

# SDS5000X Series

## Digital Storage

## Oscilloscope

### Data Sheet

EN02F



SIGLENT TECHNOLOGIES CO.,LTD

**SDS5104X**

**SDS5054X**

**SDS5034X**

## Key Features

- 1 GHz, 500 MHz, 350 MHz models with real-time sample rate up to 5 GSa/s
- SPO technology
  - Waveform capture rates up to 110,000 wfm/s (normal mode), and 500,000 wfm/s (sequence mode)
  - Supports 256-level intensity grading and color temperature display modes
  - Record length up to 250 Mpts/ch, 500 Mpts in total for all 4 channels
  - Digital trigger system
- Intelligent trigger: Edge, Slope, Pulse, Window, Runt, Interval, Dropout, Pattern, Qualified, Nth edge, Setup/hold, Delay and Video (HDTV supported). Trigger zone helps to simplify advanced triggering
- Serial bus triggering and decoder, supports protocols I2C, SPI, UART, CAN, LIN, CAN FD, CAN XL, FlexRay, I2S, MIL-STD-1553B, SENT, Manchester, SpaceWire and ARINC429
- Low background noise, supports 0.5 mV/div to 10 V/div vertical scales
- Segmented acquisition (Sequence) mode, dividing the maximum record length into multiple segments (up to 100,000), 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 100,000 frames
- Automatic measurement function on 60+ parameters, supports statistics with histogram, trend, Gating measurement, and measurements on Math, History and Ref
- Math function (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 (Enhanced Resolution); High Speed hardware-based Mask Test function, with Mask Editor tool for creating user-defined masks
- 16 digital channels with sample rate up to 1.25 GSa/s, record length up to 62.5 Mpts
- 25 MHz function / arbitrary waveform generator, built-in multiple predefined waveforms
- Large 10.1" TFT-LCD display with 1024 \* 600 resolution; Capacitive touch screen supports multi-touch gestures
- Multiple interfaces: USB Host, USB Device (USBTMC), LAN (LXI, VXI-11, telnet, socket, web), Pass/Fail, Trigger Out, 10 MHz In, 10 MHz Out, VGA output
- Built-in web server supports remote control by the LAN port using a web browser; Supports SCPI remote control commands; Supports external mouse and keyboard



## Models and Key Specifications

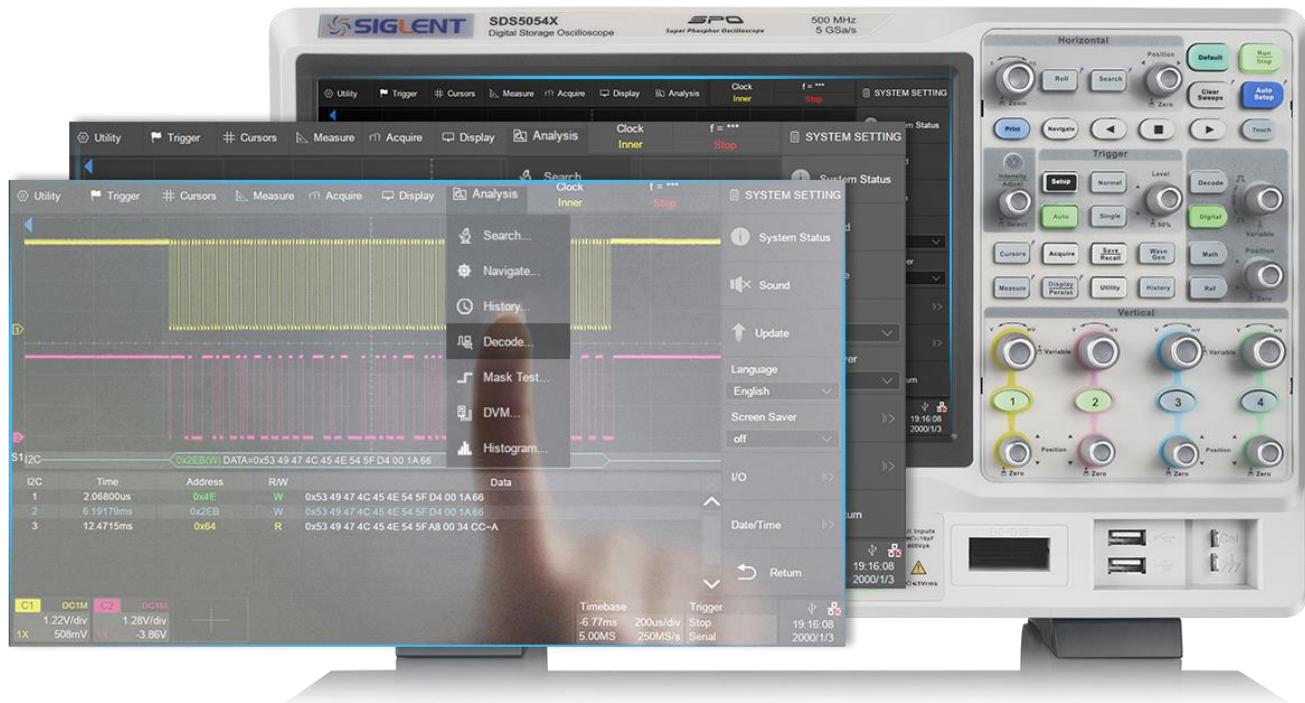
Model	SDS5034X	SDS5054X	SDS5104X
Analog channels	4 + EXT		
Bandwidth	350 MHz	500 MHz	1 GHz
Sample rate (Max.)	5 GSa/s (interleaving mode*), 2.5 GSa/s (non-interleaving mode**)		
Memory depth (Max.)	250 Mpts/ch (interleaving mode), 125 Mpts/ch (non-interleaving mode)		
Waveform capture rate (Max.)	110,000 wfm/s (Normal mode); 500,000 wfm/s (Sequence mode)		
Trigger type	Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video, Qualified, Nth edge, Setup/hold, Delay		
Serial trigger and decode	Standard: I2C, SPI, UART, CAN, LIN Optional: CAN FD, CAN XL(decode only), FlexRay, I2S, MIL-STD-1553B, SENT, Manchester (decode only), ARINC429 (decode only), SpaceWire (decode only)		
Measurement	60+ parameters, statistics, histogram, trend supported		
Math	2 traces 2 Mpts FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation, Absolute, Sign, e <sup>x</sup> , 10 <sup>x</sup> , ln, lg, Interpolation, etc.; supports formula editor		
Data analysis	Search, Navigate, History, Mask Test, Digital Voltmeter, Counter, Waveform Histogram, Bode plot and Power Analysis		
Digital channel	16-channel; maximum sample rate up to 1.25 GSa/s; record length up to 62.5 Mpts		
Waveform generator	Single channel external USB waveform generator, frequency up to 25 MHz, 125 MSa/s sample rate, 16 kpts waveform memory		
I/O	USB 2.0 Host, USB 2.0 Device, LAN 10M/100M, Pass/Fail, Trigger Out, 10 MHz In, 10 MHz Out, VGA Output		
Probe (standard)	SP3050A, 500 MHz, 1 probe supplied for each channel		
Display	10.1" TFT-LCD with capacitive touch screen (1024*600)		

