SDS2000X HD

Digital Storage Oscilloscope

SIGLENT®

Data Sheet

EN01A

SIGLENT TECHNOLOGIES CO.,LTD

SDS2354X HD
SDS2204X HD
SDS2104X 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, 200 MHz and 100 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 µVrms 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^{2}C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I^{2}S, MIL-STD-1553B, SENT and Manchester
- 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
- 2 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 (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	SDS2104X HD
Analog channels	4 + EXT		
Bandwidth	350 MHz	200 MHz	100 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^{2}C, SPI, UART, CAN, LIN Optional: CAN FD, FlexRay, I^{2}S, MIL-STD-1553B, SENT, Manchester (decode only)		
Measurement	50+ parameters, statistics, histogram, trend, and track supported		
Math	2 traces 2 Mpts FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation, Absolute, Sign, e^x, 10^x, ln, lg, Interpolation, MaxHold, MinHold, ERES, Average. 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
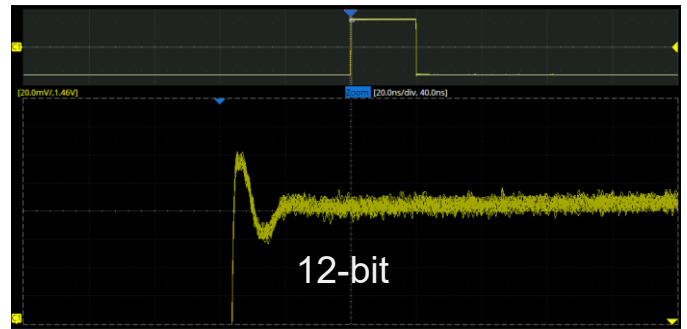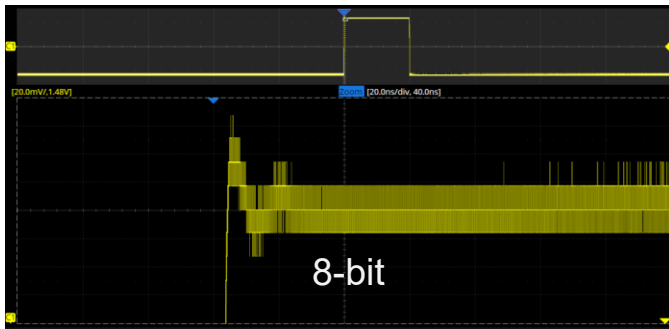
12-bit resolution shows you more details and less noise on the waveform.
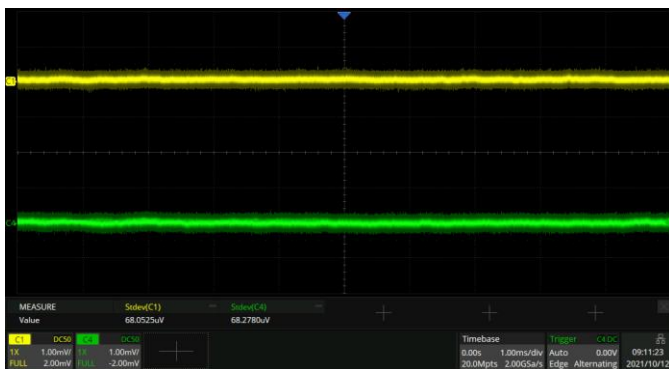

Low noise floor: Only 70 µVrms at 500 MHz bandwidth
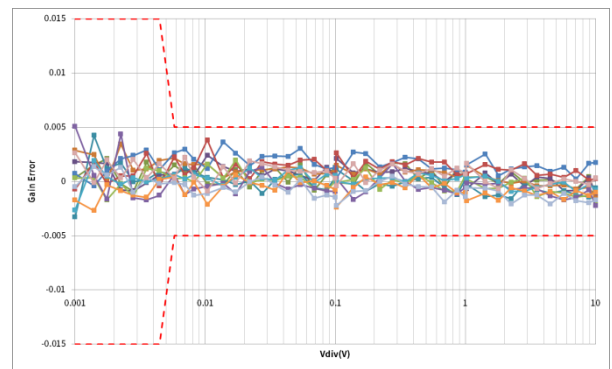
0.5% DC gain accuracy

