SDS5000X Series

Digital Storage Oscilloscope

SIGLENT®

DataSheet-2019.10

SIGLENT TECHNOLOGIES CO.,LTD

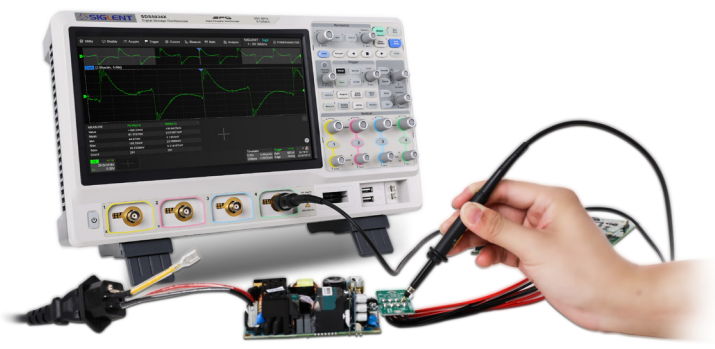
SDS5104X/SDS5102X
SDS5054X/SDS5052X
SDS5034X/SDS5032X

Product Overview

SIGLENT's SDS5000X series Digital Storage Oscilloscopes are available in bandwidths of 1 GHz, 500 MHz and 350 MHz, have a maximum sample rate of 5 GSa/s, maximum record length of 250 Mpts/ch, and display up to 4 analog channels + 16 digital channels mixed signal analysis ability.

The SDS5000X series employs Siglent's SPO technology with a maximum waveform capture rate of up to 110,000 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. History waveform recording, Sequence acquisition, Search and Navigate functions 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 SDS5000X.

The large 10.1" display capacitive touch screen supports multi-touch gestures, with the addition of user-friendly one-button design for most commonly used functions, can greatly improve the operation efficiency of the SDS5000X. It also supports mouse and external keyboard control.



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 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, FlexRay, I2S and MIL-STD-1553B
- Low background noise, supports 0.5 mV/div to 10 V/div voltage 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 50+ parameters, supports statistics with histogram,trend, Gating measurement, Math measurement, History measurement and Ref measurement
- Math function (2 Mpts FFT, addition, subtraction, multiplication, division, integration, differential, square root), 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 (optional) 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
- Supports external mouse and keyboard
- 10 types of one-button shortcuts
- Multiple interfaces: USB Host, USB Device (USBTMC), LAN (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

Models and Key Specifications

Model	SDS5034X SDS5032X	SDS5054X SDS5052X	SDS5104X SDS5102X
Bandwidth	350 MHz	500 MHz	1GHz
Sample rate (Max.)	5 GSa/s (interleaving mode)*, 2.5 GSa/s (non-interleaving mode**)		
Analog channels	2/4 + EXT		
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		
Serial trigger and decode	I2C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I2S, MIL-STD-1553B		
Digital channel (optional)	16-channel; maximum waveform capture rate up to 1.25 GSa/s; record length up to 62.5 Mpts		
Waveform generator (optional)	Single channel, frequency up to 25 MHz, 125 MSa/s sample rate, 16 kpts waveform memory		
I/O	USB Host, USB Device, LAN, Pass/Fail, Trigger Out, 10 MHz In, 10 MHz Out, VGA Output		
Probe (standard)	1 probe supplied for each channel		
Display	10.1” TFT-LCD with capacitive touch screen (1024*600)		

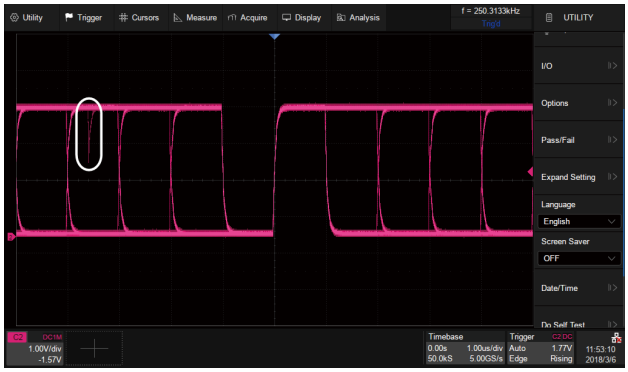
- interleaving mode: only one of CH1/CH2 and/or only one of CH3/CH4 activated
- non-interleaving mode: both CH1/CH2 or both CH3/CH4 activated

Functions & Characteristics

10.1” TFT-LCD display with capacitive touch screen

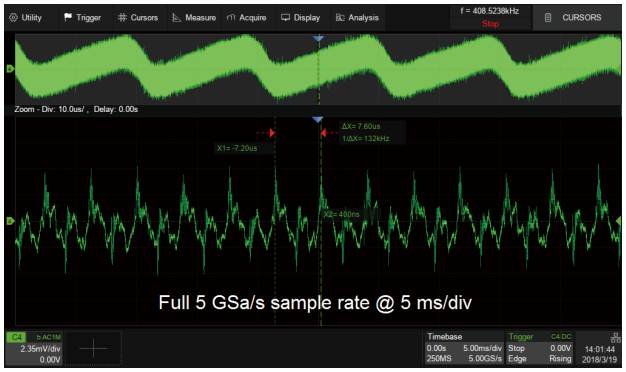
- 10.1” display with 1024*600 resolution
- Capacitive touch screen, supporting multi-touch gestures, can move or scale the waveform traces quickly by finger-touch movements, which greatly improves the operation efficiency.

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

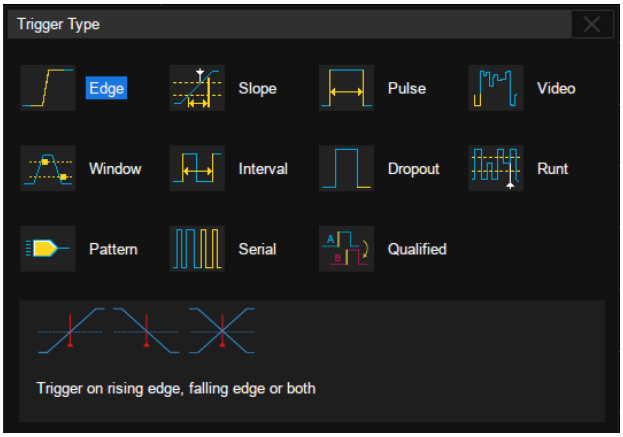
Measurements of a Variety of Parameters

Parameter measurements includes 4 categories: horizontal, vertical, miscellaneous and CH delay providing a total of 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

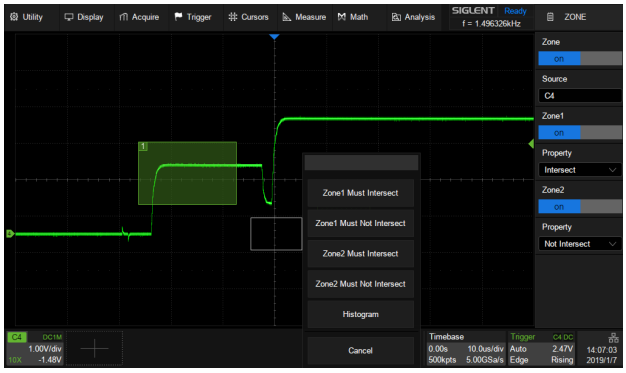
Statistics shows the current value, maximum value, minimum value, standard deviation and mean value of up to 5 parameters simultaneously. Histogram is available to show the probability distribution of a parameter. Trend is available to show the parameter value vs. time.

Multiple Trigger Functions



Edge, Slope, Pulse, Video, Windows, Runt, Interval, Dropout, Pattern, Qualified and serial trigger

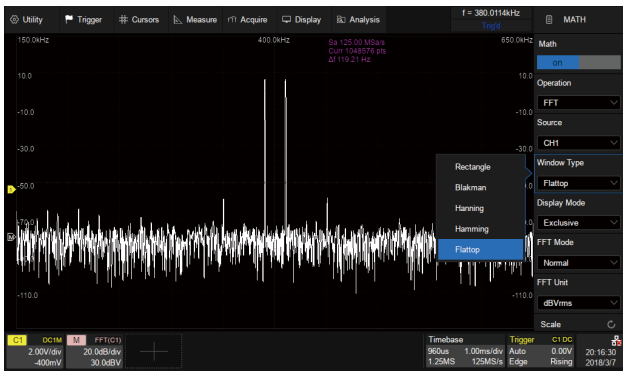
Trigger Zone



Trigger Zone is available for advanced triggering

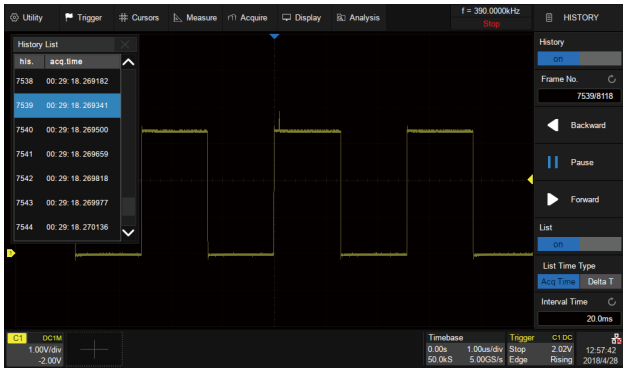
Advanced Math Function

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



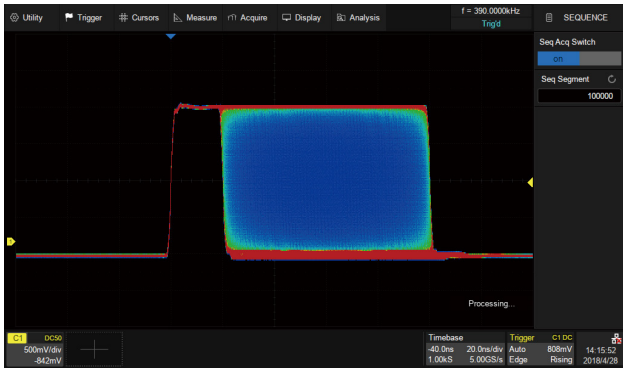
Hardware accelerated FFT supports up to 2 Mpts operation. This provides high frequency resolution with a fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs. Three modes (Normal, Average and Max hold) can satisfy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

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

Sequence Mode

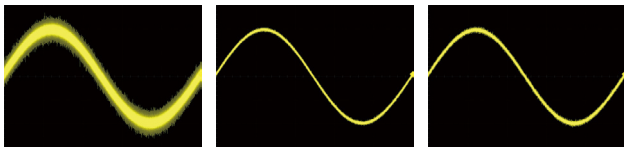


Segmented memory collection will store the waveform into multiple memory segments (up to 100,000) and each segment will store a triggered waveform as well the dead time information. The interval between segments can be as small as 2 µs. All of the segments can be played back using the History function

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

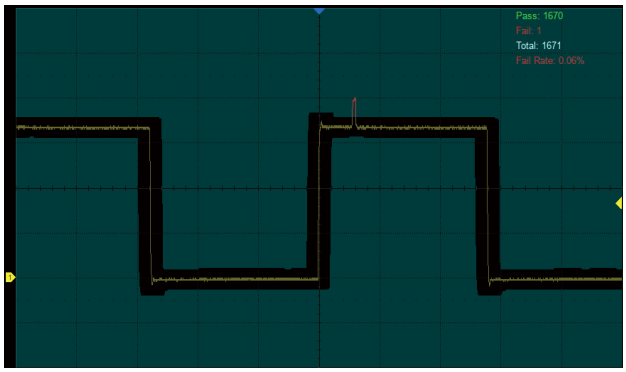
Hardware-based Average and Eres Acquisition



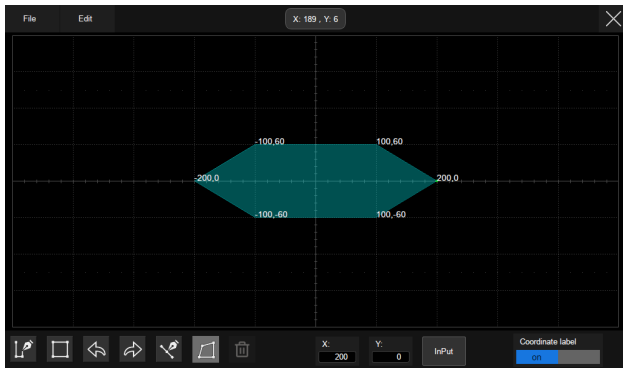
Normal Average ERES

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

Hardware-based High Speed Mask Test Function

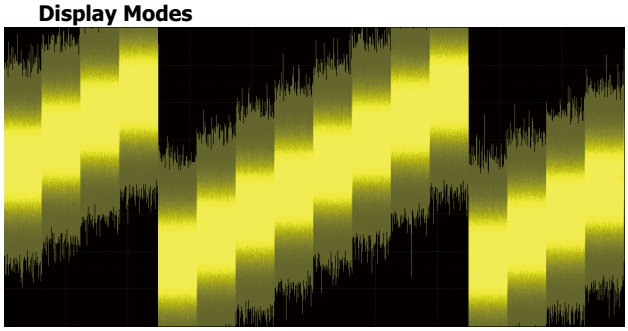


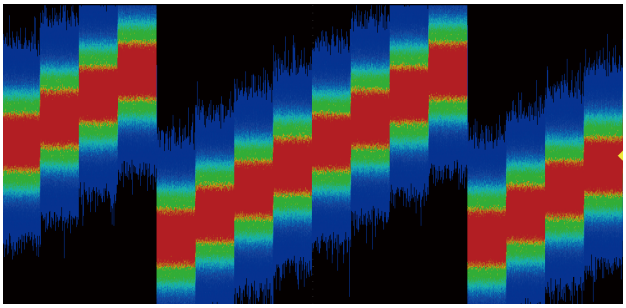
The SDS5000X utilizes a hardware-based Mask Test function, performing up to 18,000 Pass / Fail decisions each second. It is easy to generate user-defined test templates in order to provide trace mask comparisons, making it suitable for long-term signal monitoring or automated production line testing



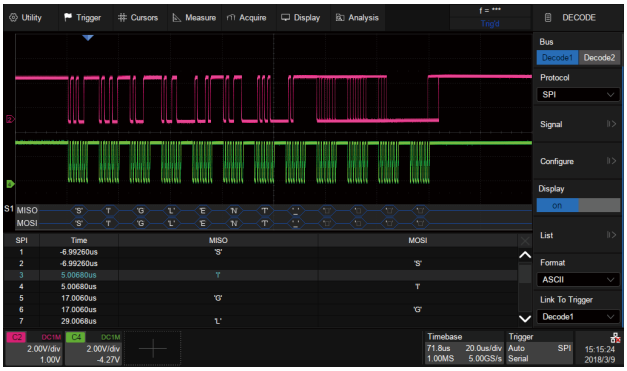
Built-in Mask Editor application helps to create custom masks

256-level Intensity Grading and Color Temperature Display Modes



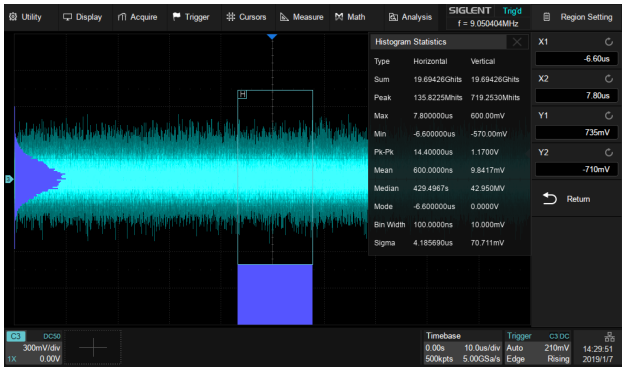


Serial Bus Decode



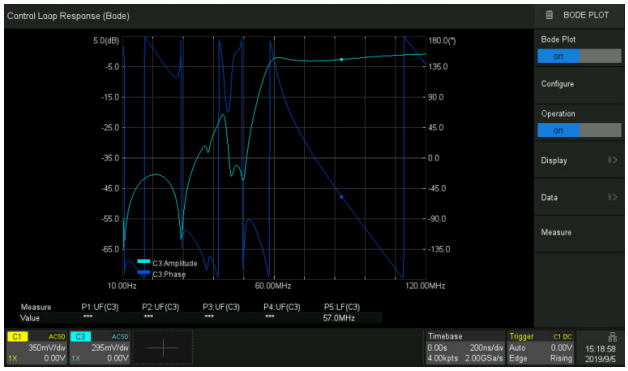
Display the decoded characters through the events list. Bus protocol information can be quickly and intuitively displayed in tabular form. I2C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I2S and MIL-STD-1553B are supported

Waveform Histogram



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

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.