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

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

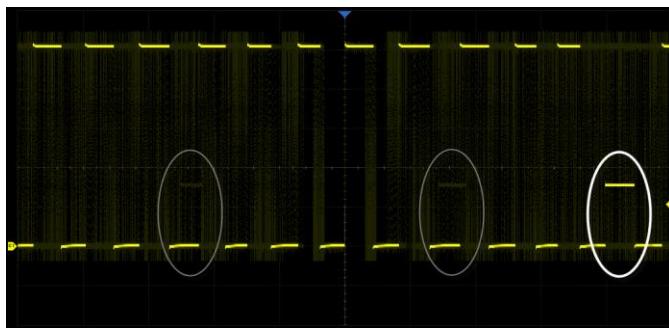
## Functions & Characteristics

### 10.1" TFT-LCD Display with Capacitive Touch Screen



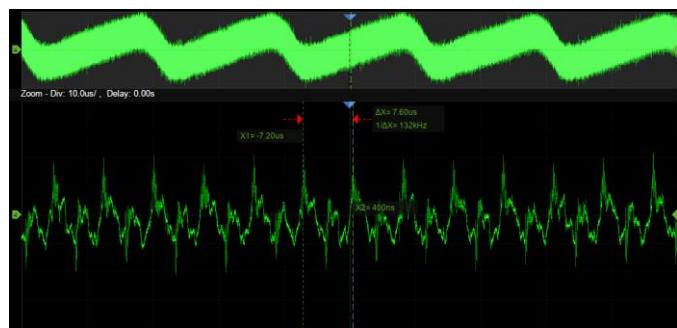
- 10.1" display with 1024\*600 resolution
- Capacitive touch screen, supporting multi-touch gestures, can move or scale the waveform traces quickly by finger-touch movements, which greatly improves the operation efficiency

Up to 110,000 wfm/s Waveform Update Rate



With a waveform update rate of up to 110,000 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

Record Length of up to 250 Mpts/ch



Using hardware-based Zoom technique and record length of up to 250 Mpts, users can select a slower timebase without compromising the sample rate, and then quickly zoom in to focus on the area of interest

## Measurements of a Variety of Parameters



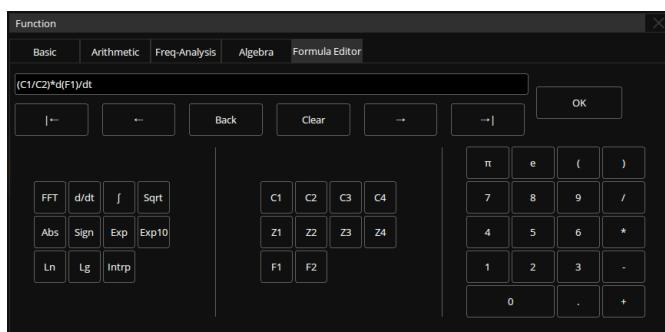
Parameter measurements includes 4 categories: horizontal, vertical, miscellaneous and CH delay providing a total of 60+ different types of measurements. Measurements can be performed within a specified gate period. Measurements on Math, Reference and History frames are supported