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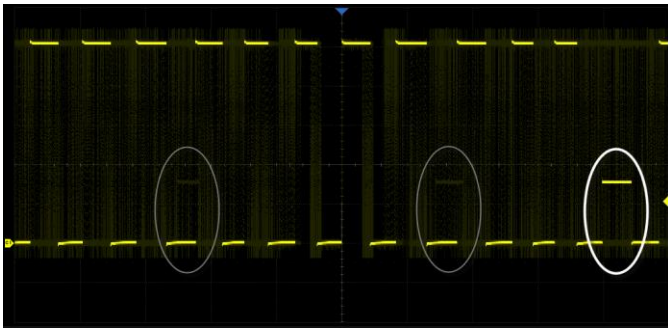
With a waveform update rate of up to 100,000 wfm/s, the oscilloscope can easily capture unusual or low-probability events. In Sequence mode, the waveform capture rate can reach 500,000 wfm/s

Deep Record Length
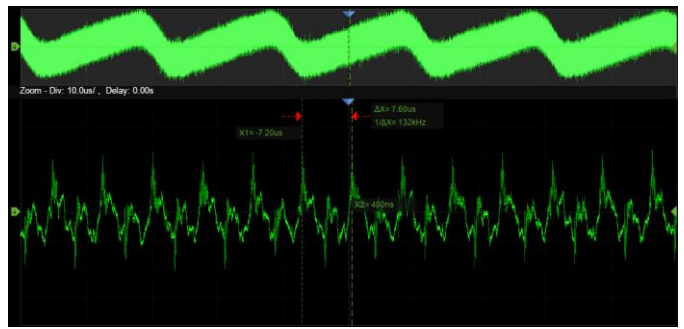
Using hardware-based Zoom technique and record length of up to 200 Mpts, users can select a slower timebase without compromising the sample rate, and then quickly zoom in to focus on the area of interest
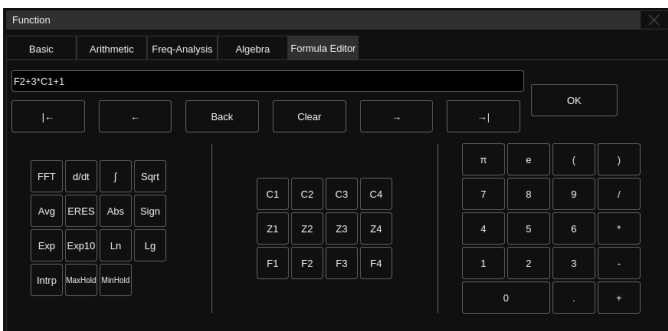
Multiple Trigger Functions
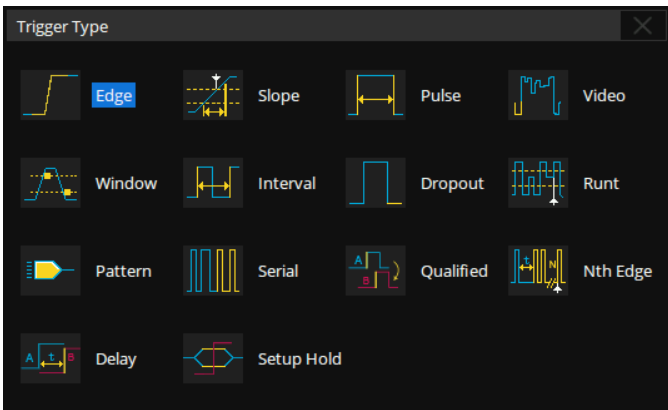
Edge, Slope, Pulse, Video, Windows, Runt, Interval, Dropout, Pattern, Qualified, Nth edge, Setup/hold, Delay, and serial trigger