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 Voltmeter Function

4-digit voltmeter and 7-digit frequency counter. Any analog channel can be selected as a source. Bar, Histogram and Trend diagrams are supported

Web control

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

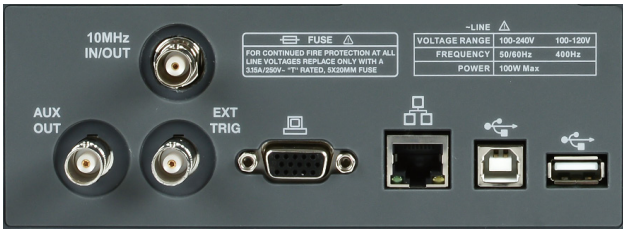
Digital Channels / MSO (Optional)

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

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 ±3 V amplitude. Six basic waveforms plus multiple types of arbitrary waveforms are built-in

Complete Connectivity



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

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 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
ERES	Enhanced bit: 0.5, 1, 1.5, 2, 2.5, 3
Sequence	Up to 100,000 segments, interval between triggers = 2 μs min
History	Up to 100,000 frames
Interpolation	sinx/x, x

Vertical System	SDS5034X SDS5032X	SDS5054X SDS5052X	SDS5104X SDS5102X
Bandwidth (-3dB) @50 Ω	350 MHz*	500 MHz**	1 GHz**
Rise time (typical) @50 Ω	1.0 ns	0.7 ns	0.4 ns
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	≤ 3.0%		
Offset range (probe 1X)	500 μV/div ~ 100 mV/div: ± 1V 102 mV/div ~ 1 V/div: ± 10 V 1.02 V/div ~ 10 V/div: ± 100 V		
Offset accuracy	±(1.5%*offset+1.5%*full scale+1mV)		
Bandwidth flatness (>2 mV/div, @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		
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)
Max. Input voltage	1 MΩ ≤ 400 Vpk(DC + AC), (DC~10 kHz) 50 Ω ≤ 5 Vrms, ±10 V Peak		
Coupling	DC, AC, GND		
Impedance	(1 MΩ±2%) || (16 pF±2 pF) 50 Ω: 50 Ω±1%		
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
** Below 2.45 mV/div (included) the bandwidth is limited to 200 MHz

Horizontal System	SDS5034X SDS5032X	SDS5054X SDS5052X	SDS5104X SDS5102X
Time scale	1 ns/div – 1000 s/div	500 ps/div – 1000 s/div	200 ps/div – 1000 s/div
Waveform update rate	Up to 110,000 wfm/s		
Intensity grading	256-level		
Display mode	Y-T, X-Y, Roll		
Roll mode	≥ 50 ms/div		
Skew (CH1~CH4)	< 150 ps		
Time base Accuracy	±1ppm initial; ±1ppm 1st year aging; ±3.5ppm 10-year aging		

Trigger System				
Mode	Auto, Normal, Single			
Level	Internal: ±4.1 div from the center of the screen			
	EXT: ±0.61 V			
	EXT/5: ±3.05 V			
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 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			
Coupling (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)	CH1 ~ CH4: ±0.2 div EXT: ±0.3 div			
Sensitivity	CH1 ~ CH4:		Noise RJ = OFF	Noise RJ = ON
		>10 mV/div:	0.3 div	0.7 div
		5 mV/div~10 mV/div:	0.5 div	0.7 div
		≤2 mV/div:	1 div	1.5 div
	EXT: 200 mVpp DC ~ 10 MHz 300 mVpp 10 MHz ~ bandwidth			
	EXT/5: 1 Vpp DC ~ 10 MHz; 1.5 Vpp 10 MHz ~ bandwidth			
Jitter	<9ps RMS (typical) for ≥300MHz sine and ≥6 divisions peak to peak amplitude for vertical gain settings from 2.5mV/div to 10V/div. <5ps RMS (typical) for ≥500MHz sine and ≥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 ~ 5,000 div			
Zone	Up to 2 zones Source: CH1~CH4 Property: Intersect, Not Intersect			
Edge Trigger				
Slope	Rising, Falling, Rising & Falling			
Source	CH1~CH4/EXT/(EXT/5)/AC Line/D0~D15			

Slope Trigger	
Slope	Rising, Falling
Source	CH1 ~ CH4
Limit range	<, >, < >, > <
Time range	2 ns ~ 20 s
Resolution	1 ns
Pulse Width Trigger	
Polarity	+wid, -wid
Limit Range	<, >, < >, > <
Source	CH1~CH4/D0~D15
Pulse Width Range	2 ns ~ 20 s
Resolution	1 ns
Video Trigger	
Standard	NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom
Source	CH1~CH4
Synchronization	Any, Select
Trigger Condition	Line, Field
Window Trigger	
Window type	Absolute, Relative
Source	CH1~CH4
Interval Trigger	
Slope	Rising, Falling
Limit Range	<, >, < >, > <
Source	CH1~CH4/D0~D15
Time Range	2 ns ~ 20 s
Resolution	1 ns
Dropout Trigger	
Timeout type	Edge, State
Source	CH1~CH4/D0~D15
Slope	Rising, Falling
Time Range	2 ns ~ 20 s
Resolution	1 ns
Runt Trigger	
Slope	Rising, Falling
Limit Range	<, >, < >, > <
Source	CH1~CH4
Time Range	2 ns ~ 20 s
Resolution	1 ns

Pattern Trigger	
Pattern Setting	Don’t Care, Low, High
Logic	AND, OR, NAND, NOR
Source	CH1~CH4/D0~D15
Limit 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
Serial Trigger	
Protocol	I2C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I2S, MIL-STD-1553B
Source	CH1~CH4/D0~D15
I2C Trigger	Type: Start, Stop, Restart, No Ack, EEPROM, Address & Data, Data Length
SPI Trigger	Type: Date
UART Trigger	Type: Start, Stop, Data, Parity Error
CAN Trigger	Type: All, Remote, ID, ID+Data, Error
LIN Trigger	Type: Break, Frame ID, ID+Data, Error
CAN FD Trigger	Type: Start, Remote, ID, ID+Data, Error
FlexRay Trigger	Type: TSS, Frame, Symbol, Errors
I2S Trigger	Type: Data, Mute, Clip, Glitch, Rising Edge, Falling Edge
Serial Decoder	
Decoders	2
Threshold	-4.1 ~ 4.1 div
List	1 ~ 7 lines
Decoder type	Full duplex
I2C	
Signal	SCL, SDA
Address	7 bit, 10 bit
SPI	
Signal	CLK, MISO, MOSI, CS
Edge Select	Rising, Falling
Chip select	Active high, active low, clock timeout
Bit Order	LSB, MSB
UART	
Signal	RX, TX
Data Width	5 bit, 6 bit, 7 bit, 8 bit
Parity Check	None, Odd, Even

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 Specification Package Revision	Ver1.3, Ver2.0
Baud Rate	5 kbps, 10 kbps, 20 kbps, 50 kbps, 100 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps, Custom
CAN FD	
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	
Source	CH1~CH4/D0~D15
Data Baud Rate	2.5 Mbps, 5 Mbps, 10 Mbps, Custom
I2S	
Signal	BCLK, WS, DATA
Audio Variant	Audio-I2S, Audio-LJ, Audio-RJ
Start Bits	0~32
Data Bits	0~32
MIL-STD-1553B	
Source	CH1~CH4

Measurement	
Source	CH1~CH4, Math, Ref, History, Zoom
Mode	Simple, Advanced
No. of Measurements	Display 12 measurements at the same time (Display mode = M2)
Range	Screen, Gating
Measurement Parameters	
Vertical	Max, Min, Pk-Pk, Top, Base, Amplitude, Mean, Cycle Mean, Stdev, Cycle Stdev, RMS, Cycle RMS, Median, Cycle Median, FOV, FPRE, ROV, RPRE, L@T
Horizontal	Period, Freq, Time@max, Time@min, +Width, -Width, 10-90%Rise, 90-10%Fall, 20-80%Rise, 80-20%Fall, +BWidth, -BWidth, +Duty, -Duty, Delay, T@M, CCJ
Miscellaneous	+Area, -Area, Area, AbsArea, Cycles, Rising Edges, Falling Edges, Edges, Ppulses, Npulses
Delay	Phase, FRFR, FRFF, FFFR, FFFF, FRLR, FRLF, FFLR, FFLF, Skew
Statistics	Current, Mean, Min, Max, Sdev, Count, Histogram, Trend
Cursors	
Source	CH1~CH4, D0~D15, Math, Ref, Histogram
Type	Manual : Time X1, X2, (X1-X2), (1/ΔT) Voltage/ampere Y1, Y2, (Y1-Y2) Track: Time X1, X2, (X1-X2)

Math	
Traces	F1, F2
Operation	+, -, *, /, FFT, d/dt, ∫dt, square root, 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, optional)
Mask test speed	Up to 18,000 frames/s
Store failed frames	To history, To screenshot
DVM	
Source	CH1~CH4
Mode	DC mean, DC RMS, AC RMS, Peak-peak, Amplitude
Plot	Bar, Histogram, Trend
Bode Plot	
Source	CH1~CH4
Supported signal sources	SAG1021I, 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
Histogram	
Source	CH1~CH4
Type	Horizontal, Vertical, Both
Counter	
Source	CH1~CH4
Frequency resolution	7 digits
Totalizer	Counter on edges, support Gate and Trigger

Function/Arbitrary 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 Hi-Z)
Waveforms	Sine, Square, Ramp, Pulse, DC, Noise, 45 Arbs
Output Impedance	50 Ω±2%
Protection	Over voltage protection, Current limit
Insulation Voltage	±42 Vpk (for SAG1021I only)
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, 5 Vpp
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)
Symmetry	0% ~ 100%
DC	
Offset range	±1.5 V (into 50 Ω) ±3 V (into Hi-Z)
Accuracy	±(|setting value|*1%+3 mV)

Noise	
Bandwidth	>25 MHz (-3dB)
Arb	
Frequency	1 μHz ~ 5 MHz
Waveform memory	16 kpts
Sample rate	125 MSa/s
Wave import	From EasyWave or U-disk

Digital Channels (Optional)

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	-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)

I/O

Standard	3 USB Hosts, 1 USB Device, LAN, AUX(Pass/Fail+Trigger Out), 10 MHz In/ Out
Pass/Fail	3.3 V TTL output

Display

Display Type	10.1 TFT LCD
Resolution	1024×600
Contrast	500:1 (typical)
Backlight	500 nit
Range	8 x 10 grid
Touch screen type	Capacitive

Waveform Display

Type	Dot, vector
Persistence Time	OFF, 1 s, 5 s, 10 s, 30 s, infinite
Color Display	Normal, Color

Environmental

Temperature	Operating: 10 °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: ≤15,266 m
Electromagnetic Compatibility	2014/30/EU Execution Standard EN 61326-1:2013
Safety	2014/35/EU Execution Standard EN 61010-1:2010

Power Supply

Input Voltage & Frequency	100 ~ 240 Vrms 50/60 Hz 100 ~ 120 Vrms 400 Hz
Power consumption	100 W max., 70 W typical, 4 W typical in standby mode

Mechanical

Dimensions	Length*Width*Height = 370 mm×144 mm×231 mm
Weight	N.W 3.9 kg(2-ch); 4.0 kg(4-ch) G.W 5.4 kg(2-ch); 5.6 kg(4-ch)

Ordering Information

Mode	Description
SDS5104X	1 GHz, 4 CH, 5 GSa/s (Max.)
SDS5102X	1 GHz, 2 CH, 5 GSa/s (Max.)
SDS5054X	500 MHz, 4 CH, 5 GSa/s (Max.)
SDS5052X	500 MHz, 2 CH, 5 GSa/s (Max.)
SDS5034X	350 MHz, 4 CH, 5 GSa/s (Max.)
SDS5032X	350 MHz, 2 CH, 5 GSa/s (Max.)
Standard Accessories	
USB cable x1	
Quick start x1	
Passive probe (SP3050A) x2 (2-ch model); x4 (4-ch model)	
Certificate of calibration x1	
Power cord x1	
Optional Accessories	
SDS-5000X-4BW05	350 MHz to 500 MHz bandwidth upgrade (4-ch model) *
SDS-5000X-2BW05	350 MHz to 500 MHz bandwidth upgrade (2-ch model) *
SDS-5000X-4BW10	500 MHz to 1 GHz bandwidth upgrade (4-ch model)
SDS-5000X-2BW10	500 MHz to 1 GHz bandwidth upgrade (2-ch model)
SDS-5000X-FG	Waveform generator software
SAG1021I	25 MHz isolated USB function/arbitrary waveform generator
SDS-5000X-16LA	16 digital channels (software)
SPL2016	16-channel logic probe
SDS-5000X-I2S	I2S trigger & decode
SDS-5000X-CANFD	CAN FD trigger & decode
SDS-5000X-FlexRay	FlexRay trigger & decode
SDS-5000X-1553B	MIL-STD-1553B trigger & decode
SDS-5000X-PA	Power Analysis
STB3	STB3 demo signal source
SAP1000	1 GHz active probe
HPB4010	High voltage probe
CPL5100/CP4020/CP4050/CP4070/ CP4070A/CP5030/ CP5030A/CP5150/ CP5500	Current probe
DPB1300/DPB4080/DPB5150/ DPB5150A/DPB5700/ DPB5700A	High voltage differential probe

* SDS5034X/SDS5032X cannot be upgraded to SDS5104X/SDS5102X

SDS2000X Plus Digital Oscilloscope

Data Sheet

DS0102XP_E01A

SIGLENT TECHNOLOGIES CO.,LTD

SDS2354X Plus
SDS2204X Plus
SDS2104X Plus
SDS2102X Plus

Product Overview

SIGLENT's SDS2000X Plus series Digital Storage Oscilloscopes are available in bandwidths of 350 MHz, 200 MHz and 100 MHz, have a maximum sample rate of 2 GSa/s, maximum record length of 200 Mpts/ch, and up to 4 analog channels + 16 digital channels mixed signal analysis ability.

The SDS2000X Plus series employs SIGLENT's SPO technology with a maximum waveform capture rate of up to 120,000 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. History waveform recording, Sequence acquisition, Search and Navigate functions allow for extended waveform records to be captured, stored, and analyzed. An impressive array of measurement and math capabilities, options for a 50 MHz waveform generator, as well as serial decoding, mask test, bode plot, and power analysis are also features of the SDS2000X Plus. A 10-bit acquisition mode helps to satisfy applications which require more than 8-bit resolution.

The large 10.1" capacitive touch screen supports multi-touch gestures, while the remote web control, mouse and external keyboard support greatly improve the operating efficiency of the SDS2000X Plus.

Key Features

- 350 MHz, 200 MHz, 100 MHz models with real-time sample rate up to 2 GSa/s. A 500 MHz bandwidth upgrade option is available for 350 MHz models.
- SPO technology
  - Waveform capture rates up to 120,000 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 200 Mpts/ch, 400 Mpts in total for all 4 channels
  - Digital trigger system
- Intelligent trigger: Edge, Slope, Pulse, Window, Runt, Interval, Dropout, Pattern and Video (HDTV supported). Trigger zone helps to simplify advanced triggering
- Serial bus triggering and decoder, supports I^2C, SPI, UART, CAN, LIN (Standard) and CAN FD, FlexRay, I^2S, and MIL-STD-1553B (optional) protocols
- Low background noise, features 0.5 mV/div to 10 V/div voltage scales
- 10-bit mode provides higher resolution and lower noise
- Segmented acquisition (Sequence) mode, dividing the maximum record length into multiple segments (up to 90,000), 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 for up to 90,000 triggered waveforms (frames)
- Automatic measurement function on 50+ parameters, supports statistics with histogram and trend
- Two Math traces, support 2 Mpts FFT, +, -, x, ÷, d/dt, ∫dt, √, average, ERES, and formula editor
- Abundant data processing and analysis functions such as Search, Navigate, Mask Test, Bode plot, Power Analysis (optional) and Counter
- 16 digital channels (optional)
- Built-in 50 MHz waveform generator (optional)
- Large 10.1" TFT-LCD display with 1024x600 resolution; Capacitive touch screen supports multi-touch gestures
- Multiple interfaces: USB Host, USB Device (USBTMC), LAN (VXI-11/Telnet/Socket) , Pass/Fail, Trigger Out
- Built-in web server supports remote control by the LAN port using a web browser; Supports SCPI remote control commands

Models and Key Specifications

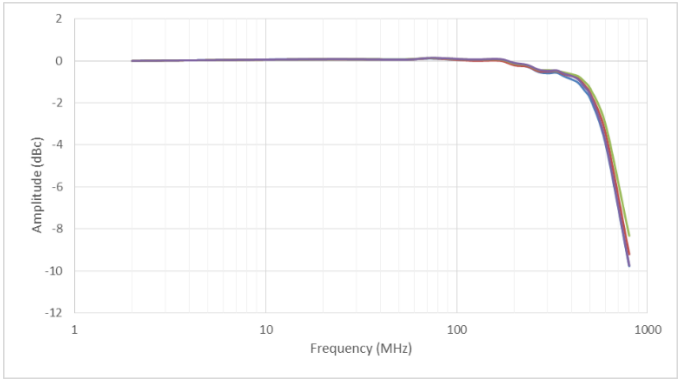
Model	SDS2354X Plus	SDS2204X Plus	SDS2104X Plus SDS2102X Plus
Analog channels	4 + EXT		2/4 + EXT
Bandwidth	350 MHz, (upgradable to 500 MHz)	200 MHz	100 MHz
Sample rate (Max.)	2 GSa/s (interleaving mode) ，1 GSa/s (non-interleaving mode)		
Memory depth (Max.)	200 Mpts/ch (interleaving mode)， 100 Mpts/ch (non-interleaving mode)		
Waveform capture rate (Max.)	Normal mode：120,000 wfm/s; Sequence mode：500,000 wfm/s		
Vertical resolution	8-bit. 10-bit mode (with typical 100 MHz bandwidth)		
Trigger type	Edge, Slope, Pulse, Window, Runt, Interval, Dropout, Pattern, Video and Serial		
Serial trigger and decode	Standard: I^2C, SPI, UART, CAN, LIN Optional: CAN FD, FlexRay, I^2S, MIL-STD-1553B		
Measurement	More than 50 parameters，supports statistics with histogram and trend		
Math	2 traces 2 Mpts FFT, +, -, x, ÷, d/dt, ∫ dt, √, average, ERES, and formula editor		
Data processing and analysis tools	Search, Navigate, History, Mask test, Bode plot, Power Analysis (optional) and Counter		
Digital channel (optional)	16-channel; maximum sample rate up to 500 MSa/s; record length up to 50 Mpts/ch		
Waveform generator (optional)	Single channel, frequency up to 50 MHz, 125 MSa/s sample rate, 16 kpts waveform memory		
Interface	USB 2.0 Host x2, USB 2.0 Device, LAN, External trigger, Auxiliary output (TRIG OUT，PASS/FAIL)		
Probe (standard)	SP2035A, 350 MHz, 1 probe supplied for each channel	PP215, 200 MHz, 1 probe supplied for each channel	
Display	10.1” TFT-LCD with capacitive touch screen (1024x600)		

Functions & Characteristics

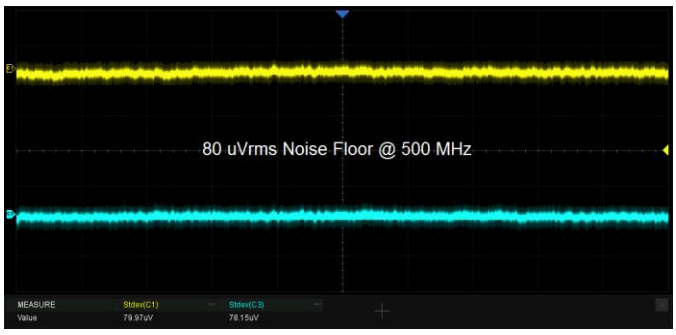
Excellent Operability

- 10.1” display with 1024x600 resolution
- Capacitive touch screen, supports multi-touch gestures, traces can be moved or scaled efficiently by a finger touch
- Built-in web server supports remote control over the LAN port using a web browser
- External mouse and keyboard support

Competitive Front End Performance

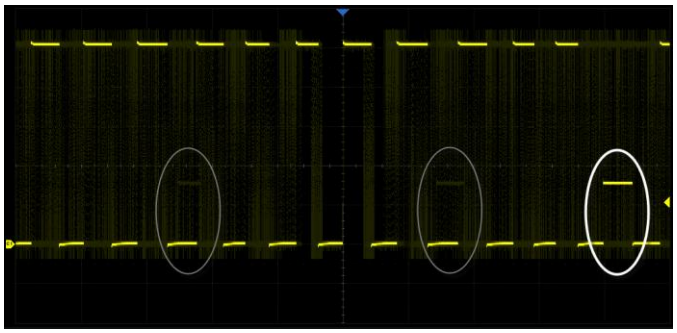


500 MHz bandwidth (at 2 GSa/s sample rate with 500 MHz bandwidth option).



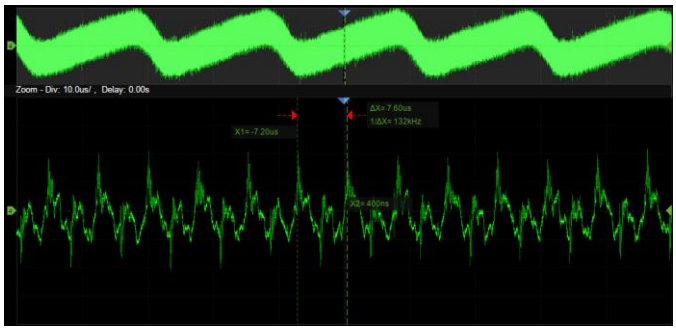
Low noise floor: Only 80 µV rms at 500 MHz bandwidth.