## Parameter Statistics Function

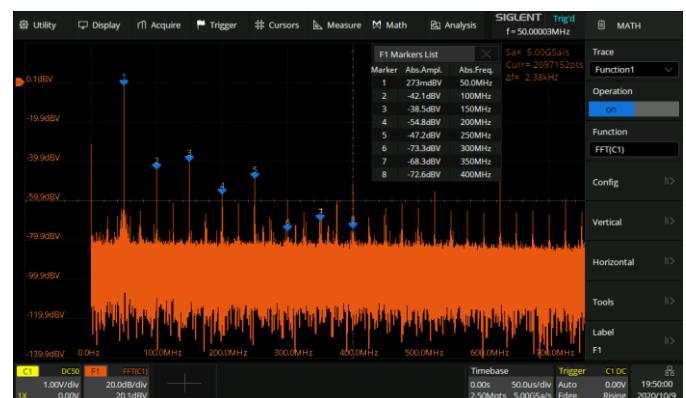


Statistics shows the current value, maximum value, minimum value, standard deviation and mean value of up to 12 parameters simultaneously. Histogram is available to show the probability distribution of a parameter. Trend is available to show the parameter value vs. time

## Advanced Math Function

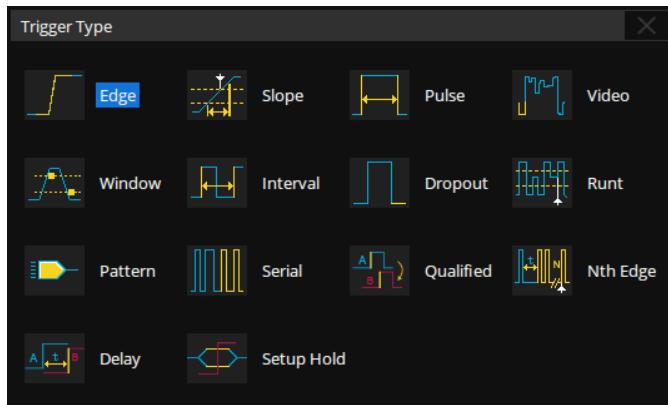


In addition to the traditional (+, -, X, /) operations, FFT, integration, differential, square root and so on are supported. Formula Editor is available for more complex operations. 2 math traces are available



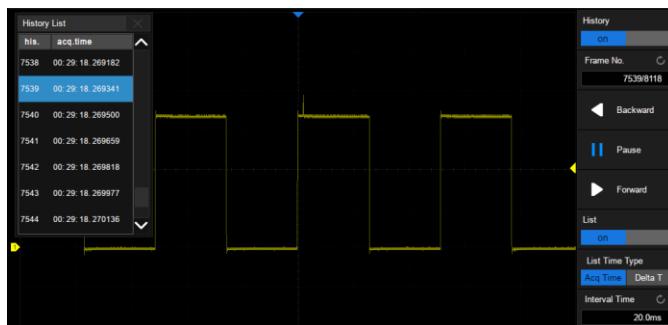
Hardware accelerated FFT supports up to 2 Mpts operation. This provides high frequency resolution with a fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs. Three modes (Normal, Average and Max hold) can satisfy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

## Multiple Trigger Functions



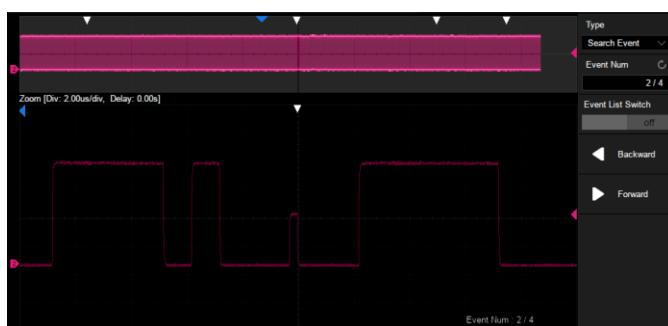
Edge, Slope, Pulse, Video, Windows, Runt, Interval, Dropout, Pattern, Qualified, Nth edge, Setup/hold, Delay and serial trigger

## History Mode



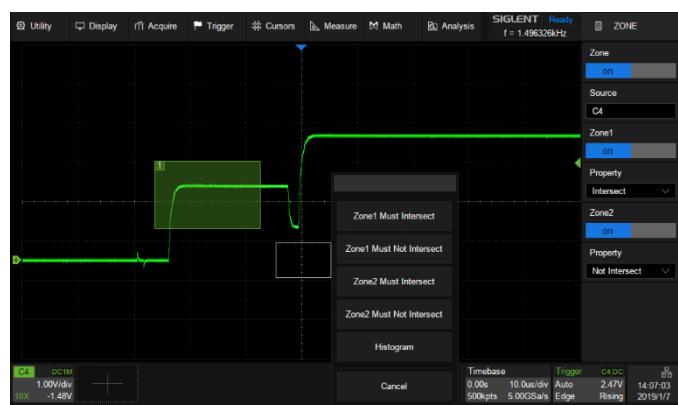
History function can record up to 100,000 frames of waveforms. The recording is executed automatically, so that the customer can play back the history waveforms at any time in order to observe unusual events and quickly locate the area of interest using the cursors or measurements. The failed frames of Mask Test can be stored as history