Trigger Zone
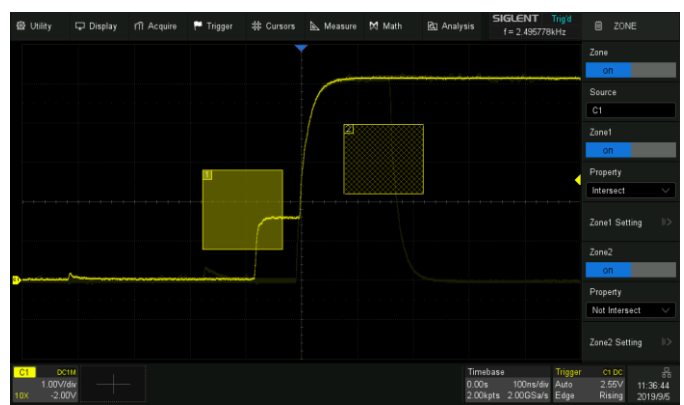
Trigger Zone is available for advanced triggering

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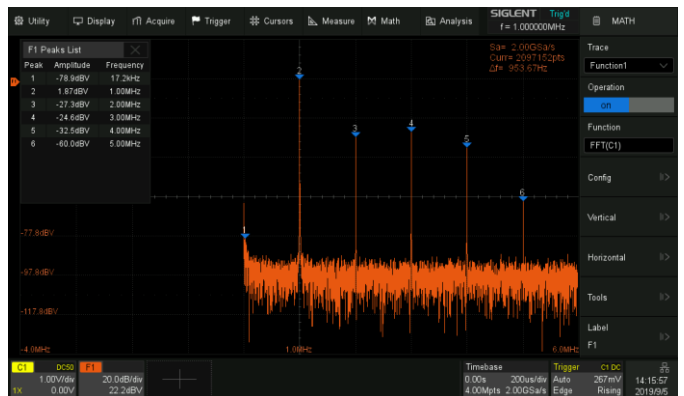
Hardware-accelerated FFT supports up to 2 Mpts operation. This provides high-frequency resolution with a fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs. Three modes (Normal, Average, and Max hold) can satisfy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

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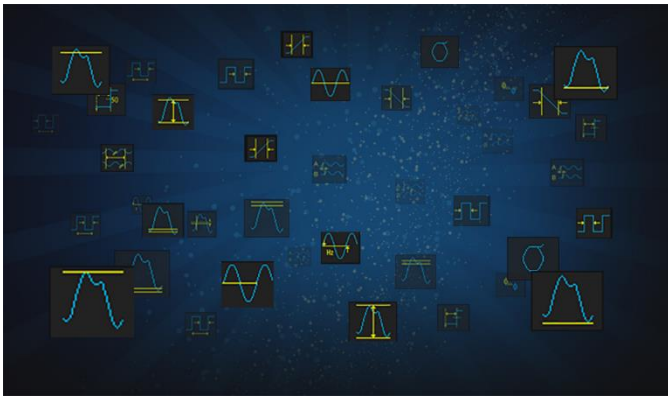
Parameter measurements include 4 categories: horizontal, vertical, miscellaneous, and CH delay providing a total of 50+ different types of measurements. Measurements can be performed within a specified gate period. Measurements on Math, Reference, and History frames are supported