Up to 120,000 wfm/s waveform update rate



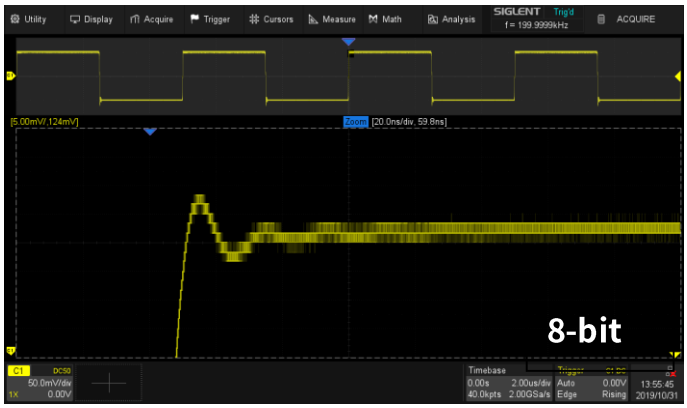
With a waveform update rate of up to 120,000 wfm/s, the oscilloscope can easily capture low-probability events. In Sequence mode the waveform capture rate can reach 500,000 wfm/s.

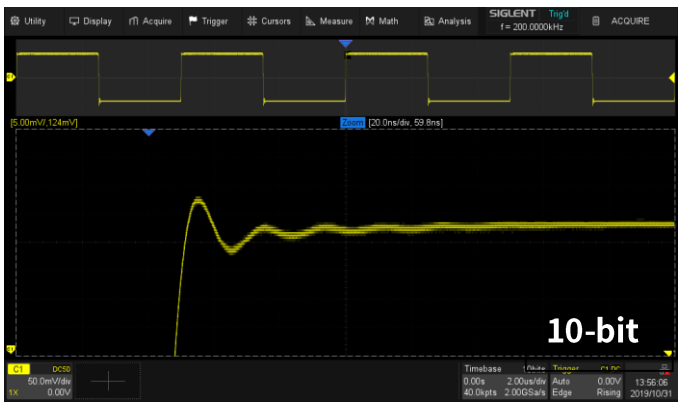
Record Length of up to 200 Mpts/ch



Utilizing a hardware-based Zoom technique and record length 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.

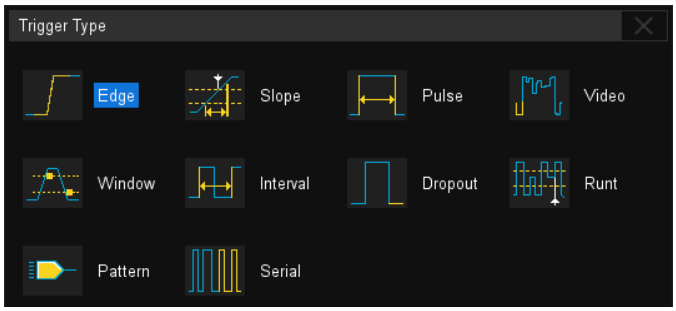
10-bit Mode





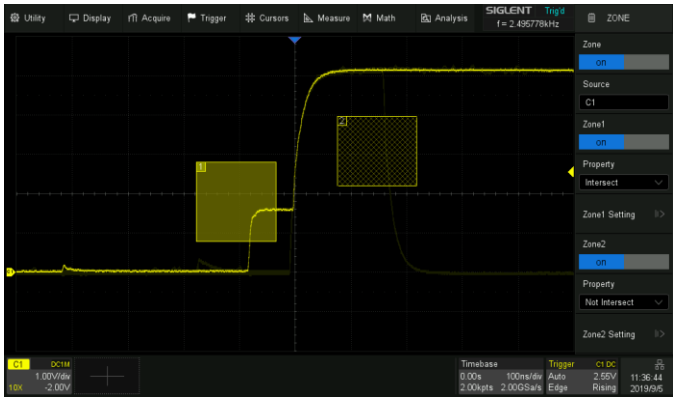
10-bit mode combined with Zoom shows you more details and less noise on the waveform.

Multiple Trigger Functions



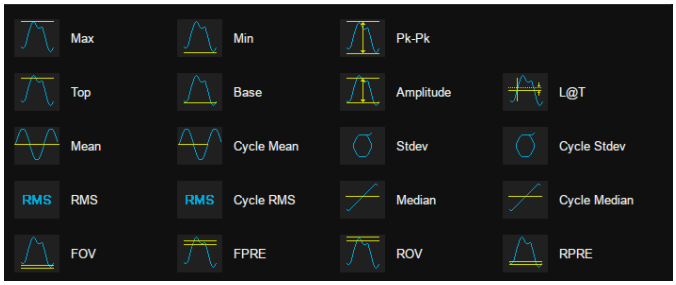
Edge, Slope, Pulse, Video, Windows, Runt, Interval, Dropout, Pattern and serial trigger.

Trigger Zone



Trigger Zone is available for advanced triggering.

Measurements for All relevant Parameters and Parameter Statistics

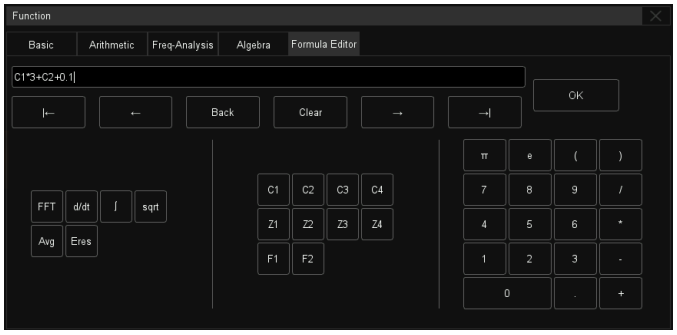


Parameter measurements includes 4 categories: Vertical, Horizontal, Miscellaneous and Channel Delay providing a total of 50+ different types of measurements. Measurements can be performed within a specified gate period. Measurements on Math, Reference and History frames are supported.

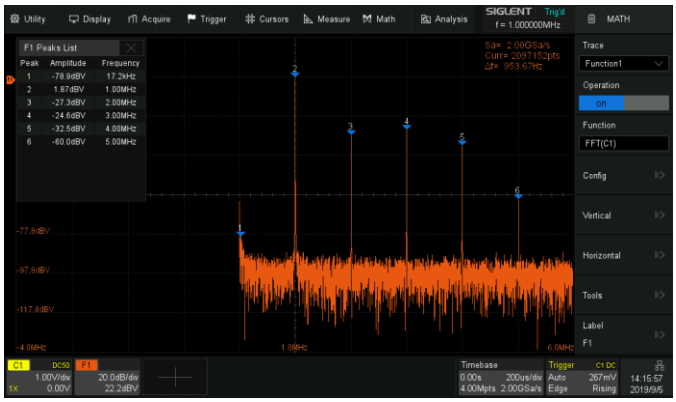
Statistics shows the current value, maximum value, minimum value, standard deviation and mean value of up to 12 parameters simultaneously. Histogram is available to show the probability distribution of a parameter. Trend is available to show the parameter value vs. time.

In addition, horizontal measurements can process up to 1000 signal edges within one single frame, thus greatly improving the test efficiency.

Advanced Math Function

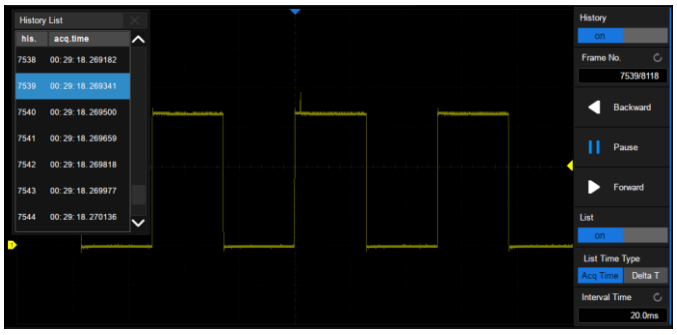


Two Math traces, support FFT, +, -, x, ÷, d/dt, ∫ dt, √, average, ERES, and formula editor.



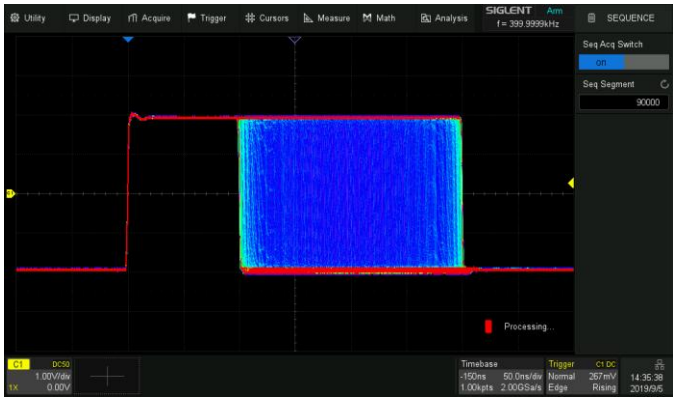
Hardware accelerated FFT up to 2 Mpts. This provides high frequency resolution with fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs. Three modes (Normal, Average and Max hold) can satisfy different requirements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

History Mode



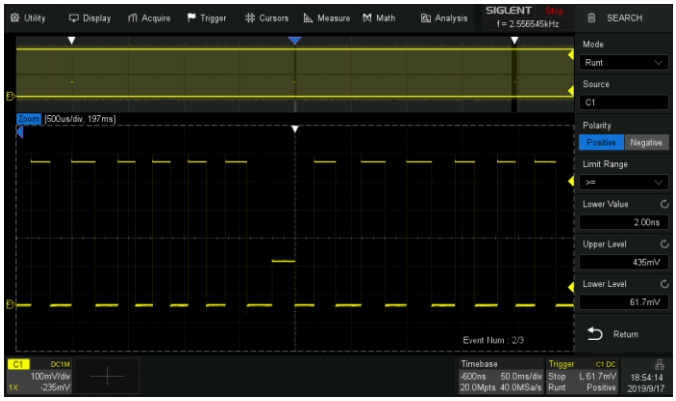
History function records up to 90,000 triggered waveforms (frames). This is done continuously in the background, so the history waveforms can be played back at any time to find and analyze past events. Serial decode, zoom and cursors measurements can be used.

Sequence Mode



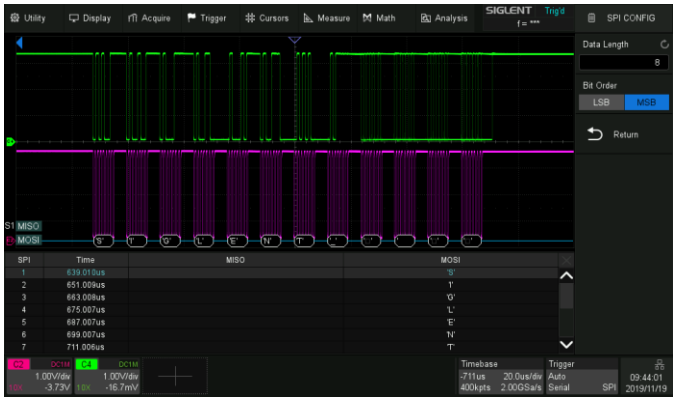
Segmented memory collection will store the waveform into multiple memory segments (up to 90,000) and each segment will store a triggered waveform together with the dead time information. The interval between segments can be as small as 2 µs. All segments can be played back at an arbitrary frame rate using the History function.

Search and Navigate



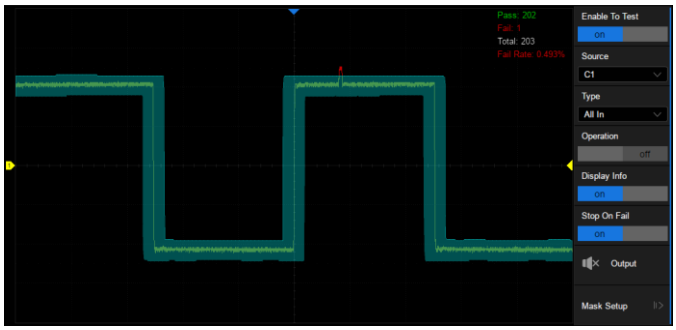
The SDS2000X Plus can find events within a record and history based on user specified trigger conditions. Navigate browses through Events flagged by the Search, plays back history frames or continuously moves the delay position on long records (useful in zoom view).

Serial Bus Decode

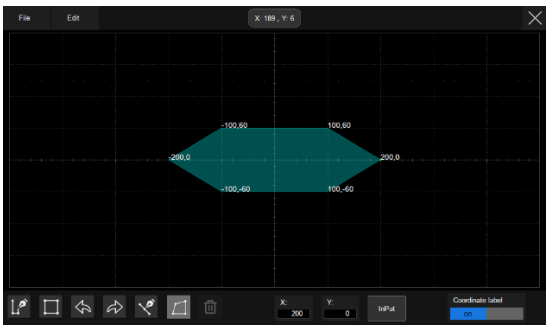


In addition to the decoder lanes correlated to the waveform, bus protocol information can be displayed in tabular form. I^2C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I^2S and MIL-STD-1553B are supported.

Hardware-based High Speed Mask Test Function



The SDS2000X Plus utilizes a hardware-based Mask Test function, performing up to 80,000 Pass / Fail decisions each second. It is easy to generate user defined test templates which the signal trace can be continuously compared to. The failed frames can be automatically stored as history frames or screen shots, 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 SDS2000X Plus can control the built-in waveform generator or any stand-alone SIGLENT SDG device to scan the amplitude and phase response over frequency of passive or active circuits. The data is presented as Bode Plot. This makes it possible to replace expensive network analyzers in less demanding applications.

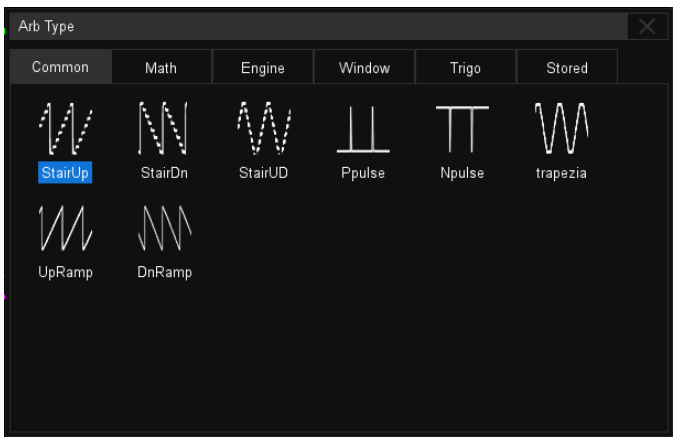
Power Analysis (Optional)

The Power Analysis option provides a full suite of power measurements and analysis, thus improving the efficiency of measurement in switching power supplies and power device designs.

Digital Channels / MSO (Optional)

Four analog channels plus 16 digital channels allow the acquisition and triggering of mixed waveforms with one instrument.

50 MHz Built-in Waveform Generator (Optional)



The built-in waveform generator can output waveforms with up to 50 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

2 x USB Host, 1 x USB Device (USBTMC)
1 x LAN (VXI-11/Telnet/Socket)
1 x Auxiliary Output (Pass/Fail and Trigger Out)

Specifications

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

- The oscilloscope calibration period has not expired
- The oscilloscope has been working continuously for at least 30 minutes at the specified temperature (18 ℃ ~ 28 ℃)

Acquisition System (analog channels)	
Sample rate	2 GSa/s (interleaving mode*1) ， 1 GSa/s (non-interleaving mode*2)
Memory depth	200 Mpts/ch (interleaving mode)*3, 100 Mpts/ch (non-interleaving mode)*3
Waveform capture rate	Normal mode: 120,000 wfm/s max. Sequence mode: 500,000 wfm/s max.
Trace intensity	256 grades
Peak detect	1 ns minimum detectable pulse
Sequence	90,000 frames max.; Interval between triggers = 2 µs min.
History	90,000 frames max.
Interpolation	Sin(x)/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 10-bit mode the maximum memory depth reduces by half

Vertical System	SDS2354X Plus	SDS2204X Plus	SDS2104X Plus SDS2102X Plus
Analog channels	4 + EXT		2/4 + EXT
Bandwidth (-3dB) @ 50 Ω	350 MHz (standard) *2 500 MHz (optional)*1,2	200 MHz *2	100 MHz
Rise time (typical) @ 50 Ω	1 ns (standard) *2 800 ps (optional)*1,2	1.7 ns *2	3.5 ns *2
Resolution	8-bit. 10-bit mode (with typical 100 MHz bandwidth)		

Vertical range	8 divisions
Vertical scale (probe 1X)	1 MΩ: 500 μV/div – 10 V/div 50 Ω: 500 μV/div – 1 V/div
DC gain accuracy	⩽ 3.0%
Offset accuracy	±(1.5%*offset+1.5%*full scale+1 mV)
Offset range (probe 1X)	500 μV/div ~ 100 mV/div: ± 2 V 102 mV/div ~ 1 V/div: ± 20 V 1.02 V/div ~ 10 V/div: ± 200 V
Bandwidth 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
Bandwidth limit	20 MHz (-0, +20%) 200 MHz (-0, +20%)
Low frequency response (AC coupling -3 dB)	5 Hz (typical)
Overshoot (150ps fast edge input @50Ω)	<12% (typical)
Coupling	DC, AC, GND
Impedance	(1 MΩ ±2%) || (17 pF ±2 pF) 50 Ω: 50 Ω ±1%
Max. Input voltage	1 MΩ ⩽400 Vpk(DC + AC), DC~10 kHz 50 Ω ⩽5 Vrms, ±10 V Peak
SFDR	⩾40 dB
CH to CH Isolation @ 50Ω	DC～100 MHz: >40 dB 100 MHz ~ BW: ⩾34 dB
Probe Attenuation	1X, 10X, 100X, Custom

* 1：In interleaving mode bandwidth is 500 MHz, rise time is 0.8 ns; in non-interleaving mode bandwidth is 350 MHz, rise time is 1 ns

* 2：In 10-bit mode bandwidth is 100 MHz (typical)，rise time is 3.3 ns (typical)

Horizontal System

Time scale	1 ns/div – 1000 s/div 0.5 ns/div – 1000 s/div when 500 MHz bandwidth option is installed
Horizontal range	10 divisions
Display mode	Y-T, X-Y, Roll (⩾50 ms/div)
Skew（CH1~CH4)	<100 ps
Time base Accuracy	±1ppm initial; ±1ppm 1st year aging; ±3.5ppm 10-year aging

Trigger System

Mode	Auto, Normal, Single
Level	Internal: ±4.1 div from the center of the screen EXT: ±0.61 V