## Search and Navigate



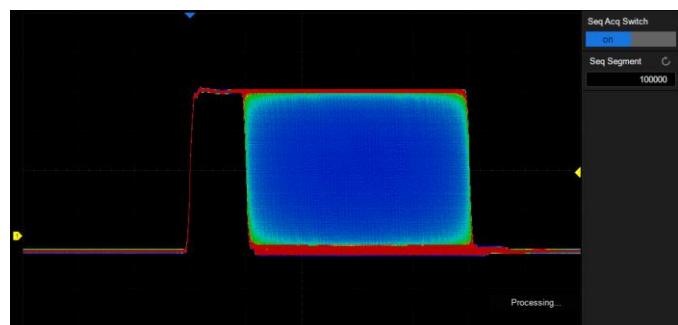
The SDS5000X can search events specified by the user in a frame. Events flagged by the Search can be recalled automatically using Navigate. It can also navigate by time (delay position) and history frames

## Trigger Zone



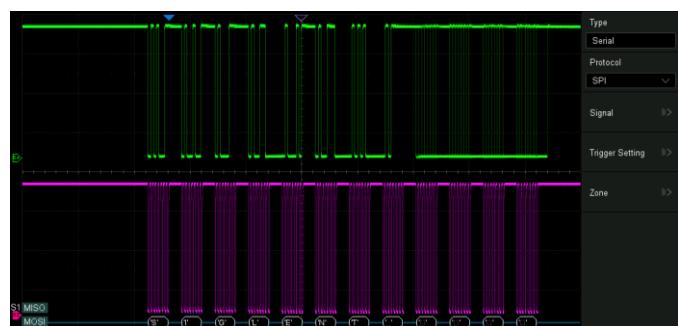
Trigger Zone is available for advanced triggering

## Sequence Mode



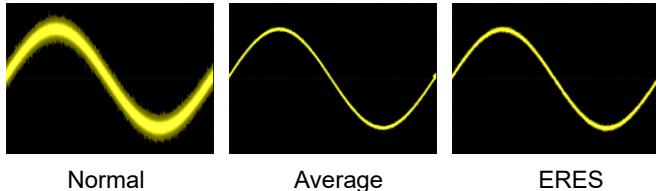
Segmented memory collection will store the waveform into multiple memory segments (up to 100,000) and each segment will store a triggered waveform as well the dead time information. The interval between segments can be as small as 2  $\mu$ s. All of the segments can be played back using the History function

## 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, CAN XL, FlexRay, I<sup>2</sup>S, MIL-STD-1553B, SENT, Manchester SpaceWire and ARINC 429 are supported

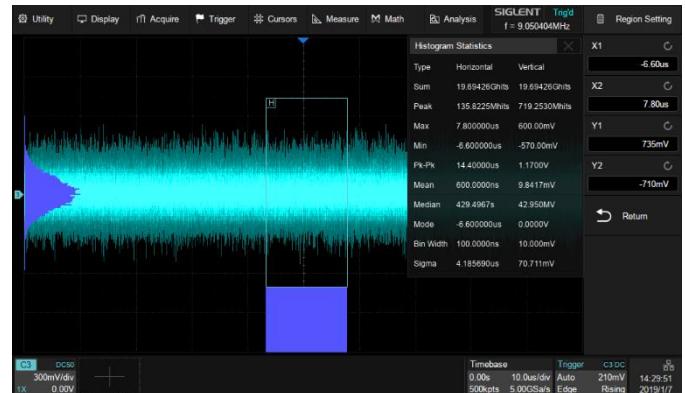
## Hardware-based Average and ERES Acquisition



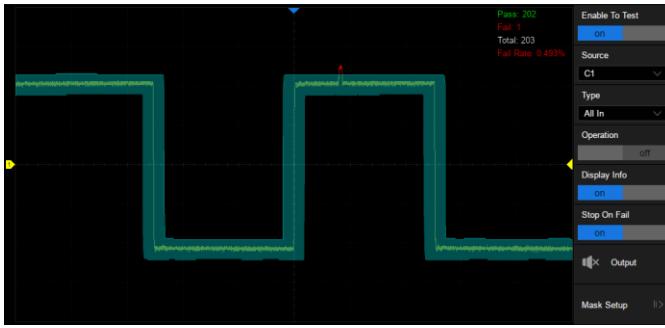
Normal      Average      ERES

Average and ERES (Enhanced Resolution) acquisition modes are hardware-based, allowing the waveforms to be captured at a faster rate

## Waveform Histogram



## Hardware-based High Speed Mask Test Function



The SDS5000X utilizes a hardware-based Mask Test function, performing up to 18,000 Pass / Fail decisions each second. It is easy to generate user-defined test templates in order to provide trace mask comparisons, making it suitable for long-term signal monitoring or automated production line testing

The Waveform Histogram feature provides a statistics view of the waveform in horizontal and vertical directions