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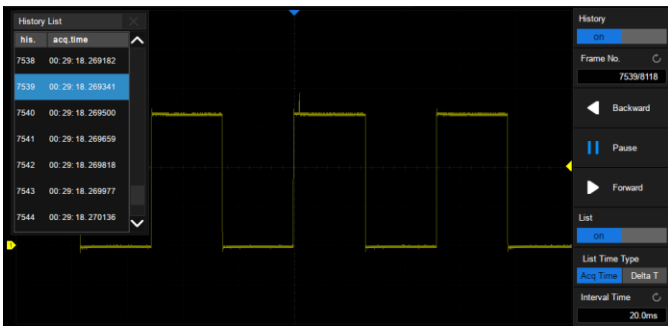
History function can record up to 80,000 frames of waveforms. The recording is executed automatically so that the customer can playback the history waveforms at any time to observe unusual events and quickly locate the area of interest using the cursors or measurements. The failed frames of the Mask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

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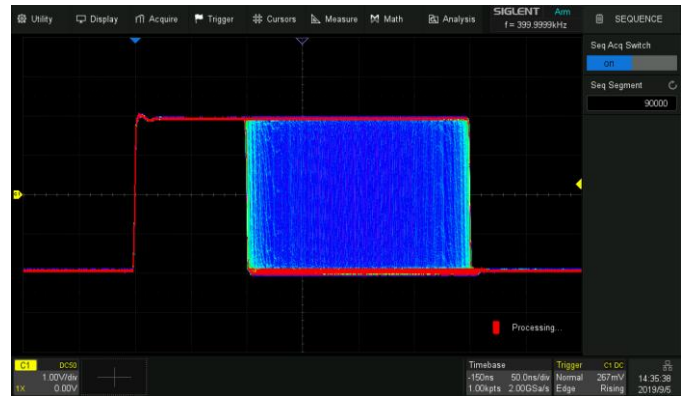
Segmented memory collection will store the waveform into multiple memory segments (up to 80,000) and each segment will store a triggered waveform as well the dead time information. The interval between segments can be as small as 2 μs. All of the segments can be played back using the History function

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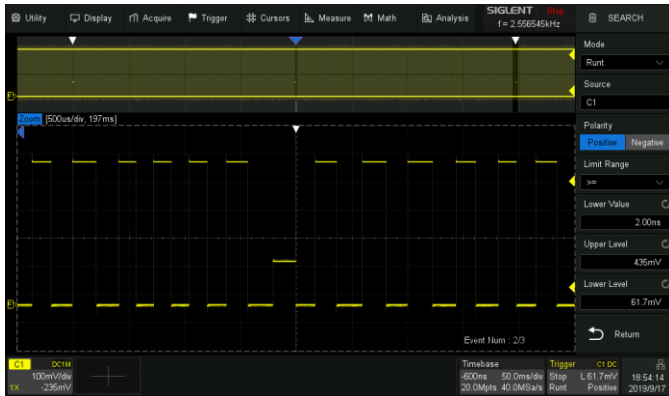
The oscilloscope can search events specified by the user in a frame. Events flagged by the Search can be recalled automatically using Navigate. It can also navigate by time (delay position) and history frames