	EXT/5: ±3.05 V			
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 20 Hz LFRJ: Attenuates the frequency components below 1.2 MHz HFRJ: Attenuates the frequency components above 600 kHz Noise RJ: Increases the trigger hysteresis EXT DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 8 Hz LFRJ: Attenuates the frequency components below 33 kHz HFRJ: Attenuates the frequency components above 967 kHz			
Accuracy (typical)	CH1～CH4: ±0.2 div EXT: ±0.3 div			
Sensitivity	CH1 ～ CH4:		Noise RJ = OFF	Noise RJ = ON
		>10 mV/div:	±0.13 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 ～ 10 MHz 300 mVpp, 10 MHz ～ 300 MHz		
	EXT/5:	1 Vpp, DC ～ 10 MHz 1.5 Vpp, 10 MHz ～ 300 MHz		
Jitter	CH1～CH4: <10 ps rms, 6 divisions pk-pk, 2 ns edge 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，1 ns resolution			
Pulse Width Trigger				
Source	CH1~CH4/D0~D15			
Polarity	+wid, -wid			
Limit range	⩽, ⩾, in range, out of range			
Time range	2 ns ～ 20 s，1 ns resolution			

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，1 ns resolution
Dropout Trigger	
Source	CH1~CH4/D0~D15
Timeout type	Edge, State
Slope	Rising, Falling
Time range	2 ns ～ 20 s，1 ns resolution
Runt Trigger	
Source	CH1~CH4
Polarity	Positive, Negative
Limit range	⩽, ⩾, in range, out of range
Time range	2 ns ～ 20 s，1 ns resolution
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，1 ns resolution
Serial Trigger	
Source	CH1~CH4/D0~D15
Protocol	Standard: I^2C、SPI、UART、CAN、LIN Optional: CAN FD、FlexRay、I^2S、MIL-STD-1553B
I^2C trigger	Type: Start, Stop, Restart, No Ack, EEPROM, Address & Data, Data Length
SPI trigger	Type: Data
UART trigger	Type: Start, Stop, Data, Parity Error
CAN trigger	Type: All, Remote, ID, ID+Data, Error
LIN trigger	Type: Break, Frame ID, ID+Data, Error
CAN FD trigger (optional)	Type: Start, Remote, ID, ID+Data, Error
FlexRay trigger (optional)	Type: TSS, Frame, Symbol, Errors

I²S trigger (optional)	Type: Data, Mute, Clip, Glitch, Rising Edge, Falling Edge
MIL-STD-1553B trigger (optional)	Type: Transfer, Word, Error, Timing

Serial Decoder	
Decoders	2
Decoder Type	Full duplex
Threshold	-4.1 ～ 4.1 div
List	1 ～ 7 lines
I²C	
Signal	SCL，SDA
Address	7bit，10bit
Decoded frames (Max.)	2,000
SPI	
Signal	CLK，MISO，MOSI，CS
Edge Select	Rising, Falling
Chip select	Active high, active low, clock timeout
Bit Order	LSB, MSB
Decoded frames (Max.)	15,000
UART	
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
Decoded frames (Max.)	15,000
CAN	
Source	CH1~CH4/D0~D15
Decoded frames (Max.)	2,000
LIN	
LIN Specification Package Revision	Ver1.3，Ver2.0
Baud Rate	600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, custom
Decoded frames (Max.)	3,000
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
Decoded frames (Max.)	1,000
FlexRay (optional)	

Source	CH1~CH4
Data Baud Rate	2.5 Mbps, 5 Mbps, 10 Mbps, custom
Decoded frames (Max.)	1,000
I²S (optional)	
Signal	BCLK, WS, DATA
Audio Variant	Audio-I2S, Audio-LJ, Audio-RJ
Start Bits	0~31
Baud Rate	1~32
Decoded frames (Max.)	10,000
MIL-STD-1553B (optional)	
Source	CH1~CH4
Decoded frames (Max.)	10,000

Measurement	
Auto measurement	
Source	CH1~CH4, D0~D15, F1~F2, Ref, History, Z1~Z4
Mode	Simple, Advanced
Range	Screen, Gate
Vertical	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	Period, Freq, Time@max, Time@min, +Width, -Width, 10-90%Rise, 90-10%Fall, 20-80%Rise, 80-20%Fall, +BWidth, -BWidth, +Duty, -Duty, Delay, T@M, CCJ
Miscellaneous	+Area, -Area, Area, AbsArea, Cycles, Rising Edges, Falling Edges, Edges, Ppulses, Npulses
Delay	Phase, FRFR, FRFF, FFFR, FFFF, FRLR, FRLF, FFLR, FFLF, Skew
Statistics	Current, Mean, Min, Max, Sdev, Count, Histogram, Trend
Cursors	
Source	CH1~CH4, D0~D15, Math, Ref
Type	Manual: Time X1, X2, (X1-X2), (1/ΔT) Voltage/Current: Y1, Y2, (Y1-Y2) Track: Time X1, X2, (X1-X2)

Math	
Traces	F1, F2
Source	CH1~CH4, Z1~Z4, F1~F2
Operation	+, -, *, ÷, FFT, d/dt, ∫ dt, √, 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), Custom (Mask Editor, optional)
Mask test speed	Up to 80,000 frames/s
Store failed frames	To history, To screenshot
Bode Plot	
Source	CH1~CH4
Supported signal sources	Built-in waveform generator 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
Counter	
Source	CH1~CH4
Frequency resolution	7 digits
Totalizer	Counter on edges, support Gate and Trigger

500 MHz Bandwidth Extension (optional)	
Channels	2 (CH1&CH3, CH1&CH4, CH2&CH3 or CH2&CH4)
Bandwidth (-3dB) @50 Ω	500 MHz
Rise time (typical) @50 Ω	800 ps
Sample Rate	2 GSa/s
Resolution	8-bit. 10-bit mode (with typical 100 MHz bandwidth)
Memory Depth	200 Mpts/ch

Digital Channels (optional)	
Channels	16, divided to 2 groups: D0~D7, D8~D15
Max. Sampling Rate	500 MSa/s

Memory Depth	50 Mpts/ch
Min. Detectable Pulse	3.3 ns
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	50 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 50Ω) -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 ～ 50 MHz
Offset accuracy (10 kHz)	±(1%*offset setting value +3 mVpp)
Amplitude flatness	Compare to 10 kHz, 5 Vpp: ±0.3 dB，≤25 MHz ±0.5 dB，>25 MHz
SFDR	DC~1 MHz: -60 dBc 1 MHz~5 MHz: -55 dBc 5 MHz~25 MHz: -50 dBc 25 MHz~50 MHz: -40 dBc
Harmonic distortion	DC~5 MHz: -50dBc 5 MHz~25MHz: -45dBc 25 MHz~50 MHz: -40 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 panel	USB 2.0 Host x2 Probe compensation: 1 kHz, 3 V_{PP} square wave
Rear panel	USB 2.0 Device LAN: 100M EXT 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	500:1 typical
Backlight	500 nit typical

Display Setting	
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
Language	Simplified Chinese, Traditional Chinese, English, French, Japanese, German, Spanish, Russian, Italian, Portuguese
Built-in help	Simplified Chinese, English

Environmental	
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: ⩽15,266 m
Electromagnetic Compatibility	2014/30/EU, Execution Standard EN 61326-1:2013
Safety	2014/35/EU, Execution Standard EN 61010-1:2010

Power Supply	
Input Voltage & Frequency	100 ～ 240 Vrms 50/60Hz 100 ～ 120 Vrms 400Hz
Power consumption	80 W max., 50 W typical, 4 W typical in standby mode

Mechanical	
Dimensions	Length x Height x Width = 352 mm×224 mm×111 mm
Weight	Net Weight: 3.3 kg (2-ch); 3.9 kg (4-ch) Gross Weight: 4.8 kg (2-ch); 5.4 kg (4-ch)

Ordering Information

Model	Description
SDS2354X Plus	350 MHz，4-ch，2 GSa/s (Max.)，200 Mpts，10.1”touch screen
SDS2204X Plus	200 MHz，4-ch，2 GSa/s (Max.)，200 Mpts，10.1”touch screen
SDS2104X Plus	100 MHz，4-ch，2 GSa/s (Max.)，200 Mpts，10.1”touch screen
SDS2102X Plus	100 MHz，2-ch，2 GSa/s (Max.)，200 Mpts，10.1”touch screen

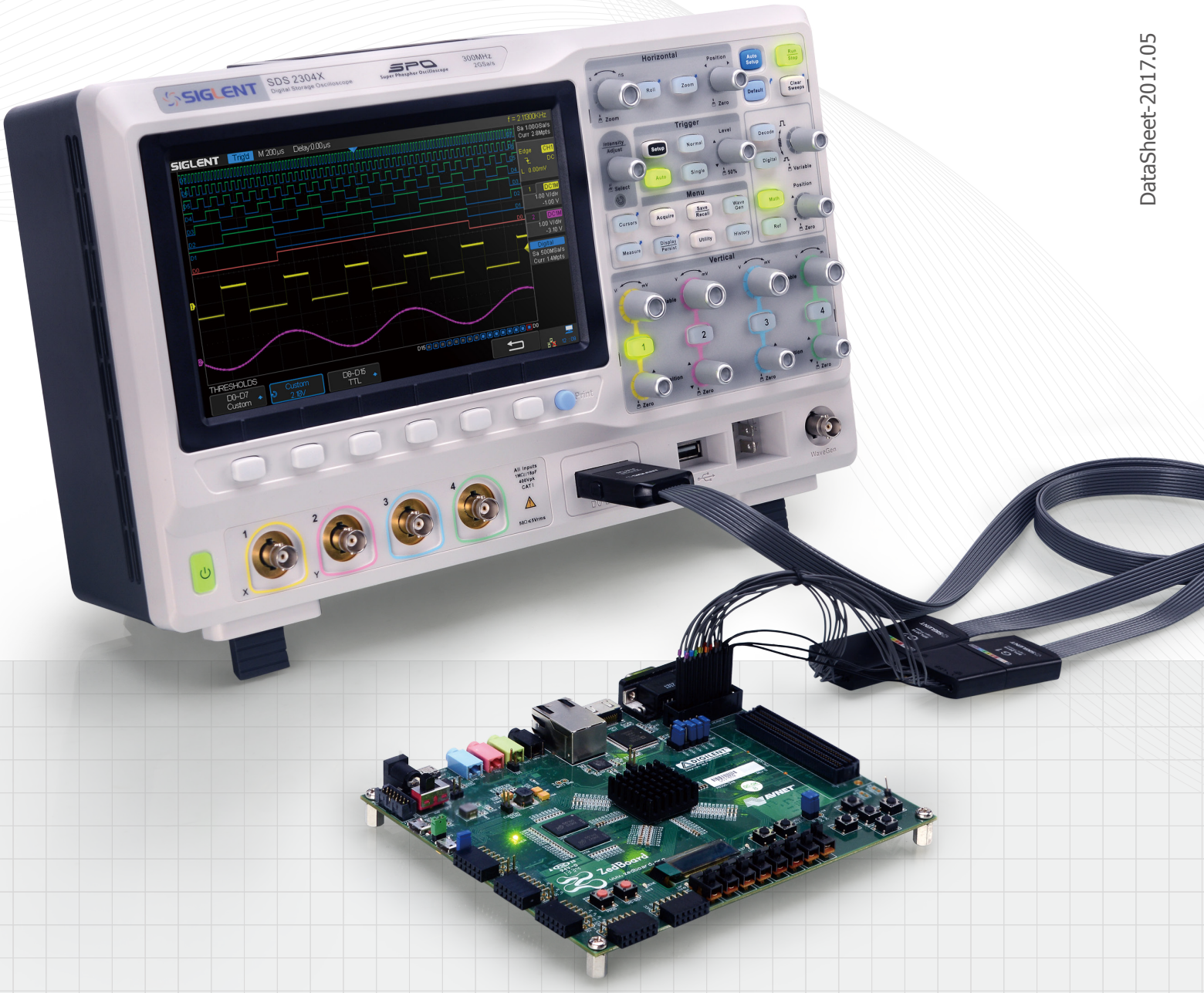
Standard Accessories	Quantity
USB cable	1
Quick start	1
Passive probe	x2 (2-ch model); x4 (4-ch model)
Certificate of calibration	1
Power cord	1

Optional Accessories	Part Number
Waveform generator option (software)	SDS2000XP-FG
16 digital channels (software)	SDS2000XP-16LA
16-channel logic probe	SPL2016
Power Analysis (software)	SDS2000XP-PA
Power Analysis deskew fixture	DF2001A
I^2S trigger & decode (software)	SDS2000XP-I2S
MIL-STD-1553B trigger & decode (software)	SDS2000XP-1553B
FlexRay trigger & decode (software)	SDS2000XP-FlexRay
CAN FD trigger & decode (software)	SDS2000XP-CANFD
100 MHz to 200 MHz bandwidth upgrade (4-ch model) (software)	SDS2000XP-4BW02
200 MHz to 350 MHz bandwidth upgrade (4-ch model) (software)	SDS2000XP-4BW03
350 MHz to 500 MHz bandwidth upgrade (4-ch model) (software)	SDS2000XP-4BW05
100 MHz to 350 MHz bandwidth upgrade (2-ch model) (software)	SDS2000XP-2BW03
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/CP5030/CP5030A/CP5150/CP5500
Bag	BAG-S2

SDS2000X Series

Super Phosphor Oscilloscope

SIGLENT®



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SIGLENT TECHNOLOGIES CO.,LTD

SDS2304X / SDS2302X
SDS2204X / SDS2202X
SDS2104X / SDS2102X
SDS2074X / SDS2072X

Product Overview

SIGLENT's SDS2000X series Super Phosphor Oscilloscopes are available in bandwidths of 70MHz, 100MHz, 200MHz and 300MHz, maximum sample rate of 2GSa/s, and maximum record length of 140Mpts. The most commonly used functions can be accessed with its user-friendly one-button design.

The SDS2000X series employs a new generation of SPO technology. It has an innovative digital trigger system with high sensitivity and low jitter, and a maximum waveform capture rate of 140,000 wfm/s (normal mode), up to 500,000 wfm/s (sequence mode). It also employs not only the common 256-level intensity grading display function but also a color temperature display mode. The trigger system supports multiple powerful triggering modes including serial bus triggering. History waveform recording and sequence acquisition allow for extended waveform records to be captured, stored, and analyzed. An impressive array of measurement and math capabilities, options for a built-in 25 MHz arbitrary waveform generator, 16 digital channels (MSO), as well as serial decoding are also features of the SDS2000X.

Key Features

- 70MHz, 100MHz, 200MHz, 300MHz models
- Real-time sampling rate up to 2GSa/s
- New generation of SPO technology
  - Waveform capture rate up to 140,000 wfm/s (normal mode), and 500,000 wfm/s (sequence mode)
  - Supports 256-level intensity grading and color temperature display
  - Record length up to 140Mpts
  - Digital trigger system
- Intelligent trigger: Edge, Slope, Pulse, Window, Runt, Interval, Dropout, Pattern and Video (HDTV supported)
- Serial bus triggering and decoder, supports protocols IIC, SPI, UART, RS232, CAN and LIN
- Low background noise, supports 1mV/div to 10V/div voltage scales
- 10 types of one-button shortcuts, including Auto Setup, Default, Cursors, Measure, Roll, History, Display/Persist, Clear Sweeps, Zoom and Print
- 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 segment to capture the qualifying event
- History waveform record (History) function, the maximum recorded waveform length is 80,000 frames
- Automatic measurement function on 37 parameters, supports statistics, Gating measurement, Math measurement, History measurement and Ref measurement
- Math function (FFT, addition, subtraction, multiplication, division, integration, differential, square root)
- High Speed hardware based Pass/ Fail function
- 16 Digital channels (MSO), Maximum waveform capture rate up to 500 MSa/s, Record length up to 140 Mpt/CH
- 25MHz function/arbitrary waveform generator, built-in 10 types of waveforms
- Large 8 inch TFT-LCD display with 800 * 480 resolution
- Abundant interfaces: USB Host, USB Device (USBTMC), LAN (VXI-11), Pass/Fail, Trigger Out
- Supports SCPI remote control commands
- Supports Multi-language display and embedded online help

Models and Key Specifications

Model	SDS2072X SDS2074X	SDS2102X SDS2104X	SDS2202X SDS2204X	SDS2302X SDS2304X
Bandwidth	70 MHz	100 MHz	200 MHz	300 MHz
Sampling Rate (Max.)	2 GSa/s			
Channels	2 + EXT 4 + EXT			
Memory Depth (Max.)	140 Mpts (Single-Channel), 70 Mpts (Dual-Channel)			
Waveform Capture Rate (Max.)	140,000 wfm/s (normal mode), 500,000 wfm/s (sequence mode)			
Trigger Type	Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video			
Serial Trigger	IIC, SPI, UART/RS232, CAN, LIN			
Decoder Type (Optional)	IIC, SPI, UART/RS232, CAN, LIN			
16 Digital Channels (MSO Option)	Maximum waveform capture rate up to 500 MSa/s, Record length up to 140 Mpts/CH			
Waveform Generator (Optional)	Single channel, Max. frequency up to 25MHz, 125MSa/s sampling rate, 16Kpts wave length			
I/O	USB Host, USB Device, LAN, Pass/Fail, Trigger Out			
Probe (Std)	PB470 70MHz 1 pcs for each channel	PP510 100MHz 1 pcs for each channel	SP2030A 300MHz 1 pcs for each channel	SP2030A 300MHz 1 pcs for each channel
Display	8 inch TFT LCD (800x480)			

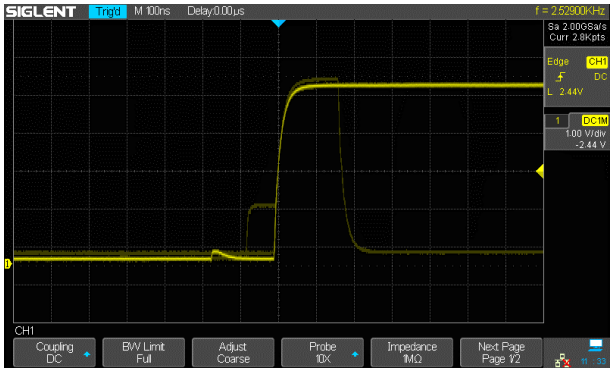
Functions & Characteristics

8 inch TFT-LCD Display and 10 One-button Menus

- 8-inch TFT-LCD display with 800 * 480 resolution
- Most commonly used functions are accessible using 10 different one-button operation keys: Auto Setup, Default, Cursors, Measure, Roll, History, Display/Persist, Clear Sweeps, Zoom and Print
- Supports auto detection of 10X probe with read-out port