Built-in Mask Editor application helps to create custom masks

## Bode Plot



The SDS5000X can control the USB AWG module or a stand-alone SIGLENT SDG 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 analyzer in some applications

## Digital Channels / MSO



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

## 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

## 25 MHz Function/Arbitrary Waveform Generator (Optional)



The SDS5000X can control the SAG1021I USB Function/Arbitrary waveform generator to output waveform with up to 25 MHz frequency and  $\pm 3$  V amplitude. Six basic waveforms plus multiple types of arbitrary waveforms are built-in

### Complete Connectivity



USB 2.0 Host, USB 2.0 Device (USBTMC), LAN 10M/100M (LXI, VXI-11, telnet, socket, web), Pass/ Fail, Trigger Out, 10 MHz In/Out and VGA output

### Web Control



With the embedded web server, users can control the oscilloscope from a simple web page. This provides wonderful remote troubleshooting and monitoring capabilities

## 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 System (analog channel)	
Sample rate	5 GSa/s (interleaving mode), 2.5 GSa/s (non-interleaving mode)
Memory depth	250 Mpts (interleaving mode), 125 Mpts (non-interleaving mode)
Peak detect	400 ps
Average	4, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384, 32768, 65536
ERES	Enhanced bit: 0.5, 1, 1.5, 2, 2.5, 3
Memory management mode	Auto, Fixed Sample Rate, Fixed Memory Depth
Sequence	Up to 100,000 segments, interval between triggers = 2 µs min
History	Up to 100,000 frames
Interpolation	$\sin x/x$ , x

Vertical System (analog channel)	SDS5034X	SDS5054X	SDS5104X
Bandwidth (-3dB) @50 Ω	350 MHz*	500 MHz**	1 GHz**
Rise time (typical) @50 Ω	1.0 ns	0.7 ns	0.4 ns
Bandwidth (-3dB) @1 MΩ, with probe	350 MHz*	500 MHz**	500 MHz**
Vertical range	8 divisions		
Vertical scale (probe 1X)	1 MΩ: 500 µV/div – 10 V/div(setting range), 1 mV/div – 10 V/div(specified range) 50 Ω: 500 µV/div – 1 V/div(setting range), 1 mV/div – 1 V/div(specified range)		
DC gain accuracy	< 1.5%, ≥5mV/div < 3.0%, <5mV/div		
Offset accuracy	±(1.5%*offset+1.5%*full scale+1mV)		
Offset range (probe 1X)	0.5mV/div~100mV/div: ±2V; 102mV/div~1V/div: ±20V; 1.02V/div~10V/div: ±200V	0.5mV/div~20mV/div: ±2V;*** 20.5mV/div~100mV/div: ±5V; 102mV/div~200mV/div: ±20V; 205mV/div~1V/div: ±50V; 1.02V/div~2V/div: ±200V 2.05V/div~10V/div: ±400V	
Bandwidth flatness (>2 mV/div, @50 Ω)	50 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		
Bandwidth limit	20 MHz (±40%) 200 MHz (±40%)		
Low frequency response (AC coupling -3 dB)	5 Hz (typical)		
Overshoot (150 ps pulse @50 Ω)	<10% (typical)	<10% (typical)	<15% (typical)
Coupling	DC, AC, GND		
Impedance	DC1M: (1 MΩ±2%)    (16 pF±2 pF) AC1M: (1.2 MΩ±2%)    (16 pF±2 pF) 50 Ω: 50 Ω±1%		
Max. Input voltage	1MΩ ≤ 400Vpk(DC + AC), DC~10kHz 50Ω ≤ 5Vrms, ±10V Peak		
SFDR	≥ 32 dBc		
CH to CH Isolation (@50Ω)	DC ~ 100 MHz >40 dB 100 MHz ~ BW: ≥34 dB		
Probe Attenuation	1X, 10X, 100X, custom		

\* Below 1 mV/div (included) the bandwidth is limited to 200 MHz(±40%)

\*\* Below 2.45 mV/div (included) the bandwidth is limited to 200 MHz(±40%)

\*\*\* The SDS5054X upgraded from SDS5034X follows the Offset range spec of the SDS5034X

Horizontal System	SDS5034X	SDS5054X	SDS5104X
Time scale	1 ns/div – 1000 s/div	500 ps/div – 1000 s/div	200 ps/div – 1000 s/div

## SDS5000X Series Digital Storage Oscilloscope

Waveform update rate	Up to 110,000 wfm/s
Intensity grading	256-level
Display mode	Y-T, X-Y, Roll
Roll mode	$\geq 50$ ms/div
Skew (C1~C4)	< 150 ps
Time base Accuracy	$\pm 1$ ppm initial; $\pm 1$ ppm 1st year aging; $\pm 3.5$ ppm 10-year aging