Serial Bus Decode

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

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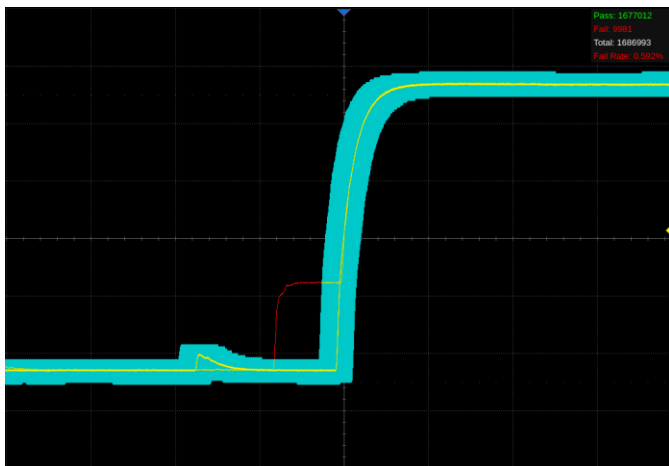
The oscilloscope utilizes a hardware-based Mask Test function, performing up to 14,000 Pass / Fail decisions each second. It is easy to generate user-defined test templates to provide trace mask comparisons, making it suitable for long-term signal monitoring or automated production line testing
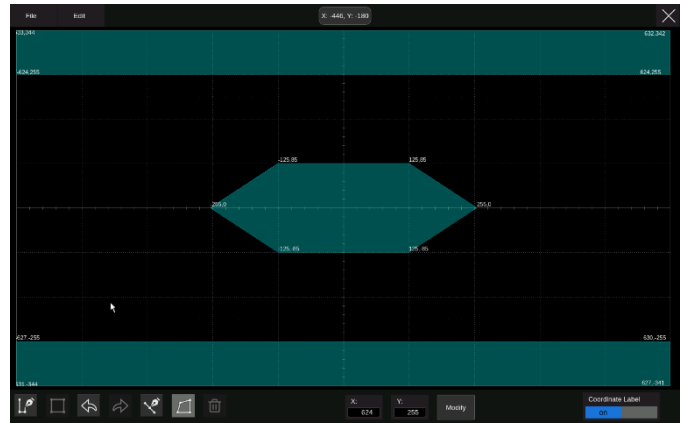
Built-in Mask Editor application helps to create custom masks

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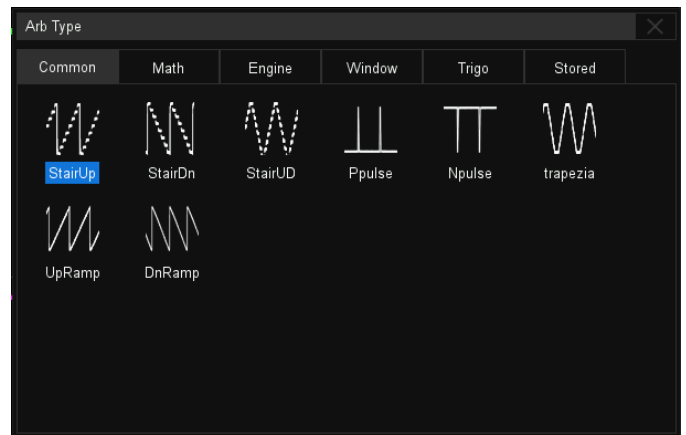
The built-in waveform generator can output waveforms with up to 25 MHz frequency and ±3 V amplitude. Six basic waveforms together with multiple types of predefined waveforms and as user-defined arbitrary waveforms are supported.

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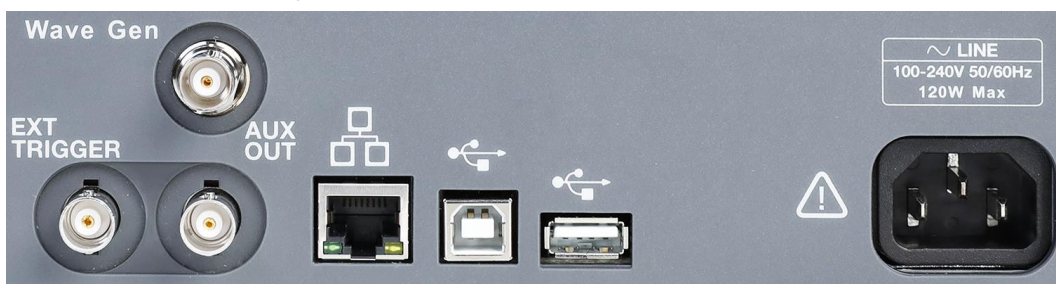
USB Host 2.0 x3, USB Device 2.0 (USBTMC) , LAN (VXI-11/Telnet/Socket), Auxiliary output (Pass/Fail, Trigger Out), etc.