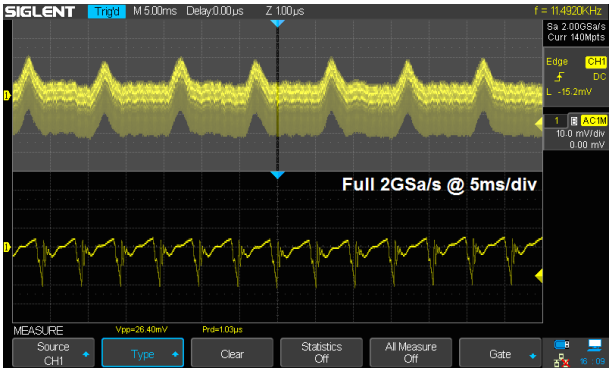
Functions & Characteristics

Waveform Capture Rate up to 500,000wfm/s



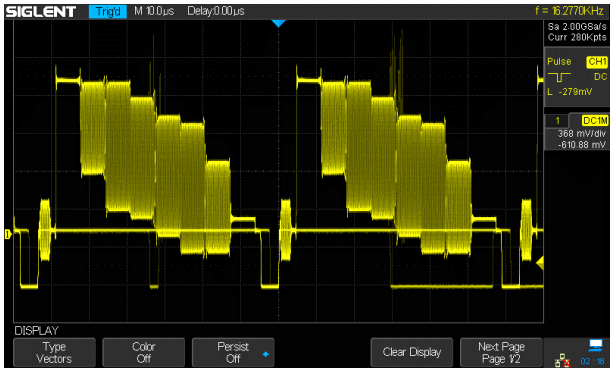
With a waveform capture rate of up to 500,000 wfm/s (sequence mode), the oscilloscope can easily capture the unusual or low-probability events

Record Length of up to 140Mpts

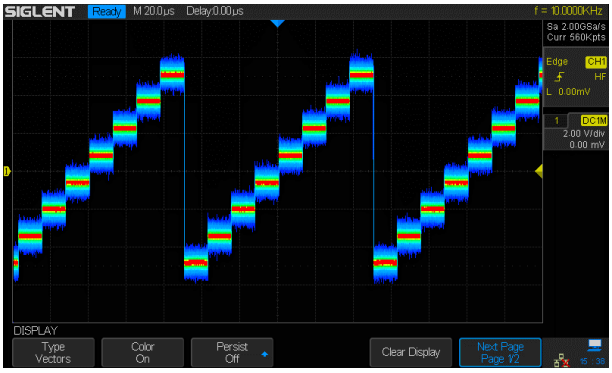


Using hardware-based Zoom technique and record length of up to 140Mpts, users are able to use a higher sampling rate to capture more of the signal, and then quickly zoom in to focus on the area of interest

256-level Intensity Grading and Color Temperature Display

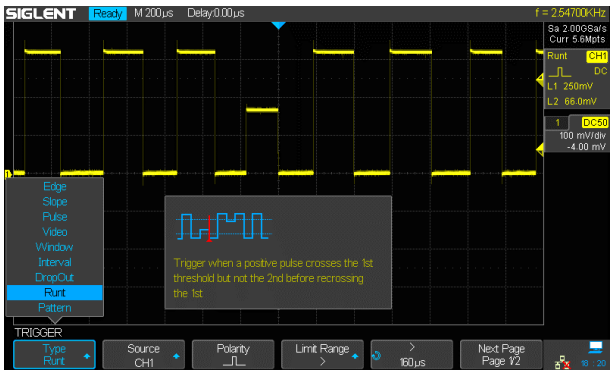


256-level intensity grading display on waveform



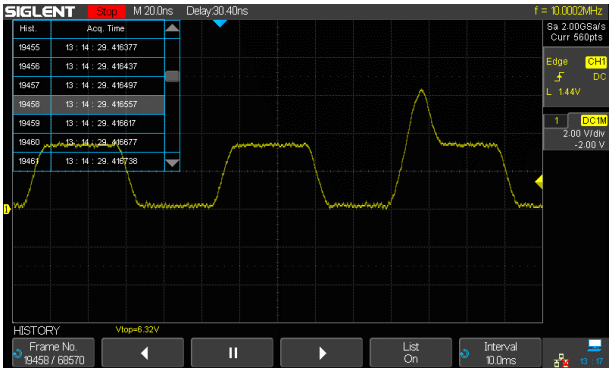
Color temperature display

Abundant Trigger Functions



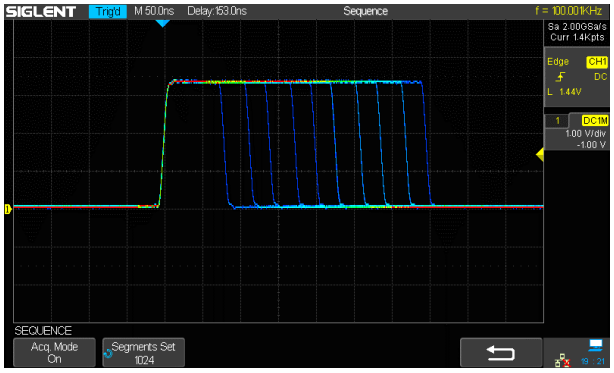
Edge, Slope, Pulse, Video, Windows, Runt, Interval, Dropout, Pattern, IIC, SPI, UART/RS232, LIN and CAN

History Mode



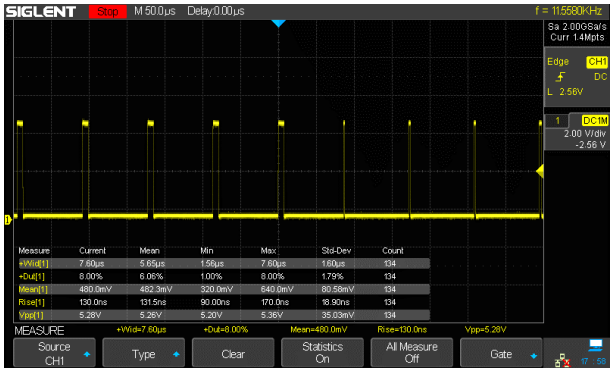
History function can record up to 80,000 frames of waveforms. The recording is executed automatically, so that the customer can play back the history waveforms at any time to observe unusual events, and locate the source quickly through the cursors or measurements. Located on the keyboard Panel, this function is easily accessible

Sequence Mode



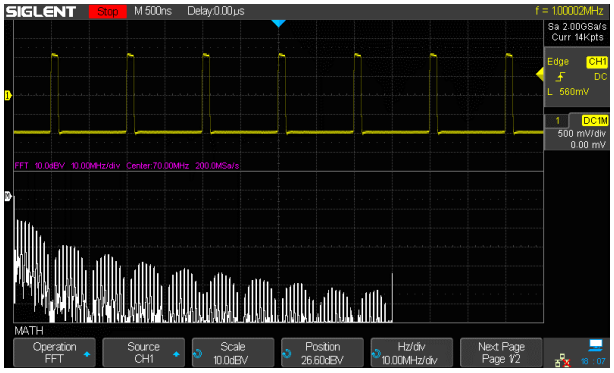
Segmented memory collection will store the waveform into multiple (up to 80,000) memory segments and each segment will store a triggered waveform, as well the dead time information. The dead time between segments could be as small as 2μs. All the segments can be play back using History function.

Comprehensive Statistical Functions



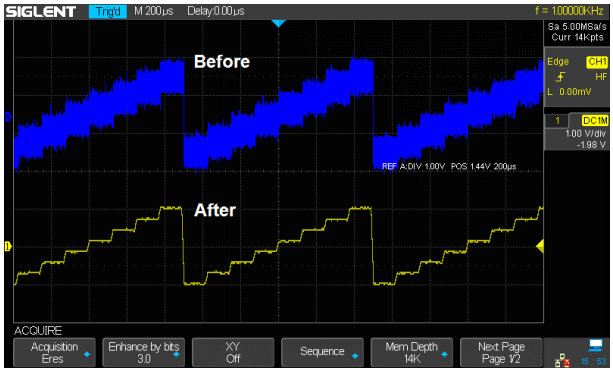
Parametric statistical functions to display 5 parameters of any measurements: current, mean, minimum value, maximum value, and standard deviation. The measurement count is also displayed. The maximum number of measurements that can be run and simultaneously analyzed statistically is five. Supports Gating measurements, Math measurement, History measurement and Ref measurement

Advanced Math Function



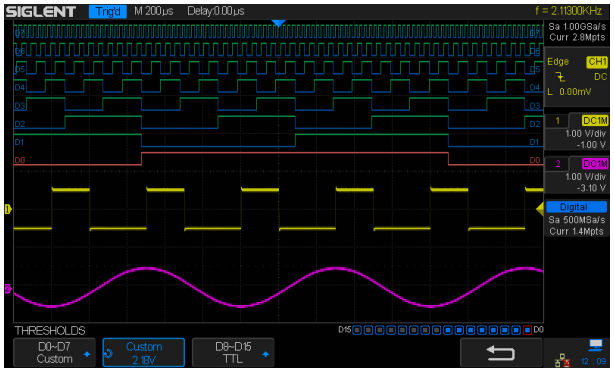
In addition to the traditional (+, -, X, /) operations, FFT, integration, differential, and square root operations are supported. The integration operation supports gating, which uses cursors to define the domain of integration

Eres Mode



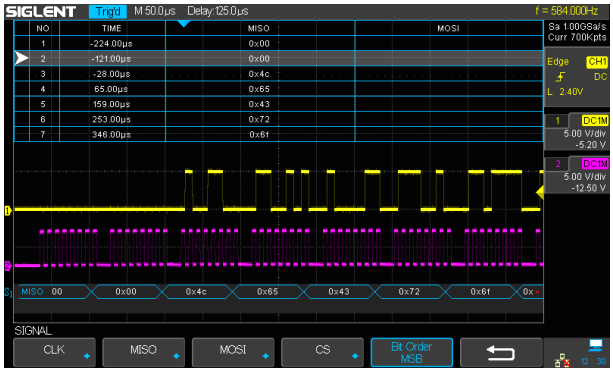
Eres mode can improve the SNR effectively, without the dependence on the periodicity of signal and stable triggering

16 Digital Channels / MSO (Optional)



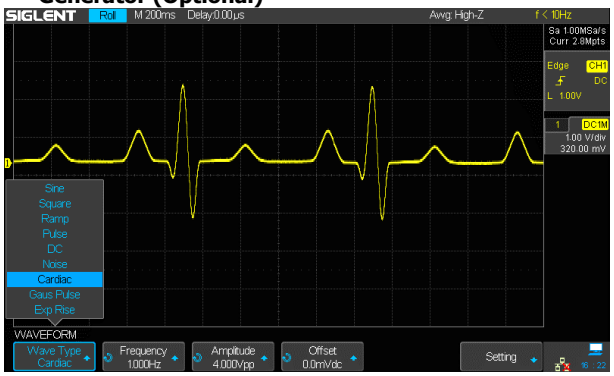
4 analog channels plus 16 digital channels enables users to acquire and trigger on the waveforms then analyze the pattern, simultaneously with one instrument.

Serial Bus Decoding Function (Optional)



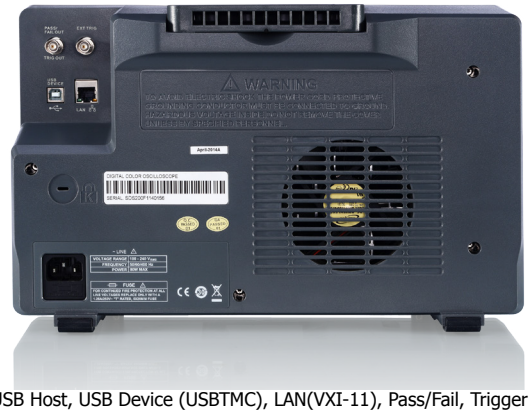
Displays the decoding through the events list. Bus protocol information can be quickly and intuitively displayed in table form

Built-in 25MHz Function/Arbitrary Waveform Generator (Optional)



10 built-in waveforms plus 4 ARBs. The arbitrary waveforms can be accessed and edited by the EasyWave PC software

Complete Connectivity



USB Host, USB Device (USBTMC), LAN(VXI-11), Pass/Fail, Trigger Out

Specifications

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

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

Acquire System	
Sampling Rate	2GSa/s (single-channel[1]), 1GSa/s (dual-channel)
Memory Depth	140Mpts (single-channel), 70Mpts (dual-channel)
Peak Detect	1ns
Average	Averages: 4, 16, 32, 64, 128, 256, 512, 1024
Eres	Enhance bits: 0.5, 1, 1.5, 2., 2.5, 3 selectable
Interpolation	Sinx/x, Linear

Input	
Channel	2/4 + EXT
Coupling	DC, AC, GND
Impedance	DC: (1MΩ±2%) || (22pF ±3pF) 50Ω: 50Ω±2%
Max. Input voltage	1MΩ ≤400Vpk (DC + Peak AC <=10kHz) 50Ω ≤5Vrms
CH to CH Isolation	DC~Max BW >35dB
Probe Attenuation	0.1X, 0.2X, 0.5X, 1X, 2X, 5X, 10X, 20X, 50X, 100X, 200X, 500X, 1000X, 2000X, 5000X, 10000X

Horizontal System	
Time Scale	1.0ns/div ~ 50s/div
Channel Skew	<100ps
Waveform Capture Rate	Up to 140,000 wfm/s (normal mode), 500,000 wfm/s (sequence mode)
Intensity grading	256-level
Display Format	Y-T, X-Y, Roll
Time base Accuracy	±25ppm
Roll Mode	50ms/div ~ 50s/div (1-2-5 Step)

Vertical System	
Bandwidth (-3dB)	300MHz (SDS2304X/ SDS2302X) 200MHz (SDS2204X/ SDS2202X) 100MHz (SDS2104X/ SDS2102X) 70 MHz (SDS2074X/ SDS2072X)
Vertical Resolution	8 bit
Vertical Range	8 divisions
Vertical Scale (Probe 1X)	1mV/div - 10V/div (1-2-5 step)
Offset Range (Probe 1X)	1mV/div ~ 100mV/div: ±1V 102mV/div ~ 1V/div: ±10V 1.02V/div ~ 10V/div: ±100V
Bandwidth Limit	20MHz ±40%
Bandwidth Flatness	DC ~ 10%(BW): ±1dB 10% ~ 50%(BW): ±2dB 50% ~ 100%(BW): +2dB/-3dB
Low Frequency Response (AC Coupling -3dB)	≤10Hz (at input BNC)
Noise	stdev ≤ 0.2 div (< 2mV/div) stdev ≤ 0.5 div (≥ 2mV/div)
DC Gain Accuracy	5mV/div ~10V/div: ≤3.0% ≤2mV/div: ≤4.0%
Offset Accuracy	≥2mV/div: ±(1%*offset+1.5%*8*div+2mV) <2mV/div: ±(1%* offset +1.5%*8*div+1mV)
Rise Time [1]	(Typ.) <1.2ns (SDS2304X/ SDS2302X) (Typ.) <1.7ns (SDS2204X/ SDS2202X) (Typ.) <3.5ns (SDS2104X/ SDS2102X) (Typ.) <5.0ns (SDS2074X/ SDS2072X)
Overshoot (500ps Rise Edge)	<10%

Trigger System	
Mode	Auto, Normal, Single
Level	Internal: ±4.5div from the center of the screen EXT: ±0.6V EXT/5: ±3V
Holdoff Range	100ns ~ 1.5s
Coupling	AC, DC, LFRJ, HFRJ, Noise RJ (CH1~CH4)
Coupling Frequency Response (CH1~CH4)[2]	DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 8Hz LFRJ: Attenuates the frequency components below 900kHz HFRJ: Attenuates the frequency components above 500kHz
Coupling Frequency Response (EXT) [2]	DC: Passes all components of the signal AC: Blocks DC components and attenuates signals below 8Hz LFRJ: Attenuates the frequency components below 400kHz HFRJ: Attenuates the frequency components above 1MHz
Accuracy[2]	CH1 ~ CH4: ±0.2div EXT: ±0.3div
Sensitivity	CH1~ CH4: 0.6div EXT: 200mVpp (DC~ 10MHz) 300mVpp (10MHz~ BW) EXT/5: 1Vpp (DC~ 10MHz) 1.5Vpp (10MHz~ BW)
Jitter	<100ps (CH1~ CH4)
Displacement	Pre-Trigger: 0 ~ 100% memory Delay-Trigger: 0 ~ 2,000 div
Edge Trigger	
Slope	Rising, Falling, Rising&Falling
Source	CH1~CH4/EXT/(EXT/5)/AC Line
Slope Trigger	
Slope	Rising, Falling
Limit Range	<, >, < >, > <
Source	CH1 ~ CH4
Time Range	2ns ~ 4.2s
Resolution	1ns

Pulse Width Trigger	
Polarity	+wid , -wid
Limit Range	<, >, < >, > <
Source	CH1~CH4
Pulse Width Range	2ns ~ 4.2s
Resolution	1ns
Video Trigger	
Signal Standard	NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom
Source	CH1~CH4
Sync	Any, Select
Trigger Condition	Line, Field
Window Trigger	
Window Type	Absolute, Relative
Source	CH1~CH4
Interval Trigger	
Slope	Rising, Falling
Limit Range	<, >, < >, > <
Source	CH1~CH4
Time Range	2ns ~ 4.2s
Resolution	1ns
Dropout Trigger	
Timeout Type	Edge, State
Source	CH1~CH4
Slope	Rising, Falling
Time Range	2ns ~ 4.2s
Resolution	1ns
Runt Trigger	
Polarity	+wid , -wid
Limit Range	<, >, < >, > <
Source	CH1~CH4
Time Range	2ns ~ 4.2s
Resolution	1ns
Pattern Trigger	
Pattern Setting	Invalid, Low, High
Logic	AND, OR, NAND, NOR
Source	CH1~CH4
Limit Range	<, >, < >, > <
Time Range	2ns ~ 4.2s
Resolution	1ns
Serial Trigger	
IIC Trigger	
Condition	Start, Stop, Restart, No Ack, EEPROM, Address&Data, Data Length
Source (SDA/SCL)	CH1~CH4
Data format	Hex
Limit Range	EEPROM: =, >, <
Data Length	EEPROM: 1byte Address&Data: 1~2byte Data Length: 1~12byte
R/W bit	Address&Data: Read, Write, Do not care
SPI Trigger	
Condition	Data
Source (CS/CLK/Data)	CH1~CH4
Data format	Binary
Data Length	4 ~ 96 bit
Bit Value	0, 1, X
Bit Order	LSB, MSB

UART/RS232 Trigger	
Condition	Start, Stop, Data, Parity Error
Source (RX/TX)	CH1~CH4
Data format	Hex
Limit Range	=, >, <
Data Length	1 byte
Data Width	5 bit, 6 bit, 7 bit, 8 bit
Parity Check	None, Odd, Even
Stop Bit	1 bit, 1.5 bit, 2 bit
Idle Level	High, Low
Baud Rate (Selectable)	600/1200/2400/4800/9600/19200/38400/57600/115200 bit/s
Baud Rate (Custom)	300bit/s~334000bit/s
CAN Trigger	
Type	All, Remote, ID, ID+Data, Error
Source	CH1~CH4
ID	STD (11bit), EXT(29bit)
Data format	Hex
Data Length	1~2byte
Baud Rate (Selectable)	5k/10k/20k/50k/100k/125k/250k/500k/800k/1M bit/s
Baud Rate (Custom)	5kbit/s~1Mbit/s
LIN Trigger	
Type	Break, Frame ID, ID+Data, Error
Source	CH1~CH4
ID	1byte
Data format	Hex
Data Length	1~2byte
Baud Rate (Selectable)	600/1200/2400/4800/9600/19200 bit/s
Baud Rate (Custom)	300bit/s~20kbit/s