### Trigger System

Mode	Auto, Normal, Single					
Level	Internal: $\pm 4.1$ div from the center of the screen EXT: $\pm 0.61$ V EXT/5: $\pm 3.05$ V					
Ext Trigger Channel input voltage	1 M $\Omega$ : $\leq 42$ Vpk 50 $\Omega$ : $\leq 1.5$ Vrms @ EXT, 5 Vrms @ EXT/5					
Hold off range	By time: 8 ns ~ 30 s (8 ns step) By event: $1 \sim 10^8$					
Coupling	C1~C4 DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 8 Hz LFRJ: Attenuates the frequency components below 1.2 MHz HFRJ: Attenuates the frequency components above 740 kHz Noise RJ: Increases the trigger hysteresis EXT DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 10 Hz LFRJ: Attenuates the frequency components below 400 kHz HFRJ: Attenuates the frequency components above 1.6 MHz					
Accuracy (typical)	C1 ~ C4: $\pm 0.2$ div EXT: $\pm 0.3$ div					
Sensitivity	C1 ~ C4:  EXT:  EXT/5:	>10mV/div:	0.3 div	0.7 div		
		5mV/div~10mV/div:	0.5 div	0.7 div		
		$\leq 2$ mV/div:	1 div	1.5 div		
		200mVpp, DC ~ 10MHz 300mVpp, 10MHz ~ bandwidth (300 MHz typical)				
Jitter	<9ps RMS (typical) for $\geq 300$ MHz sine and $\geq 6$ divisions peak to peak amplitude for vertical gain settings from 2.5mV/div to 10V/div <5ps RMS (typical) for $\geq 500$ MHz sine and $\geq 6$ divisions peak to peak amplitude for vertical gain settings from 2.5mV/div to 10V/div					
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	2ns ~ 20s, Resolution = 1 ns					
<b>Pulse Width Trigger</b>						
Source	C1~C4/D0~D15					
Polarity	+wid, -wid					
Limit range	<, >, in range, out of range					
Time range	2ns ~ 20s, 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	2ns ~ 20s, Resolution = 1 ns
<b>Dropout Trigger</b>	
Source	C1~C4/D0~D15
Timeout type	Edge, State
Slope	Rising, Falling
Time range	2ns ~ 20s, Resolution = 1 ns
<b>Runt Trigger</b>	
Source	C1~C4
Polarity	Positive, Negative
Limit range	<, >, in range, out of range
Time range	2ns ~ 20s, 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	2ns ~ 20s, 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	8ns ~ 20s, 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	2ns ~ 20s, 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
<b>Serial Decoder</b>	
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	7bit, 10bit
<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	Ver1.3, Ver2.0
Source	C1~C4/D0~D15
Baud Rate	600bps, 1200bps, 2400bps, 4800bps, 9600bps, 19200bps, 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
<b>SpaceWire (Optional)</b>	
Source	C1 ~ C4
Signal	Data, Strobe
Clock Recovery	Fixed speed, Auto detect
Baud Rate	2 Mbps, 5 Mbps, 10 Mbps, 20 Mbps, 50 Mbps, 100 Mbps, 200 Mbps, 400 Mbps, Custom
Sync Mode	Auto, Nulls, Pattern, Manual
View mode	N/L-char, Packet
<b>CAN XL (Optional)</b>	
Source	C1 ~ C4 / D0 ~ D15
Type	SIC Mode/Fast Mode
Nominal Baud	10 kbps, 25 kbps, 50 kbps, 100 kbps, 250 kbps, 1 Mbps, 2 Mbps, 5 Mbps, 8 Mbps, 10 Mbps, Custom
FD Baud	500 kbps, 1 Mbps, 2 Mbps, 5 Mbps, 8 Mbps, 10 Mbps, Custom
XL Baud	500 kbps, 1 Mbps, 2 Mbps, 5 Mbps, 8 Mbps, 10 Mbps, 12 Mbps, 15 Mbps, 20 Mbps, Custom

## Measurement

### Automatic Measurement

Source	C1~C4, D0~D15, F1~F2, Ref, History, Z1~Z4
Mode	Simple, Advanced
Range	Screen, Gating
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, FPREF, ROV, RPREF, Level@Trigger, UpperLower
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, Bit Rate, Data Rate
Delay Parameters	Phase, FRFR, FRFF, FFFR, FFFF, FRLR, FRLF, FFLR, FFLF, Skew, Tsu@R, Tsu@F, Th@R, Th@F, $\Delta$ Time1-4, $\Delta$ TimeMax, $\Delta$ TimeMin
Statistics	Current, Mean, Min, Max, Sdev, Count, Histogram, Trend, Track
Statistics Count	Unlimited, 1~1024
Statistics Count in a frame (AIM count)	Up to 25,000
<b>Cursors</b>	
Source	C1~C4, D0~D15, F1~F2, Ref, Histogram
Type	Manual : Time X1, X2, (X1-X2), (1/ $\Delta$ T); Vertical Y1, Y2, (Y1-Y2) Track: Time X1, X2, (X1-X2) Measure

## Math

Trace	F1, F2
Source	C1~C4, F1~F2, Z1~Z4
Operation	FFT, +, -, x, $\div$ , $\int$ dt, d/dt, $\sqrt{\cdot}$ , Identity, Negation,  x , Sign, $e^x$ , $10^x$ , ln, lg, Interpolation, Atan, 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, Blackman-Harris, Gaussian 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
<b>Navigate</b>	
Type	Search event, Time, History frame
<b>Mask Test</b>	