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℃ ~ 28℃)

Acquire (analog)	
Sample rate	2 GSa/s (interleaving mode[*1]) , 1 GSa/s (non-interleaving mode[*2])
Memory depth	200 Mpts/ch (interleaving mode) , 100 Mpts/ch (non-interleaving mode) [*3]
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 μs min.
History	Up to 80,000 frames
Interpolation	sinx/x, x

* 1：Interleaving mode: only one of CH1/CH2 and/or only one of CH3/CH4 activated

* 2：Non-interleaving mode: both CH1/CH2 and/or both CH3/CH4 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	SDS2104X HD
Channel	4 + EXT		
Bandwidth (-3 dB) @ 50 Ω	350 MHz	200 MHz	100 MHz
	(Upgradable to 500 MHz max.)		
Flatness@50 Ω	10 kHz ~ BW/10: ±0.5 dB BW/10 ~ BW/3: ±0.8 dB BW/3 ~ BW2/3: +1.0 dB, -1.2 dB BW2/3 ~ BW: +2.0 dB, -2.5 dB		
Rise time@50 Ω (typical)	1 ns	1.7 ns	3.5 ns
Resolution	12-bit		
ENOB [*1] (typical)	8.4-bit	8.6-bit	8.7-bit
Noise floor[*2] (rms, @50 Ω, typical,1 mV/div)	65 μV	55 μV	50 μV
Range	8 divisions		
Vertical scale (probe 1X)	1 MΩ: 0.5 mV/div – 10 V/div 50 Ω: 0.5 mV/div – 1 V/div		
DC gain accuracy (typical)	0.5 mV/div ~ 4.95 mV/div: ±1.5 %; 5 mV/div ~ 10 V/div: ±0.5 %;		
Offset accuracy	± (0.5% of the offset setting + 0.5% of full scale + 1 mV)		
Offset range (probe 1X)	1 MΩ: 0.5 mV/div ~ 5 mV/div: ±1.6 V; 5.1 mV/div ~ 10 mV/div: ±4 V; 10.2 mV/div ~ 20 mV/div:±8 V; 20.5 mV/div ~ 100 mV/div: ±16 V; 102 mV/div ~ 200 mV/div: ±80 V; 205 mV/div ~ 1 V/div: ±160 V; 1.02 V/div ~ 10 V/div: ±400 V	50 Ω: 0.5 mV/div ~ 5 mV/div: ±1.6V; 5.1 mV/div ~ 10 mV/div: ±4 V; 10.2 mV/div ~ 20 mV/div:±8 V; 20.5 mV/div ~ 1 V/div: ±10 V	
Bandwidth limit	Hardware Bandwidth limit: 20 MHz, 200 MHz		
Low frequency response (AC coupling -3 dB)	5 Hz (typical)		
Overshoot (100	12%	3%	1%

mV/div, 150 ps edge @50 Ω, typical)			
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		

* 1：99.99 MHz input(100 MHz model uses 49.99 MHz)，-0.5 dBFS，20 mV/div，50 Ω input impedance

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

Horizontal	SDS2354X HD	SDS2204X HD	SDS2104X HD
Time scale	1 ns/div – 1000 s/div		
Range	10 divisions		
Display mode	Y-T, X-Y, Roll		
Roll mode	≥ 50 ms/div		
Skew (CH1~CH4)	< 100 ps		
Time base Accuracy	±2 ppm initial (0~50℃); ±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 ~ 10^8			
Coupling	CH1~CH4 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)	CH1 ~ CH4: ±0.2 div EXT: ±0.3 div			
Sensitivity	CH1 ~ CH4:		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	CH1 ~ CH4: < 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 ~ 5,000 div			
Zone	Up to 2 zones			