Serial Decoder (Optional)	
No. of Decoder	2
IIC Decoder	
Signal	SCL, SDA
Address	7bit, 10bit
Threshold	-4.5~4.5div
List	1~7 Lines
SPI Decoder	
Signal	CLK, MISO, MOSI, CS
Edge Select	Rising, Falling
Idle Level	Low, High
Bit Order	MSB, LSB
Threshold	-4.5~4.5 div
List	1 ~ 7 lines
UART/ RS232 Decoder	
Signal	RX, TX
Data Width	5 bit, 6 bit, 7 bit, 8 bit
Parity Check	None, Odd, Even
Stop Bit	1 bit, 1.5 bit, 2 bit
Idle Level	Low, High
Threshold	-4.5~4.5 div
List	1 ~ 7 lines

CAN Decoder	
Signal	CAN_H, CAN_L
Source	CAN_H, CAN_L, CAN_H-CAN_L
Threshold	-4.5~4.5 div
List	1 ~ 7 lines
LIN Decoder	
LIN Specification Package Revision	Ver1.3, Ver2.0
Threshold	-4.5 ~ 4.5 div
List	1 ~ 7 lines

Measurement

Source	CH1~CH4, Math, Ref, History	
No. of Measurements	Display 5 measurements at the same time	
Range	Screen, Gating	
Measurement Parameters (37 Types)		
Vertical (Voltage)	Vmax	Highest value in input waveform
	Vmin	Lowest value in input waveform
	Vpp	Difference between maximum and minimum data values
	Vamp	Difference between top and base in a bimodal signal, or between max and min in an unimodal signal
	Vtop	Value of most probable higher state in a bimodal waveform
	Vbase	Value of most probable lower state in a bimodal waveform
	Mean	Average of all data values
	Vmean	Average of data values in the first cycle
	stdev	Standard deviation of all data values
	Vstd	Standard deviation of all data values in the first cycle
	Vrms	Root mean square of all data values
	Crms	Root mean square of all data values in the first cycle
	FOV	Overshoot after a falling edge; (base-min)/Amplitude
	FPRE	Overshoot before a falling edge; (max-top)/Amplitude
	ROV	Overshoot after a rising edge; (max-top)/Amplitude
	RPRE	Overshoot before a rising edge; (base-min)/Amplitude
	Level@X	The voltage value of the trigger point
Horizontal (Time)	Period	Period for every cycle in waveform at the 50% level, and positive slope
	Freq	Frequency for every cycle in waveform at the 50% level, and positive slope
	+Wid	Width measured at 50% level and positive slope
	-Wid	Width measured at 50% level and negative slope
	Rise Time	Duration of rising edge from 10-90%
	Fall Time	Duration of falling edge from 90-10%
	Bwid	Time from the first rising edge to the last falling edge, or the first falling edge to the last rising edge at the 50% crossing
	+Dut	Ratio of positive width to period
	-Dut	Ratio of negative width to period
	Delay	Time from the trigger to the first transition at the 50% crossing
	Time@Level	Time from trigger of each transition at a specific level and slope

Measurement

Delay	Phase	Calculate the phase difference between two edges
	FRR	Time between the first rising edges of the two channels
	FRF	Time from the first rising edge of channel A, to the first falling edge of channel B
	FFR	Time from the first falling edge of channel A, to the first rising edge of channel B
	FFF	Time from the first falling edge of channel A, to the first falling edge of channel B
	LRR	Time from the first rising edge of channel A, to the last rising edge of channel B
	LRF	Time from the first rising edge of channel A, to the last falling edge of channel B
	LFR	Time from the first falling edge of channel A, to the last rising edge of channel B
	LFF	Time from the first falling edge of channel A, to the last falling edge of channel B
Cursors	Manual : Time X1, X2, (X1-X2), (1/ΔT) Voltage Y1, Y2, (Y1-Y2) Track: Time X1, X2, (X1-X2)	
Statistics	Current, Mean, Min, Max, Std-Dev, Count	
Counter	±1Hz counter error	

Math

Operation	+, -, *, /, FFT, d/dt, ∫dt, square root
FFT Window	Rectangular, Blackman, Hanning, Hamming
FFT Display	Full Screen, Split

Built-in Function/Arbitrary Waveform Generator (Optional)

Channel	1
Max. Output Frequency	25MHz
Sampling Rate	125 MSa/s
Frequency Resolution	1 μHz
Frequency Accuracy	±50 ppm
Vertical Resolution	14 bits
Amplitude Range	2mVpp ~ 3Vpp (into 50Ω) 4mVpp ~ 6Vpp (into HiZ)
Waveforms	Sine, Square, Ramp, Pulse, DC, Noise, Cardiac, Gaus Pulse, Exp Rise, Exp Fall, Arb
Output Impedance	50Ω±2%
Protection	Short-Circuit Protection
Sine	
Frequency	1μHz ~ 25MHz
Offset Accuracy (100 kHz)	±(0.3dB* offset setting value +1mVpp)
Amplitude Flatness (Compare to 100 kHz, 5Vpp)	±0.3 dB
SFDR	DC ~ 1 MHz -60dBc 1 MHz ~ 5 MHz -55dBc 5 MHz ~ 25 MHz -50dBc
HD	DC-5 MHz -50dBc 5 MHz - 25MHz -45dBc

Square/Pulse	
Frequency	1μHz ~ 10MHz
Duty Cycle	20% ~ 80%
Rise/Fall time	< 24 ns (10% ~ 90%)
Overshoot	< 3% (typical, 1KHz, 1Vpp)
Pulse Width	> 50ns
Jitter (Cycle to Cycle)	< 500ps + 10ppm
Ramp	
Frequency	1μHz ~ 300kHz
Linearity (Typical)	< 0.1% of Pk-Pk (Typical, 1 kHz, 1 Vpp, 100% Symmetry)
Symmetry	0% ~ 100%
DC	
Offset range	±1.5V (into 50Ω) ±3 V (into HiZ)
Accuracy	±(|offset|*1%+3 mV)
Noise	
Bandwidth	>25MHz (-3dB)
Arb	
Frequency	1μHz ~ 5MHz
Wave Length	16Kpts
Sampling Rate	125MSa/s
Waveform Import	EasyWave, U-Disk

Digital Channels	
No. of Channels	16
Max. Sampling Rate	500MSa/s
Memory Depth	14Mpts/CH
Min. Detectable Pulse Width	4ns
Level Group	D0~D7,D8~D15
Level Range	-3V~3V
Logic Type	TTL, CMOS, LVCMOS3.3, LVCMOS2.5, custom
Skew[2]	D0~D15: ±1 sampling interval Digital to Analog: ± (1 sampling interval +1ns)

I/O	
Standard	USB Host, USB Device, LAN, Pass/Fail, Trigger Out
Pass/Fail	3.3V TTL Output

Display	
Display Type	8-inch TFT LCD
Resolution	800×480
Color	24 bit
Contrast	500:1
Backlight	300nit
Range	8 x 14 divisions

Waveform Display	
Type	Dot, Vector
Persistence Time	OFF, 1s, 5s, 10s, 30s, infinite
Color Display	Normal, Color
Screen Saver	1min, 5min, 10min, 30min, 1hour, OFF

Language

Language	Simplified Chinese, Traditional Chinese, English, French, Japanese, Korean, German, Russian, Italian, Portuguese

Environments

Temperature	Operating: 10℃ ~ 40℃ Non-operating: -20℃ ~ 60℃
Humidity	Operating: 85%RH, 40℃ , 24 hours Non-operating: 85%RH, 65℃ , 24 hours
Altitude	Operating: ≤3,000m Non-operating: ≤15,266m
Electromagnetic Compatibility	2004/108/EC Execution Standard EN 61326-1:2006 EN 61000-3-2:2006 + A2:2009, EN 61000-3-3:2008
Safety	2006/95/EC Execution Standard EN 61010-1:2010/EN 61010-2-030:2010

Power Supply

Input Voltage & Frequency	100 ~ 240 Vrms 50/60Hz
	100 ~ 120 Vrms 400Hz
Power	60W Max

Mechanical

Dimensions	Length* Width*Height = 352mm*128mm*224mm
Weight	N.W 3.4 Kg(2-ch); 3.6 Kg(4-ch) G.W 4.9 Kg(2-ch); 5.2 Kg(4-ch)

Note[1] Single-channel: one channel in CH1/CH2 (or CH3/CH4) is ON and another is OFF
Dual-channel: both channels in CH1/CH2 (or CH3/CH4) are ON

Note[2] Typical Value refers to the tested value under specific conditions. It might vary with the ambient temperature or other conditions

SDS2000X Probes

Probe type	Model	Picture	Description
Passive	PB470		PB470, 70MHz bandwidth, 1X/10X (SDS2072X/SDS2074X) PP510, 100MHz bandwidth, 1X/10X (SDS2102X/SDS2104X) SP2030A, 300MHz bandwidth, 10X (SDS2202X/SDS2204X, SDS2302X/ SDS2304X)
	PP510		
	SP2030A		
Logic Probe	SPL2016		16 Channel Logic Probe
Current	CP4020		Bandwidth: 100KHz , Max. continuous current: 20Arms, Peak current: 60A Switch Ratio: 50mV/A, 5mV/A, Accuracy: 50mV/A (0.4A-10ApK)±2%, 5mV/A (1A-60ApK) ±2%, 9V battery source
	CP4050		Bandwidth: 1MHz , Max. continuous current: 50Arms, Peak current: 140A Switch Ratio: 500mV/A, 50mV/A Accuracy: 500mV/A (20mA-14ApK)±3%±20mA , 50mV/A (200mA-100ApK) ±4%±200mA, 50mV/A (100A-140ApK) ±15%max, 9V battery source
	CP4070		Bandwidth: 150KHz , Max. continuous current: 70Arms, Peak current: 200A Switch Ratio: 50mV/A, 5mV/A, Accuracy: 50mV/A (0.4A-10ApK)±2% , 5mV/A (1A-200ApK) ±2%, 9V battery source
	CP4070A		Bandwidth: 300KHz , Max. continuous current: 70Arms, Peak current: 200A Switch Ratio: 100mV/A, 10mV/A, Accuracy: 100mV/A (50mA-10ApK)±3%±50mA , 10mV/A (500mA-40ApK) ±4%±50mA, 10mV/A (40A-200ApK) ±15% max., 9V battery source
	CP5030		Bandwidth: 50MHz , Max. continuous current: 30Arms, Peak current: 50A Switch Ratio: 100mV/A, 1V/A, Accuracy: 1V/A (±1%±1mA), 100mV/A (±1%±10mA), DC12V/1.2A power adapter
	CP5030A		Bandwidth: 100MHz , Max. continuous current: 30Arms, Peak current: 50A Switch Ratio: 100mV/A, 1V/A, Accuracy: 1V/A (±1%±1mA), 100mV/A (±1%±10mA), DC12V/1.2A power adapter
	CP5150		Bandwidth: 12MHz , Max. continuous current: 150Arms, Peak current: 300A Switch Ratio: 100mV/A, 10mV/A, Accuracy: 100mV/A (±1%±10mA), 10mV/A (±1%±100mA), DC12V/1.2A power adapter
	CP5500		Bandwidth: 5MHz , Max. continuous current: 500Arms, Peak current: 750A Switch Ratio: 100mV/A, 10mV/A, Accuracy: 100mV/A (±1%±10mA), 10mV/A (±1%±100mA), DC12V/1.2A power adapter
High Voltage Differential	DPB4080		Bandwidth: 50MHz, Differential Range: 800V (DC + Peak AC), 100X/200X/500X/1000X, Accuracy: ±1%, DC 9V/1A power adapter
	DPB5150		Bandwidth: 70MHz, Differential Range: 1500V (DC + Peak AC),50X/500X Accuracy: ±2%, DC 5V/1A USB adapter
	DPB5150A		Bandwidth: 100MHz, Differential Range: 1500V (DC + Peak AC), 50X/500X , Accuracy: ±2% DC 5V/1A USB adapter

Probe type	Model	Picture	Description
High Voltage Differential	DPB5700		Bandwidth: 70MHz, Differential Range: 7000V (DC + Peak AC), 100X/1000X , Accuracy: ±2%, DC 5V/1A USB adapter
	DPB5700A		Bandwidth: 100MHz Differential Range: 7000V (DC + Peak AC), 100X/1000X Accuracy: ±2% DC 5V/1A USB adapter
High Voltage	HPB4010		Bandwidth: 40MHz Differential Range: DC 10KV, AC (rms): 7KV (sine), AC (Vpp): 20KV (Pulse) 1000X Accuracy: ≤3%

Ordering Information

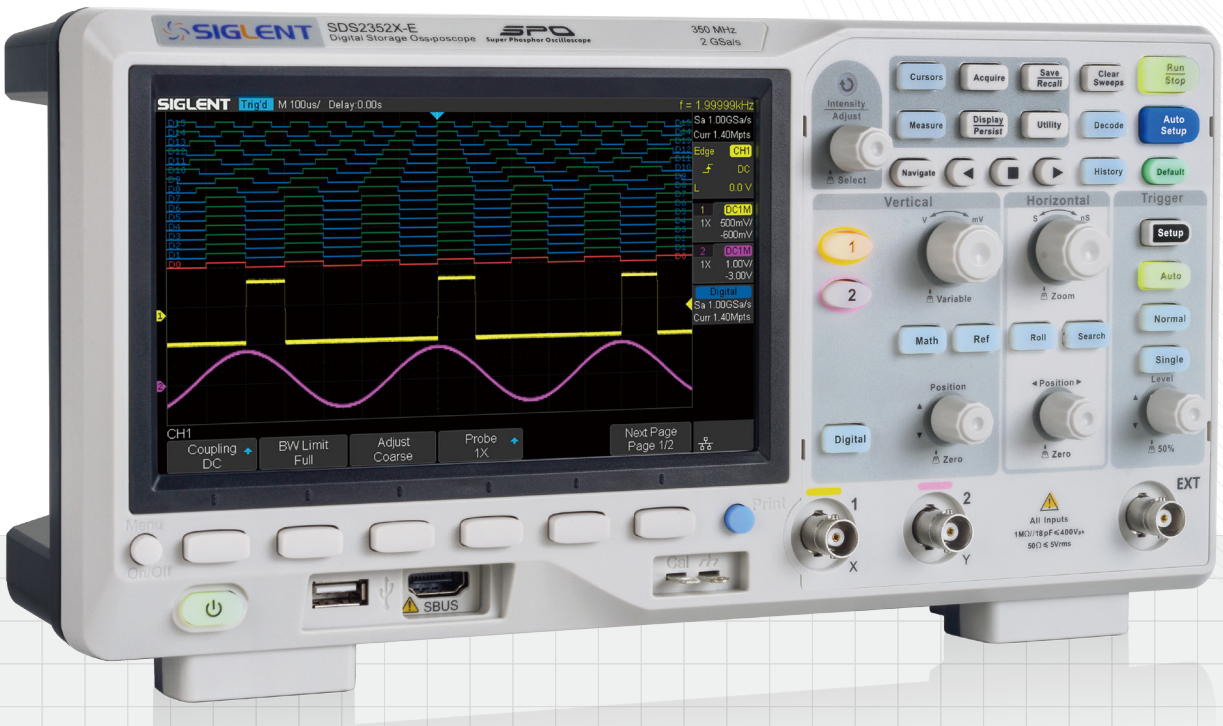
Description	Model
300MHz, 4CH, 2GSa/s (Max.), 140Mpts	SDS2304X
300MHz, 2CH, 2GSa/s (Max.), 140Mpts	SDS2302X
200MHz, 4CH, 2GSa/s (Max.), 140Mpts	SDS2204X
200MHz, 2CH, 2GSa/s (Max.), 140Mpts	SDS2202X
100MHz, 4CH, 2GSa/s (Max.), 140Mpts	SDS2104X
100MHz, 2CH, 2GSa/s (Max.), 140Mpts	SDS2102X
70MHz, 4CH, 2GSa/s (Max.), 140Mpts	SDS2074X
70MHz, 2CH, 2GSa/s (Max.), 140Mpts	SDS2072X
Standard Accessories	
USB Cable -1	
Passive Probe -2 (2-ch model); -4 (4-ch model)	
Power Cord -1	
Quick Start -1	
Certificate of Calibration -1	
Optional Accessories	
SDS-2000X-DC	IIC, SPI, UART/RS232, CAN, LIN Decoder
SDS-2000X-FG	25MHz Function/Arbitrary Waveform Generator
SDS-2000X-PA	Power Analyze Software
SDS-2000X-16LA	16 Digital Channels（Software）
SPL2016	16 Channel Logic Probe
ISFE	Isolated Front End
STB	STB3
DF2001A	Power analysis Deskew Fixture
HPB4010	High Voltage Probe
CP4020/CP4050/CP4070/ CP4070A/CP5030/ CP5030A/CP5150/CP5500	Current Probe
DPB4080/DPB5150/ DPB5150A/DPB5700/ DPB5700A	High Voltage Differential Probe

SDS2000X-E Series

Super Phosphor Oscilloscope

SIGLENT®

DataSheet-2018.12



SIGLENT TECHNOLOGIES CO.,LTD

SDS2202X-E
SDS2352X-E

Product overview

SIGLENT's new SDS2000X-E Series Super Phosphor Oscilloscopes are available in two bandwidths; 200 MHz and 350 MHz. They each have a maximum sampling rate of 2 GSa/s and a standard record length of 28 Mpts. The most commonly used functions can be accessed with its user-friendly one-button design.

The SDS2000X-E series employs a new generation of SPO technology. With its excellent signal fidelity, background noise is lower than similar products in the industry. It has a minimum vertical input range of 500 uV/div, an innovative digital trigger system with high sensitivity and low jitter, and a waveform capture rate of 400,000 frames/sec (sequence mode). It also employs a 256-level intensity grading display function and a color temperature display mode not found in other models in this class. Siglent's newest oscilloscope offering supports multiple powerful triggering modes including serial bus triggering and decoding. History waveform recording and sequential triggering allow for extended waveform records to be captured, stored, and analyzed. Also included is the deep memory FFT. This math function uses up-to 1 M samples for the FFT calculation, providing the SDS2000X-E with very high frequency resolution. The hardware co-processor executes true fast measurement and math to all of 28M sample points so that there is minimal distortion on analysis. It also supports searching and navigating, on-screen Bode plot, 16 channel digital /MSO (optional), an external USB powered 25 MHz AWG function generator module (option), a USB WIFI adapter for wireless control and monitoring (option), and an embedded application that allows remote control via web browser. The features and high-performance of the SDS2000X-E oscilloscopes cannot be matched else anywhere at this price.