## SDS5000X Series Digital Storage Oscilloscope

Source	C1~C4, Z1~Z4
Mask creating	Auto (Create mask), Customized (Mask Editor)
Mask test speed	Up to 18,000 frames/s
<b>DVM</b>	
Source	C1~C4
Mode	DC mean, DC RMS, AC RMS, Peak-peak, Amplitude
Plot	Bar, Histogram, Trend
<b>Bode Plot</b>	
Source	C1~C4
Supported signal sources	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

No. of Channels	16
Max. Sampling Rate	1.25 GSa/s
Memory Depth	62.5 Mpts/ch
Min. Detectable Pulse Width	3.3 ns
Level Group	D0~D7, D8~D15
Level Range	-10V~10V
Logic Type	TTL, CMOS, LVCMOS3.3, LVCMOS2.5, Custom
Skew	D0~D15: $\pm 1$ sampling interval Digital to Analog: $\pm (1 \text{ sampling interval} + 1 \text{ ns})$

## SAG1021I 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
Insulation Voltage	$\pm 42$ Vpk
<b>Sine</b>	
Frequency	1 $\mu$ Hz ~ 25 MHz
Offset accuracy (10 kHz)	$\pm (1\% \text{ offset setting value} + 3 \text{ mVpp})$
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 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
<b>Ramp</b>	
Frequency	1 μHz ~ 300 kHz
Linearity	< 0.1% of Pk-Pk (typical, 1 kHz, 1 Vpp, 50% symmetry)
Channels	0% ~ 100%
<b>DC</b>	
Offset range	±1.5 V (into 50 Ω) ±3 V (into Hi-Z)
Accuracy	±( setting value *1%+3 mV)
<b>Noise</b>	
Bandwidth (-3 dB)	>25 MHz
<b>Arb</b>	
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

<b>I/O</b>	
Standard	3 USB 2.0 Hosts, 1 USB 2.0 Device, 10M/100M LAN, AUX (Pass/Fail+Trigger Out), 10 MHz In/ Out
Pass/Fail	3.3 V TTL output
Calibration signal for passive probe	1 kHz, 3.3 V Square

<b>Display</b>	
Display Type	10.1" TFT LCD with capacitive touch screen
Resolution	1024×600
Contrast	500:1 typical
Backlight	500 nit typical

<b>Display Setting</b>	
Range	8 x 10 grid
Display Type	Dot, vector
Persistence Time	OFF, 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 °C ~ 40 °C Non-operating: -20 °C ~ 60 °C
Humidity	Operating: 85% RH, 40 °C, 24 hours Non-operating: 85% RH, 65 °C, 24 hours
Altitude	Operating: ≤3,000 m 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, 150kHz-30MHz
	Radiated disturbance CISPR 11/EN 55011 CLASS A group 1, 30MHz-1GHz
	Electrostatic discharge (ESD) IEC 61000-4-2/EN 61000-4-2 4.0 kV (Contact), 8.0 kV (Air)

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	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 2.7GHz )
	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, 0.15-80MHz
	Voltage dips and interruptions	IEC 61000-4-11/EN 61000-4-11	Voltage Dips : 0% UT during half cycle; 0% UT during 1 cycle; 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.		

### Power Supply

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

### Mechanical

Dimensions	Length x Width x Height = 370 mm×144 mm×231 mm
Weight	Net Weight: 4.0 kg Gross Weight: 5.6 kg

## Ordering Information

Model	Description
SDS5104X	1 GHz, 4 CH, 5 GSa/s (Max.)
SDS5054X	500 MHz, 4 CH, 5 GSa/s (Max.)
SDS5034X	350 MHz, 4 CH, 5 GSa/s (Max.)