	Source: CH1~CH4
	Property: Intersect, Not Intersect
Edge Trigger	
Source	CH1~CH4/EXT/(EXT/5)/AC Line/D0~D15
Slope	Rising, Falling, Rising & Falling
Slope Trigger	
Source	CH1~CH4
Slope	Rising, Falling
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
Pulse Width Trigger	
Source	CH1~CH4/D0~D15
Polarity	+width, -width
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
Video Trigger	
Source	CH1~CH4
Standard	NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom
Synchronization	Any, Select
Trigger Condition	Line, Field
Window Trigger	
Source	CH1~CH4
Window type	Absolute, Relative
Interval Trigger	
Source	CH1~CH4/D0~D15
Slope	Rising, Falling
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
Dropout Trigger	
Source	CH1~CH4/D0~D15
Timeout type	Edge, State
Slope	Rising, Falling
Time range	2 ns ~ 20 s, Resolution = 1 ns
Runt Trigger	
Source	CH1~CH4
Polarity	Positive, Negative
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
Pattern Trigger	
Source	CH1~CH4/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
Qualified Trigger	
Type	State, State with Delay, Edge, Edge with Delay
Qualified Source	CH1~CH4/D0~D15
Edge Trigger Source	CH1~CH4/D0~D15
Nth Edge Trigger	
Source	CH1~CH4/D0~D15
Slope	Rising, Falling
Idle time	8 ns ~ 20 s, Resolution = 1 ns
Edge Number	1 ~ 65535
Delay Trigger	
Source A	CH1~CH4/D0~D15
Source B	CH1~CH4/D0~D15
Slope	Rising, Falling
Limit range	<, >, in range, out of range
Time range	2 ns ~ 20 s, Resolution = 1 ns
Serial Trigger	

Source	CH1~CH4/D0~D15
Protocol	Standard: I²C, SPI, UART, CAN, LIN Optional: CAN FD, FlexRay, I²S, MIL-STD-1553B, SENT
I²C	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
I²S（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
I²C	
Source	CH1~CH4/D0~D15
Signal	SCL, SDA
Address	7-bit, 10-bit
SPI	
Source	CH1~CH4/D0~D15
Signal	CLK, MISO, MOSI, CS
Edge Select	Rising, Falling
Chip select	Active high, Active low, Clock timeout
Bit Order	LSB, MSB
UART	
Source	CH1~CH4/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
CAN	
Source	CH1~CH4/D0~D15
LIN	
LIN Version	Ver 1.3, Ver 2.0
Source	CH1~CH4/D0~D15
Baud Rate	600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, Custom
CAN FD（Optional）	
Source	CH1~CH4/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
FlexRay（Optional）	
Source	CH1~CH4/D0~D15
Baud Rate	2.5 Mbps, 5 Mbps, 10 Mbps, Custom
I²S（Optional）	
Source	CH1~CH4/D0~D15
Signal	BCLK, WS, DATA
Audio Variant	Audio-I2S, Audio-LJ, Audio-RJ
Start Bits	0~31
Data Bits	1~32
MIL-STD-1553B（Optional）	
Source	CH1~CH4
SENT（Optional）	

Source	CH1~CH4/D0~D15
Manchester（Optional）	
Source	CH1~CH4
Baud Rate	500 bps~5 Mbps

Measurement

Automatic Measurement	
Source	CH1~CH4, D0~D15, Z1~Z4, F1~F2, 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, FPRE, 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
Cursors	
Source	CH1~CH4, D0~D15, F1~F2, 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, F2
Source	CH1~CH4, Z1~Z4, F1~F2
Operation	FFT, +, -, x, ÷, $\int dt$, d/dt, $\sqrt{}$, Identity, Negation, |x|, Sign, e^x, 10^x, ln, lg, Interpolation, Max hold, Min hold, ERES, Average, 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	CH1~CH4, History
Mode	Edge, Slope, Pulse, Interval, Runt
Copy setting	Copy from trigger, Copy to trigger
Navigate	
Type	Search event, Time, History frame
Mask Test	
Source	CH1~CH4，Z1~Z4
Mask creating	Auto (Create mask), Customized (Mask Editor)
Mask test speed	Up to 14,000 frames/s
DVM	
Source	CH1~CH4
Mode	DC mean, DC RMS, AC RMS, Peak-peak, Amplitude
Plot	Bar, Histogram, Trend
Gate	20 ms
Bode Plot	
Source	CH1~CH4
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
Power Analysis (optional)	
Measure	Power quality, Current Harmonics, Inrush current, Switching loss, Slew rate, Modulation, Output ripple, Turn on/turn off, Transient response, PSRR, Efficiency, SOA
Histogram	
Source	CH1~CH4
Type	Horizontal, Vertical, Both
Counter	
Source	CH1~CH4
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: ±1 sampling interval Digital to Analog: ± (1 sampling interval +1 ns)