Key Features

- 200MHz, 350MHz bandwidth models
- Real-time sampling rate up to 2 GSa/s (1 GSa/s per channel, if both channels active)
- The newest generation of SPO technology
  - Waveform capture rate up to 110,000 wfm/s (normal mode), and 400,000 wfm/s (sequence mode)
  - Supports 256-level intensity grading and color display modes
  - Record length up to 28 Mpts
  - Digital trigger system
- Intelligent trigger: Edge, Slope, Pulse Width, Window, Runt, Interval, Time out (Dropout), Pattern
- Serial bus triggering and decoding (standard), supports protocols IIC, SPI, UART, CAN, LIN
- Video trigger, supports HDTV
- Low background noise with voltage scales from 500μV/div to 10V/div
- 10 types of one-button shortcuts, supports Auto Setup, Default, Cursors, Measure, Roll, History, Display/Persist, Clear Sweep, Zoom and Print
- Segmented acquisition (Sequence) mode, divides 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 segment to capture qualifying events
- History waveform record (history) function (maximum recorded waveform length is 80,000 frames)
- Automatic measurement function for 38 parameters as well as Measurement Statistics, Zoom, Gating, Math, History and Reference functions
- 1 Mpt FFT
- Math and measurement functions use all sampled data points in memory (up to 28 Mpts)
- Math functions (FFT, addition, subtraction, multiplication, division, integration, differential, square root)
- Preset key can be customized for user settings or factory "defaults"
- Security Erase mode
- High Speed hardware based Pass/ Fail function
- 16 Digital channels (MSO) (option)
- Bode plot
- Search and navigate
- USB AWG module(option)
- USB WIFI adapter(option)
- Web Browser based control
- Large 7 inch TFT -LCD display with 800 * 480 resolution
- Multiple interface types: USB Host, USB Device (USB -TMC), LAN, Pass / Fail, Trigger Out
- Supports SCPI remote control commands
- VXI-11+SCPI, Telnet (port 5024) +SCPI and Socket (port 5025) +SCPI programming over LAN
- Supports web control and virtual instrument control panel for both PC and mobile terminals
- Web control update rate of up-to 10 times/s provides nearly real-time update rate
- Supports Multi-language display and embedded online help

Models and key Specification

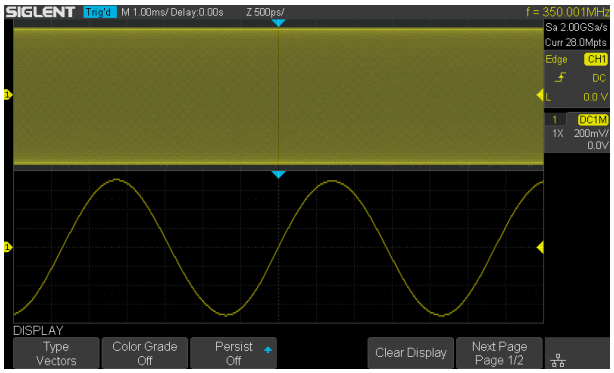
Model	SDS2202X-E	SDS2352X-E
Bandwidth	200 MHz	350 MHz
Sampling Rate (Max.)	2 GSa/s	
Channels	2+EXT	
Memory Depth (Max.)	14 Mpts/CH (not interleave mode) 28 Mpts/CH (interleave mode)	
Waveform Capture Rate (Max.)	110,000 wfm/s (normal mode), 400,000 wfm/s (sequence mode)	
Trigger Type	Edge, Slope, Pulse Width, Window, Runt, Interval, Dropout, Pattern, Video	
Serial Trigger and decoder (Standard)	IIC, SPI, UART, CAN, LIN	
16 Digital Channels (option)	Maximum waveform capture rate up to 1GSa/s, Record length up to 14 Mpts/CH	
USB AWG module (option)	One channel, 25 MHz, sample rate of 125 MHz, 16 kpts waveform memory sample size	
Bode plot	Minimum start frequency of 10 Hz, minimum scan bandwidth of 500 Hz, maximum scan bandwidth of 120 MHz (dependent on Oscilloscope and AWG bandwidth), 500 maximum scan frequency points	
USB WIFI adapter (option)	802.11b/g/n, WPA-PSK NOTE: To ensure compatibility, we recommend using only SIGLENT WiFi accessories	
I/O	USB Host, USB Device, LAN, Pass/Fail, Trigger Out, Sbus (Siglent MSO)	
Probe (Std)	2 pcs passive probe PP215	2 pcs passive probe SP2035
Display	7 inch TFT–LCD (800 x 480 pixels)	
Weight	Without package 2.6 Kg; With package 3.8 Kg	

Function & Characteristics

7-inch TFT-LCD display and 10 one-button menus

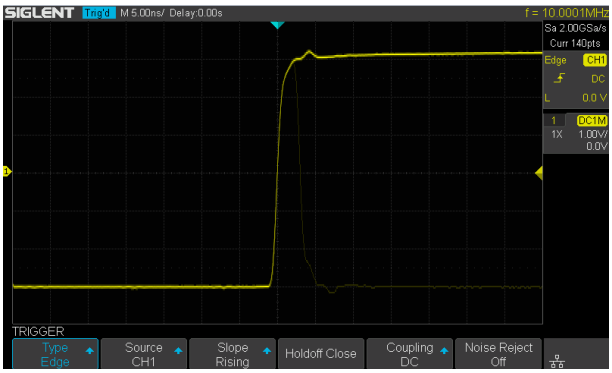
- 7-inch TFT-LCD display with 800 * 480 resolution
- Most commonly used functions are accessible using 10 different one-button operation keys: Auto Setup, Default, Cursor, Measure, Roll, History, Persist, Clear Sweep, Zoom, Print.

Maximum sample rate of 2 GSa/s, record Length of up to 28 Mpts



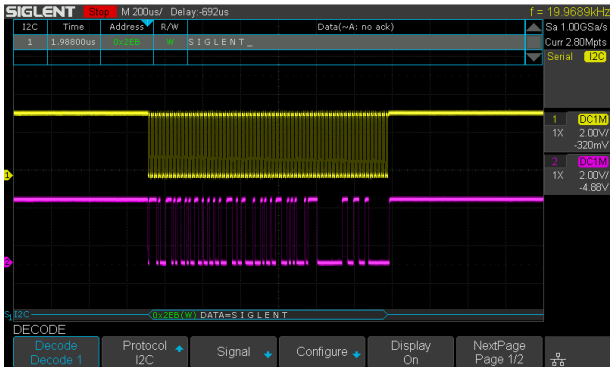
Using hardware-based Zoom technologies and max record length of up to 28 Mpts, users are able to oversample to capture for longer time periods at higher resolution and use the zoom feature to see more details within each signal.

Waveform Capture Rate up to 400,000 wfm/s



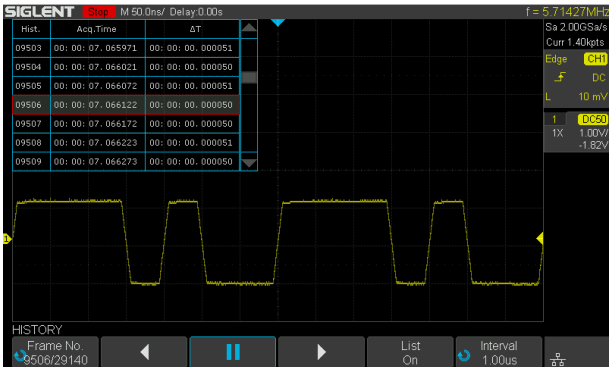
With a waveform capture rate of up to 400,000 wfm/s (sequence mode), the oscilloscope can easily capture the unusual or low-probability events.

Serial Bus Decoding Function (Standard)



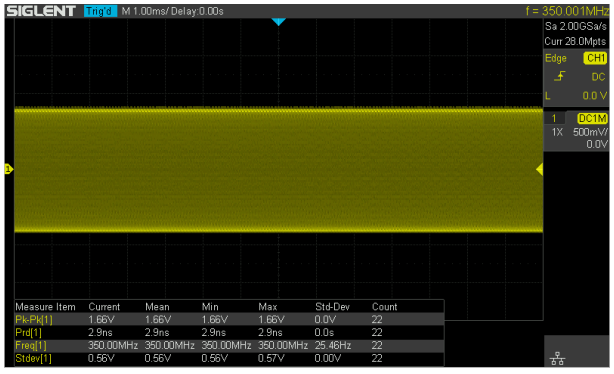
SDS2000X-E displays the decoding through the events list. Bus protocol information can be quickly and intuitively displayed in a tabular format.

History Waveforms (History) Mode and Segmented Acquisition (Sequence)



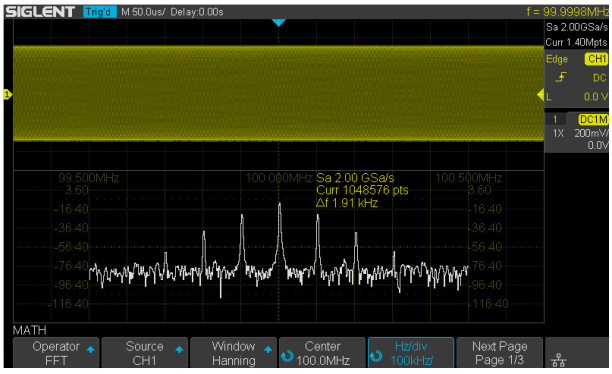
Playback the latest triggered events using the history function. Segmented memory collection will store trigger events into multiple (Up to 80,000) memory segments, each segment will store triggered waveforms and timestamp of each frame.

True measurement to 28 M points



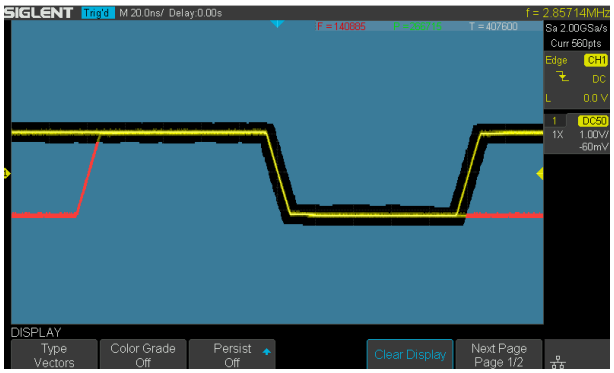
SDS2000X-E can apply automatic measurements on all sampled data points up to 28 Mpts. This ensures the accuracy of measurements while the math co-processor decreases measurement time and increases ease-of-use.

1 Mpoint FFT



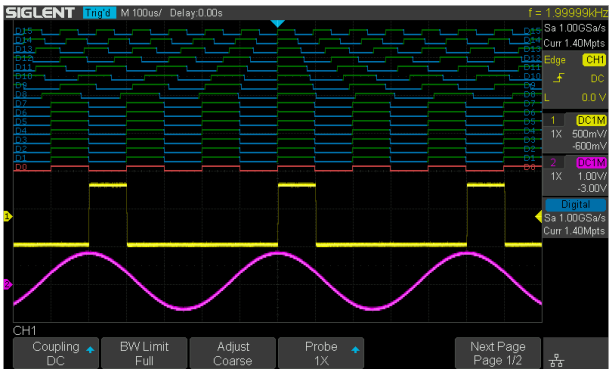
The new math co-processor enables FFT analysis of incoming signals using up to 1 million samples per waveform. This provides high frequency resolution with a fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs.

Hardware-Based High Speed Pass/Fail function



The SDS2000X-E utilizes a hardware-based Pass/Fail function, performing up to 40,000 Pass / Fail decisions each second. Easily generate user defined test templates provide trace mask comparison making it suitable for long-term signal monitoring or automated production line testing.

16 Digital Channels/MSO (option)



16 digital channels enables users to acquire and trigger on digital input channels and view both digital and analog waveforms simultaneously with one instrument.

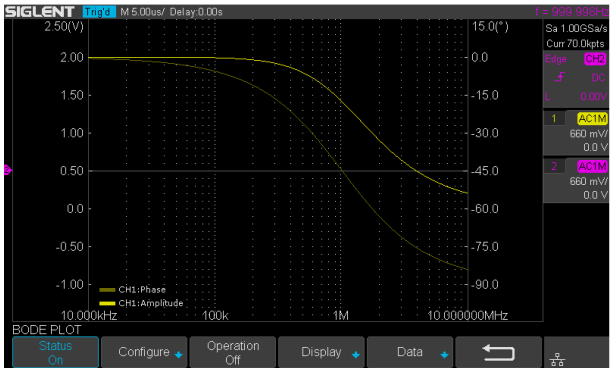
USB 25 MHz AWG Module (option)

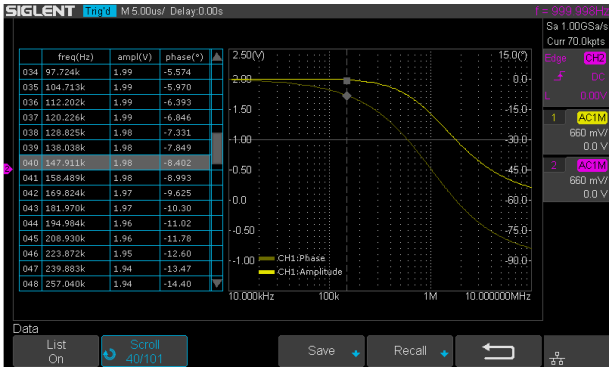
The optional 25 MHz function/arbitrary waveform generator is operated from the USB host connection. Functions include Sine, Square, Ramp, Pulse, Noise, DC and 45 additional built-in waveforms. The arbitrary waveforms can be accessed and edited by the SIGLENT EasyWave PC software.

Search and Navigate

The SDS2000X-E can search events specified by the user in a frame. It can also navigate by time (delay position) and historical frames.

Bode Plot



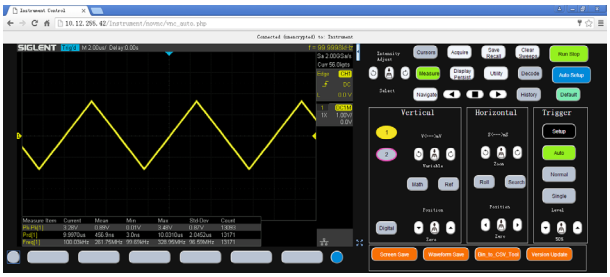


SDS2000X-E can control the USB AWG module or an independent SIGLENT SDG instrument, scan a circuits amplitude and phase frequency response, and display the data as a Bode Plot. It can also show the result lists, and export the data to a USB disk.

USB WIFI Adapter (option)

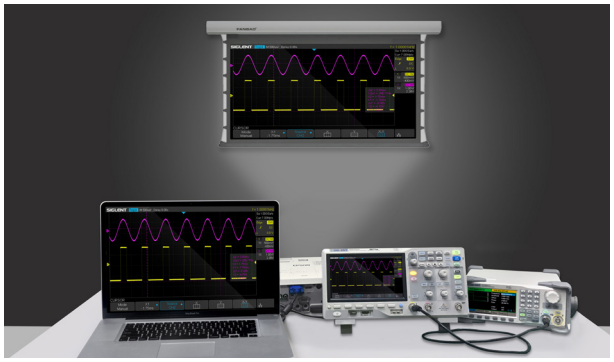
WiFi control of instrumentation can provide a convenient and safe method of configuring and collecting data. This new feature works with a SIGLENT approved WiFi adapter to provide wireless control and communications with SIGLENT SDS2000X-E scopes.

Web control



With the new embedded web server, users can control the SDS2000X-E from a simple web page. This provides wonderful remote troubleshooting and monitoring capabilities. The web page has PC and mobile styles that include an embedded virtual control panel.

Real-time update screen in web page



With 100 Mbps LAN, the internal web page can update at a rate of up to 10 times/s, providing a nearly-real time update of waveform data and measurements. When viewed on a PC, the screen can be displayed in full screen mode. With this feature and a PC VGA interface, you can easily use a projector or other video display device to deliver the screen information to a larger audience.

Complete Connectivity

SDS2000X -E supports USB Host, USB Device (USB -TMC), LAN, Pass/Fail and Trigger Out.

Specifications

Acquire System	
Sampling Rate	2 GSa/s (single channel), 1 GSa/s (two channels)
Memory Depth	Max 28 Mpts/Ch (single channel), 14 Mpts/Ch(two channels)
Peak Detect	1 nsec
Average	Averages: 4, 16, 32, 64, 128, 256, 512, 1024
Eres	Enhance bits: 0.5, 1.5, 2, 2.5, 3
Waveform interpolation	Sin(x)/x, Linear

Input	
Channels	2+EXT
Coupling	DC, AC, GND
Impedance	DC 1 MΩ: (1 MΩ ± 2%) || (18 pF ± 2 pF) DC 50 Ω: 50 Ω ± 2%
Max. Input voltage	1 MΩ: ≤ 400 Vpk (DC + Peak AC <= 10 kHz) 50 Ω: ≤ 5V rms
CH to CH Isolation	DC-Max BW :> 40 dB
Probe attenuation	0.1X, 0.2X, 0.5X, 1X, 2X, 5X, 10X……1000X, 2000X, 5000X, 10000X, Custom

Vertical System	
Bandwidth (-3 dB)	350 MHz (SDS2352X-E) 200 MHz (SDS2202X-E)
Vertical Resolution	8-bit
Vertical Scale (Probe 1 X)	500 μV/div - 10 V/div (1-2-5 sequence)
Offset Range (Probe 1 X)	500 μV - 100 mV: ± 2 V
	102 mV- 1 V: ± 20 V
	1.02 V - 10 V: ± 200 V
Bandwidth Limit	20 MHz ± 40%
Channel Flatness (Inner 50 Ω)	DC - 60% (BW): ± 1 dB
	60% - 100% (BW): + 1 dB/-3 dB
Low Frequency Response (AC -3 dB)	≤ 2 Hz (at input BNC)
Noise	ST-DEV ≤ 0.5 division (< 1 mV/div)
	ST-DEV ≤ 0.2 division (< 2 mV/div)
	ST-DEV ≤ 0.1 division (≥ 2 mV/div)
SFDR including harmonics	≥35 dB
DC Gain Accuracy	≤ ± 3.0%: 5 mV/div-10 V/div
	≤ ± 4.0%: ≤ 2 mV/div
Offset Accuracy	± (1% * Offset + 1.5% * 8 * div + 2 mV): ≥2 mV/div
	± (1% * Offset + 1.5% * 8 * div + 500 uV): ≤1 mv/div
Risetime	Typical 1.0 ns (SDS2352X-E)
	Typical 1.8 ns (SDS2202X-E)

Horizontal System

Timebase Scale	500 ps/div-100 s/div
Channel Skew	<100 ps
Waveform Capture Rate	Up to 110,000 wfm/s (normal mode), 400,000 wfm/s (sequence mode)
Intensity Grading	256 Levels
Display Format	Y-T, X-Y, Roll
Timebase Accuracy	±25 ppm
Roll Mode	50 ms/div-100 s/div (1-2-5 step)

