight 4.1 kg, Gross Weight 5.6 kg



## Ordering Information

Model	Description
SDS2354X HD	12-bit, 350 MHz, 2 GSa/s, 4-CH, 200 Mpts/ch memory depth, 10.1" capacitive touch screen
SDS2204X HD	12-bit, 200 MHz, 2 GSa/s, 4-CH, 200 Mpts/ch memory depth, 10.1" capacitive touch screen

Standard Accessories	Quantity
USB cable	1
Quick start	1
Passive probe ( 500 MHz)	1/channel
Certificate of calibration	1
Wireless mouse	1
Power cord	1

Optional Accessories	Part No.
16-channel logic probe	SPL2016
Power Analysis deskew fixture	DF2001A
STB3 demo signal source	STB3
USB-GPIB adapter	USB-GPIB
High voltage probe	HPB4010
High voltage differential probe	DPB1300/DPB4080/DPB5150/DPB5150A/DPB5700/DPB5700A
Current probe	CPL5100/CP4020/CP4050/CP4070/CP4070A/CP6030/CP6030A/CP6150/CP6500
Rack Mount Kit	SDS2000HD-RMK
Bag	BAG-S2

Options	Part No.
Waveform generator (software)	SDS2000HD-FG
Power Analysis (software)	SDS2000HD-PA
I <sup>2</sup> S trigger & decode (software)	SDS2000HD-I2S
MIL-STD-1553B trigger & decode (software)	SDS2000HD-1553B
FlexRay trigger & decode (software)	SDS2000HD-FlexRay
CAN FD trigger & decode (software)	SDS2000HD-CANFD
SENT trigger & decode (software)	SDS2000HD-SENT
Manchester decode (software)	SDS2000HD-Manch
ARINC429 decode (software)	SDS2000HD-ARINC
200 MHz to 350 MHz bandwidth upgrade (software)	SDS2000HD-BW2T3
200 MHz to 500 MHz bandwidth upgrade (software)	SDS2000HD-BW2T5
350 MHz to 500 MHz bandwidth upgrade (software)	SDS2000HD-BW3T5

## About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, isolated handheld oscilloscopes, function/arbitrary waveform generators, RF/MW signal generators, spectrum analyzers, vector network analyzers, digital multimeters, DC power supplies, electronic loads and other general purpose test instrumentation. Since its first oscilloscope was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

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