Waveform Generator (optional)	
Channels	1
Max. Output Frequency	25 MHz
Sampling Rate	125 MSa/s
Frequency Resolution	1 µHz
Frequency Accuracy	±50 ppm
Vertical Resolution	14 bit
Amplitude Range	-1.5 V ~ +1.5 V (into 50 Ω) -3 V ~ +3 V (into High-Z)
Waveforms	Sine, Square, Ramp, Pulse, DC, Noise, 45 Arbitrary
Output Impedance	50 Ω ± 2%
Protection	Over voltage protection, Current limit
Sine	
Frequency	1 µHz ~ 25 MHz
Offset accuracy (10 kHz)	±(1%*offset setting value +3 mVpp)
Amplitude flatness	±0.3 dB, compare to 10 kHz, 2.5 Vpp into 50 Ω
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
Square/Pulse	
Frequency	1 µHz ~ 10 MHz
Duty cycle	1% ~ 99%
Edge	< 24 ns (10% ~ 90%)
Overshoot	< 3% (typical，1 kHz, 1 Vpp)
Pulse width	> 50 ns
Jitter (cycle-cycle)	< 500 ps + 10 ppm
Ramp	
Frequency	1 µHz ~ 300 kHz
Linearity	< 0.1% of Pk-Pk (typical, 1 kHz, 1 Vpp, 50% symmetry)
Channels	0% ~ 100%
DC	
Offset range	±1.5 V (into 50 Ω) ±3 V (into Hi-Z)
Accuracy	±(|setting value|*1% + 3 mV)
Noise	

Bandwidth (-3 dB)	>25 MHz
Arb	
Frequency	1 µHz ~ 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

I/O

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: ≤1.5 Vrms，EXT/5: ≤ 7.5Vrms, Auxiliary Output: TRIG OUT(3.3 V LVCMOS), PASS/FAIL OUT(3.3 V TTL)

Display

Display Type	10.1 TFT LCD with capacitive touch screen
Resolution	1024×600
Contrast (typical)	500:1
Backlight (typical)	500 nit

Display Setting

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

Environmental

Temperature	Operating: 0 °C ~ 50 °C Non-operating: -30 °C ~ 70 °C		
Humidity	Operating: 5% ~ 90%RH, 30℃, degraded to 50%RH at 50 ℃ Non-operating: 5% ~ 95%		
Altitude	Operating: ≤ 3,000 m, 25 ℃ Non-operating: ≤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
SDS2104X HD	12-bit, 100 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.
Waveform generator (software)	SDS2000HD-FG
16 digital channels (software)	SDS2000HD-16LA
16-channel logic probe	SPL2016
Power Analysis (software)	SDS2000HD-PA
Power Analysis deskew fixture	DF2001A
I^{2}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
100 MHz to 200 MHz bandwidth upgrade (software)	SDS2000HD-BW1T2
100 MHz to 350 MHz bandwidth upgrade (software)	SDS2000HD-BW1T3
100 MHz to 500 MHz bandwidth upgrade (software)	SDS2000HD-BW1T5
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
ISFE isolated front end	ISFE
STB3 demo signal source	STB3
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
Bag	BAG-S2

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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