Standard Accessories	Quantity
USB cable	1
Quick start	1
Passive probe (SP3050A)	1/channel
Certificate of calibration	1
Power cord	1
Optional Accessories	Description
SP6150A	High-speed passive probe: 1.5 GHz, 10X, Input impedance 1.8 pF    500 Ω
SAP1000	High-speed active probe: 1 GHz, 10X, Input impedance 1.2 pF    1 MΩ, Input dynamic range ±8 V, Offset range ±12 V, SAPBus interface
SAP2500	High-speed active probe: 2.5 GHz, 10X, Input impedance 1.1 pF    1 MΩ, Input dynamic range ±8 V, Offset range ±12 V, SAPBus interface
SAP2500D	High-speed differential probe: 2.5 GHz, 10X, Input impedance (differential) 1 pF    200 kΩ, Input dynamic range ±4 V, Offset range ±8 V, SAPBus interface
HPB4010	High voltage passive probe: DC-40MHz, 1000X, Input impedance 3.0 pF    100 MΩ, Max. measurement voltage DC: 0~10 kVDC, AC: ≤ 7 kVrms (Sinewave), 20 kVp-p (Pulse)
DPB1300	High voltage differential probe: 50 MHz, 50X/500X, Max differential test voltage (DC + Peak AC) ±1300 V, Max input common mode voltage CATIII 600 V / CATII 1000 V, 12 V adapter power supply
DPB5150	High voltage differential probe: 70 MHz, 50X/500X, Max differential test voltage (DC + Peak AC) ±1500 V, Max input common mode voltage CATIII 600 V / CATII 1000 V, USB 5V adapter power supply
DPB5150A	High voltage differential probe: 100 MHz, 50X/500X, Max differential test voltage (DC + Peak AC) ±1500 V, Max input common mode voltage CATIII 600 V / CATII 1000 V, USB 5V adapter power supply
DPB5700	High voltage differential probe: 70 MHz, 100X/1000X, Max differential test voltage (DC + Peak AC) ±7000 V, Max input common mode voltage CATIII 1000 V, USB 5V adapter power supply
DPB5700A	High voltage differential probe: 100 MHz, 100X/1000X, Max differential test voltage (DC + Peak AC) ±7000 V, Max input common mode voltage CATIII 1000 V, USB 5V adapter power supply
SCP5030	Current probe: DC-50 MHz, Conversion factor 1 V/A, 0.1 V/A, Max current 30 Arms/50 Apk, 300V, SAPBus interface
SCP5030A	Current probe: DC-100 MHz, Conversion factor 1 V/A, 0.1 V/A, Max current 30 Arms/50 Apk, 300V, SAPBus interface
SCP5150	Current probe: DC-12 MHz, Conversion factor 0.1 V/A, 0.01 V/A, Max current 150 Arms/300 Apk, CAT III 300 V/CAT II 600 V, SAPBus interface
SCP5500	Current probe: DC-2 MHz, Conversion factor 0.1 V/A, 0.01 V/A, Max current 500 Arms/750 Apk, CAT III 300 V/CAT II 600 V, SAPBus interface
CPL5100	Current probe: DC-600 kHz, Conversion factor 0.1 V/A, 0.01 V/A, Current range 50 mA -100 Apk, 12 V adapter power supply
CP4020	Current probe: DC-200 kHz, Conversion factor 5 mV/A, 50 mV/A, Max current 20 Arms/60 Ap-p, CAT III 600 V/CAT II 600 V, 9 V adapter power supply
CP4050	Current probe: DC-1 MHz, Conversion factor 50 mV/A, 500 mV/A, Max current 50 Arms/140 Ap-p, CAT III 300 V/CAT II 600 V, 9 V adapter power supply
CP4070	Current probe: DC-300 kHz, Conversion factor 5 mV/A, 50 mV/A, Max current 70 Arms/200 Ap-p, CAT III 300 V/CAT II 600 V, 9 V adapter power supply
CP4070A	Current probe: DC-300 kHz, Conversion factor 10 mV/A, 100 mV/A, Max current 70 Arms/200 Ap-p, CAT III 600 V/CAT II 600 V, 9 V adapter power supply

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CP6030	Current probe: DC-50 MHz, Conversion factor 1 V/A, 0.1 V/A, Max current 30 Arms/50 Apk, 300V, 12 V adapter power supply
CP6030A	Current probe: DC-100 MHz, Conversion factor 1 V/A, 0.1 V/A, Max current 30 Arms/50 Apk, 300V, 12 V adapter power supply
CP6150	Current probe: DC-12 MHz, Conversion factor 0.1 V/A, 0.01 V/A, Max current 150 Arms/300 Apk, CAT III 300 V/CAT II 600 V, 12 V adapter power supply
CP6500	Current probe: DC-5 MHz, Conversion factor 0.1 V/A, 0.01 V/A, Max current 500 Arms/750 Apk, CAT III 300 V/CAT II 600 V, 12 V adapter power supply
SAP4000P	Power rail probe: DC - 4 GHz, 1.1X, Input impedance: 50 kΩ @ low frequency, 50 Ω @ high frequency, Input dynamic range ± 600 mV, Offset range ± 24 V, SAPBus interface
SPL2016	16-channel logic probe: Input impedance 100 kΩ    18 pF, Input dynamic range ±20 V, Min. input swing 800 mVpp, Max. data rate 300 Mbps (without lead), 100 Mbps (with lead)
SAG1021I	50 MHz isolated USB function/arbitrary waveform generator
DF2001A	Power Analysis deskew fixture
STB3	STB3 demo signal source
USB-GPIB	USB-GPIB adapter
SDS5000X-RMK	Rack Mount Kit
BAG-S2	Bag
<b>Options</b>	<b>Description</b>
SDS-5000X-4BW05	350 MHz to 500 MHz bandwidth upgrade (4-ch model) * (software)
SDS-5000X-4BW10	500 MHz to 1 GHz bandwidth upgrade (4-ch model) (software)
SDS-5000X-PA	Power Analysis (software)
SDS-5000X-I2S	I2S trigger & decode (software)
SDS-5000X-1553B	MIL-STD-1553B trigger & decode (software)
SDS-5000X-FlexRay	FlexRay trigger & decode (software)
SDS-5000X-CANFD	CAN FD trigger & decode (software)
SDS-5000X-SENT	SENT trigger & decode (software)
SDS-5000X-Manch	Manchester decode (software)
SDS-5000X-ARINC	ARINC429 decode (software)
SDS-5000X-CANXL	CAN XL decode (software)
SDS-5000X-SpaceWire	SpaceWire decode (software)

\* SDS5034X cannot be upgraded to SDS5104X

## 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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