Trigger System

Trigger Mode	Auto, Normal, Single
Trigger Level	Internal: ±4.5 div from the center of the screen
	EXT: ±0.6 V
	EXT/5: ±3 V
Holdoff Range	80 ns - 1.5 s
Trigger Coupling	AC DC LFRJ HFRJ Noise RJ
Coupling Frequency Response	DC: Passes all components of the signal
	AC: Blocks DC components and attenuates signals below 8 Hz
	LFRJ: Blocks the DC component and attenuates the low-frequency components below 2 MHz
	HFRJ: Attenuates the high-frequency components above 1.2 MHz
Coupling Frequency Response (EXT)	DC: Passes all components of the signal
	AC: Blocks DC components and attenuates signals below 10 Hz
	LFRJ: Blocks the DC components and attenuates low-frequency components below 6 KHz
	HFRJ: Attenuates high-frequency components above 200 KHz
Trigger Accuracy (typical)	Internal: ±0.2 div
	EXT: ±0.4 div
Trigger Sensitivity	DC - Max BW 0.6 div
	EXT: 200 mVpp DC – 10 MHz
	300 mVpp 10 MHz - BW frequency (External 50 Ω)
	EXT/5: 1 Vpp DC – 10 MHz
	1.5 Vpp 10 MHz -BW frequency (External 50 Ω)
Trigger Jitter	< 100 ps
Trigger Displacement	Pre-Trigger: 0 - 100% Memory
	Delay Trigger: 0 to 10,000 div
Edge Trigger	
Slope	Rising, Falling, Rising&Falling
Source	All channels / EXT / (EXT/5) / AC Line
Slope Trigger	
Slope	Rising, Falling
LimitRange	<, >, <>, ><
Source	All channels
TimeRange	2 ns - 4.2 s
Resolution	1 ns

Pulse Trigger	
Polarity	+wid , -wid
Limit Range	<, >, <>, ><
Source	All channels
Pulse Range	2 ns - 4.2 s
Resolution	1 ns
Video Trigger	
Signal Standard	NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom
Source	All channels
Sync	Any, Select
Trigger condition	Line, Field
Window Trigger	
Window Type	Absolute, Relative
Source	All channels
Interval Trigger	
Slope	Rising, Falling
Limit Range	<, >, <>, ><
Source	All channels
Time Range	2 ns - 4.2 s
Resolution	1 ns
Dropout Trigger	
Timeout Type	Edge, State
Source	All channels
Slope	Rising, Falling
Time Range	2 ns - 4.2 s
Resolution	1 ns
Runt Trigger	
Polarity	+wid , -wid
Limit Range	<, >, <>, ><
Source	All channels
Time Range	2 ns - 4.2 s
Resolution	1 ns
Pattern Trigger	
Pattern Setting	Invalid, Low, High
Logic	AND, OR, NAND, NOR
Source	All channels
Limit Range	<, >, <>, ><
Time Range	2 ns - 4.2 s
Resolution	1 ns

Search	
Event	Edge, Slope, Pulse, Interval, Runt
Event Number	Y-T: 700 ROLL: No limitation Stop After ROLL: 700

Serial Trigger	
I2C Trigger	
Condition	Start, Stop, Restart, No Ack, EEPROM, 7 bits Address & Data, 10 bits Address & Data, Data Length
Source (SDA/SCL)	All channels
Data Format	Hex
Limit Range	EEPROM: =, >, <
Data Length	EEPROM: 1 byte Addr & Data: 1-2 byte Data Length: 1-12 byte
R/W bit	Addr & Data: Read, Write, Do not care
SPI Trigger	
Condition	Data
Source (CS/CL/Data)	All channels
Data Format	Binary
Data Length	4-96-bit
Bit Value	0, 1, X
Bit Order	LSB, MSB
UART Trigger	
Condition	Start, Stop, Data, Parity Error
Source (RX/TX)	All channels
Data Format	Hex
Limit Range	=, >, <
Data Length	1 byte
Data Width	5, 6, 7, 8-bits
Parity Check	None, Odd, Even
Stop Bit	1, 1.5, 2-bits
Idle Level	High, Low
Baud Rate (Selectable)	600/1200/2400/4800/960019200/38400/57600/115200 bit/s
Baud Rate (Custom)	300-5000000 bit/s
CAN Trigger	
Condition	Start Remote, ID, ID + Data, Error
Source	All channels
ID	STD (11 bit), EXT (29 bit)
Data Format	Hex
Data Length	1-2 byte
Baud Rate	5 k/ 10 k/ 20 k/ 50k/ 100 k/ 125 k/ 250 k/ 500 k/ 800 k/ 1 M bit/s
LIN Trigger	
Condition	Break, Frame ID, ID+Data, Error
Source	All channels
ID	1 byte
Data Format	Hex
Data Length	1-2 byte
Baud Rate (Selectable)	600/1200/2400/4800/9600/19200 bit/s
Baud Rate (Custom)	300 bit/s - 20 kbit/s

Serial Decoder	
Number of Decoders	2
I2C Decoder	
Signal	SCL, SDA
Address	7, 10 bits
Threshold	-4.5 - 4.5 div
List	1 - 7 lines
SPI Decoder	
Signal	SCL, MISO, MOSI, CS (2 channel scopes can only use 2 signal identifiers)
Edge Select	Rising, Falling
Idle Level	Low, High
Bit Order	MSB, LSB
Threshold	-4.5 - 4.5 div
List	1 - 7 lines
UART Decoder	
Signal	RX, TX
Data Width	5, 6, 7, 8-bits
Parity Check	None, Odd, Even
Stop Bit	1, 1.5, 2-bits
Idle Level	Low, High
Threshold	-4.5 - 4.5 div
List	1 - 7 lines
CAN Decoder	
Signal	CAN_H, CAN_L
Source	CAN_H, CAN_L, CAN_H - CAN_L
Threshold	-4.5 - 4.5 div
List	1 - 7 lines
LIN Decoder	
LIN Specification Package Revision	Ver 1.3, Ver 2.0
Threshold	-4.5 - 4.5 div
List	1 - 7 lines

Measurement		
Source	All channels, All channels in Zoom, Math, All References, History	
Number of Measurements	Display 4 measurements at the same time. 5 measurements displayed in statistics table	
Measurement Range	Screen or Gate region	
Measurement Parameters (38 Types)		
Vertical (Voltage)	Max	Highest value in input waveform
	Min	Lowest value in input waveform
	Pk - Pk	Difference between maximum and minimum data values
	Ampl	Difference between top and base in a bimodal signal, or between max and min in a singal mode signal
	Top	Value of most probable higher state in a bimodal waveform
	Base	Value of most probable lower state in a bimodal waveform
	Mean	Average of all data values
	Cmean	Average of data values in the first cycle
	Stdev	Standard deviation of all data values
	Cstd	Standard deviation of all data values in the first cycle
	VRMS	Root mean square of all data values
	Crms	Root mean square of all data values in the first cycle
	FOV	Overshoot after a falling edge; (base -min)/Amplitude
	FPRE	Overshoot before a falling edge; (max -top)/Amplitude
	ROV	Overshoot after a rising edge; (max -top)/Amplitude
	RPRE	Overshoot before a rising edge; (base -min)/Amplitude
	Level@X	The voltage value of the trigger point
Horizontal (Time)	Period	Time between the middle threshold points of two consecutive, like-polarity edges
	Freq	Reciprocal of period
	+Wid	Width measured at 50% level and positive slope
	-Wid	Width measured at 50% level and negative slope
	Rise Time	Duration of rising edge from 10-90%
	Fall Time	Duration of falling edge from 90-10%
	Bwid	Time from the first rising edge to the last falling edge, or the first falling edge to the last rising edge at the 50% crossing
	+Dut	Time difference between the 50% threshold of a rising edge to the 50% threshold of the next falling edge of the pulse
	-Dut	Time difference between the 50% threshold of a falling edge to the 50% threshold of the next rising edge of the pulse
	Delay	Time from the trigger to the first transition at the 50% crossing
	Time@Level	Time from the trigger to each rising edge at the 50% crossing. When Statistics is Off, it shows the time from the trigger to the last rising edge at the 50% crossing. When Statistics is On, it shows the Current, Mean, Min, Max, Standard Deviation of time from the trigger to each rising edge at the 50% crossing in multiple frames (number = Count).
Delay	Phase	Phase difference between two edges
	FRR	Time from the first rising edge of channel A to the following first rising edge of channel B
	FRF	Time from the first rising edge of channel A to the following first falling edge of channel B
	FFR	Time from the first falling edge of channel A to the following first rising edge of channel B
	FFF	Time from the first falling edge of channel A to the following first falling edge of channel B
	LRR	Time from the first rising edge of channel A to the last rising edge of channel B
	LRF	Time from the first rising edge of channel A to the last falling edge of channel B
	LFR	Time from the first falling edge of channel A to the last rising edge of channel B
	LFF	Time from the first falling edge of channel A to the last falling edge of channel B
	Skew	Time of source A edge minus time of nearest source B edge

Measurement	
Cursors	Manual : Time X1, X2, (X1 -X2), (1/ΔT) Voltage Y1, Y2, (Y1 -Y2) Track: Time X1, X2, (X1 -X2)
Statistics	Current, Mean, Min, Max, Stdev, Count
Counter	Hardware 6-digit counter (channels are selectable)

Math Function	
Operation	+ , - , * , / , FFT, d/dt, ∫dt, √
FFT window	Rectangular, Blackman, Hanning, Hamming, Flattop
FFT display	Full Screen, Split, Exclusive

USB AWG Module (option)	
Channel	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 ~ +1.5 V (50 Ω load)
	-3 ~ +3 V (High-Z load)
Waveform Type	Sine, Square, Ramp, Pulse, Noise, DC and 45 built-in waveforms
Output impedance	50 Ω ± 2%
Protection	Over-Voltage Protection, Current-Limiting Protection
Sine	
Frequency	1 μHz ~ 25 MHz
Offset Accuracy (10 kHz)	± (1%*Offset Setting Value +3 mVpp)
Amplitude flatness (10 kHz, 5 Vpp)	±0.3 dB
SFDR	DC ~ 1 MHz -60 dBc
	1 MHz ~ 5 MHz -55 dBc
	5 MHz ~ 25 MHz -50 dBc
HD	DC ~ 5 MHz -50 dBc
	5 MHz ~ 25 MHz -45 dBc
Square/Pulse	
Frequency	1 μHz ~ 10 MHz
Duty Cycle	1% ~ 99%
Rise/Fall Time	< 24 ns (10% ~ 90%)
Overshoot (1 kHz, 1 Vpp, Typical)	< 3% (typical 1 kHz, 1 Vpp)
Pulse Width	> 50 ns
Jitter	< 500 ps + 10 ppm
Ramp	
Frequency	1 μHz ~ 300 kHz
Linearity (Typical)	< 0.1% of Pk-Pk (Typical, 1 kHz, 1 Vpp, 50% Symmetry)
Symmetry	0% ~ 100%

DC	
Offset range	±1.5 V (50 Ω load)
	±3 V (High-Z load)
Accuracy	± (|offset|* 1% + 3 mV)
Noise	
Bandwidth	> 25 MHz (-3 dB)
Arbitrary Wave	
Frequency	1 μHz ~ 5 MHz
Wave Length	16 kpts
Sampling Rate	125 MSa/s
Lead In	EasyWave and U-Disk

Digital Channels (option)	
No. of Channels	16
Max. Sampling Rate	1 GSa/s
Memory Depth	14 Mpts/CH
Min. Detectable Pulse Width	4 ns
Level Group	D0 ~ D7, D8 ~ D15
Level Range	-8 V ~ 8 V
Logic Type	TTL, CMOS, LVCMOS3.3, LVCMOS2.5, custom
Skew[2]	D0 ~ D15: ±1 sampling interval Digital to Analog: ± (1 sampling interval +1 ns)

I/O	
Standard	USB Host*2, USB Device, LAN, Pass/Fail, Trigger Out
Pass/Fail	3.3 V TTL Output

Display (Screen)	
Display Type	7-inch TFT LCD
Display Resolution	800 × 480 pixels
Display Color	24-bit
Contrast (Typical)	500:1
Backlight	300 nits
Range	8 x 14 divisions

Display (Waveform)	
Display Mode	Dot, Vector
Persist Time	Off, 1 Sec, 5 Sec, 10 Sec, 30 Sec, Infinite
Color Display	Normal, Color
Screen Saver	1 min, 5 min, 10 min, 30 min, 1 hour, Off
Language	Simplified Chinese, Traditional Chinese, English, French, Japanese, Korean, German, Russian, Italian, Portuguese

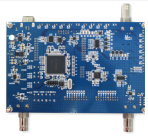
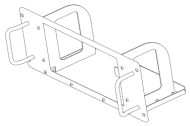
Environments	
Temperature	Operating: 10℃ ~ +40℃
	Non-operating: -20℃ ~ +60℃
Humidity	Operating: 85% RH, 40℃ , 24 hours
	Non-operating: 85% RH, 65℃ , 24 hours
Height	Operating: ≤3000 m
	Non-operating: ≤15,266 m
Compliance	LVD IEC 61010-1:2010
	EMC EN6 1326-1:2013

Power Supply	
Input Voltage	100 - 240 Vrms (± 10%), 50 / 60 Hz 100 - 120 Vrms (± 10%), 400 Hz
Power	50W Max

Mechanical	
Dimensions	Length: 312 mm
	Width: 132.6 mm
	Height: 151 mm
Weight	N.W: 2.6 kg; G.W: 3.8 kg

Probes and Accessories

Probe	Model	Picture	Description
Passive	PP510		Bandwidth: 200 MHz, 1X/10X, 1 M/10 Mohm, 300 V/600 V Bandwidth: 350 MHz, 1X/10X, 1 M/1 Mohm, 150 V/300 V
	PP215		
	SP2035		
Current Probe	CP4020		Bandwidth: 100 KHz, Max. continuous current: 20 Arms, Peak current: 60 A Switch Ratio: 50 mV/A, 5 mV/A, Accuracy: 50 mV/A (0.4 A-10 Apk)±2%, 5 mV/A (1 A-60 Apk) ±2%, 9 V battery source
	CP4050		Bandwidth: 1MHz, Max. continuous current: 50Arms, Peak current: 140 A Switch Ratio: 500 mV/A, 50 mV/A Accuracy: 500 mV/A (20 mA -14ApK) ± 3% ± 20 mA , 50 mV/A (200 mA -100 ApK) ± 4%±200 mA, 50 mV/A (100 A -140 ApK) ±15% max, 9 V battery source
	CP4070		Bandwidth: 150 kHz, Max. continuous current: 70 Arms, Peak current: 200 A Switch Ratio: 50 mV/A, 5 mV/A, Accuracy: 50 mV/A (0.4 A -10 ApK) ± 2% , 5 mV/A (1 A -200 ApK) ± 2%, 9 V battery source
	CP5030		Bandwidth: 50 MHz, Max. continuous current: 30 Arms, Peak current: 50 A Switch Ratio: 100 mV/A, 1 V/A, Accuracy: 1 V/A (± 1% ± 1mA), 100 mV/A (± 1% ± 10 mA), DC 12 V/ 1.2 A power adapter
	CP5030A		Bandwidth: 100 MHz, Max. continuous current: 30 Arms, Peak current: 50 A Switch Ratio: 100 mV/A, 1 V/A, Accuracy: 1 V/A (± 1% ± 1 mA), 100 mV/A (± 1% ± 10 mA), DC 12V/1.2 A power adapter
	CP5150		Bandwidth: 12 MHz, Max. continuous current: 150 Arms, Peak current: 300 A Switch Ratio: 100 mV/A, 10 mV/A, Accuracy: 100 mV/A (± 1% ± 10 mA), 10 mV/A (± 1% ± 100 mA), DC 12 V/1.2 A power adapter
	CP5500		Bandwidth: 5 MHz, Max. continuous current: 500 Arms, Peak current: 750 A Switch Ratio: 100 mV/A, 10 mV/A, Accuracy: 100 mV/A (± 1% ± 10 mA), 10 mV/A (± 1% ± 100 mA), DC 12 V/1.2 A power adapter
Differential Probe	DPB4080		Bandwidth: 50 MHz, Differential Range: 800 V (DC + Peak AC), 100X/200X/500X/1000X, Accuracy: ±1%, DC 9 V/1 A power adapter
	DPB5150		Bandwidth: 70 MHz, Differential Range: 1500 V (DC + Peak AC), 50X/500X Accuracy: ± 2%, DC 5 V/1A USB adapter

Probe	Model	Picture	Description
	DPB5150A		Bandwidth: 100 MHz, Differential Range: 1500 V (DC + Peak AC), 50X/500X , Accuracy: ±2% DC 5 V/1 A USB adapter
	DPB5700		Bandwidth: 70 MHz, Differential Range: 7000 V (DC + Peak AC), 100X/1000X , Accuracy: ±2%, DC 5 V/1 A USB adapter
	DPB5700A		Bandwidth: 100 MHz Differential Range: 7000 V (DC + Peak AC), 100X/1000X Accuracy: ±2% DC 5 V/1 A USB adapter
High Voltage	HPB4010		Bandwidth: 40 MHz Differential Range: DC 10 KV, AC (rms): 7 KV (sine), AC (Vpp): 20 KV (Pulse) 1000X Accuracy: ≤3%
Isolated front end	ISFE		Provides isolation between standard oscilloscope channels, isolation between the measured signal and ground. Uses USB 5 V power supply, plug and play. The maximum input voltage allowed is up to ± 600 Vpk
Demo Board	STB-3 Test Board		Output signals including square, sine, AM, fast edge, pulse, PWM, I2C, CAN, LIN etc. Used in teaching and demonstrations
USB AWG Module	SAG1021		Output Sine, Square, Ramp, pulse, Noise, DC and 45 built-in waveforms. The arbitrary waveforms can be accessed and edited by the EasyWave PC software
Rack Mount	SDS1X-E-RMK		The height is 4U

Ordering information

Product Name	SDS2000X-E Series Digital Oscilloscope	
	SDS2202X-E 200 MHz	
	SDS2352X-E 350 MHz	
Standard Accessories	USB Cable -1	
	Quick Start -1	
	Passive Probe -2	
	Certification of Calibration -1	
	Power Cord -1	
Optional Accessories	16 Channels MSO Software	SDS2000X-E-16LA
	16 Channels Logic Analyzer	SLA1016
	AWG Software	SDS2000X-E-FG
	USB AWG Module Hardware	SAG1021
	WIFI Software	SDS2000X-E-WIFI
	USB WIFI Adapter	TL_WN725N
	Isolated Front End	ISFE
	STB Demo Source	STB-3
	High Voltage Probe	HPB4010
	Current Probes	CP4020/CP4050/CP4070/CP4070A/CP5030/CP5030A/CP5150/CP5500
	Differential Probes	DPB4080/DPB5150/DPB5150A/DPB5700/DPB5700A
	Rack Mount	SDS1X-E-RMK

SDS2000X-E Series

Super Phosphor Oscilloscope

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, function/arbitrary waveform generators, digital multimeters, DC power supplies, spectrum analyzers, isolated handheld oscilloscopes and other general purpose test instrumentation. Since its first oscilloscope, the ADS7000 series, 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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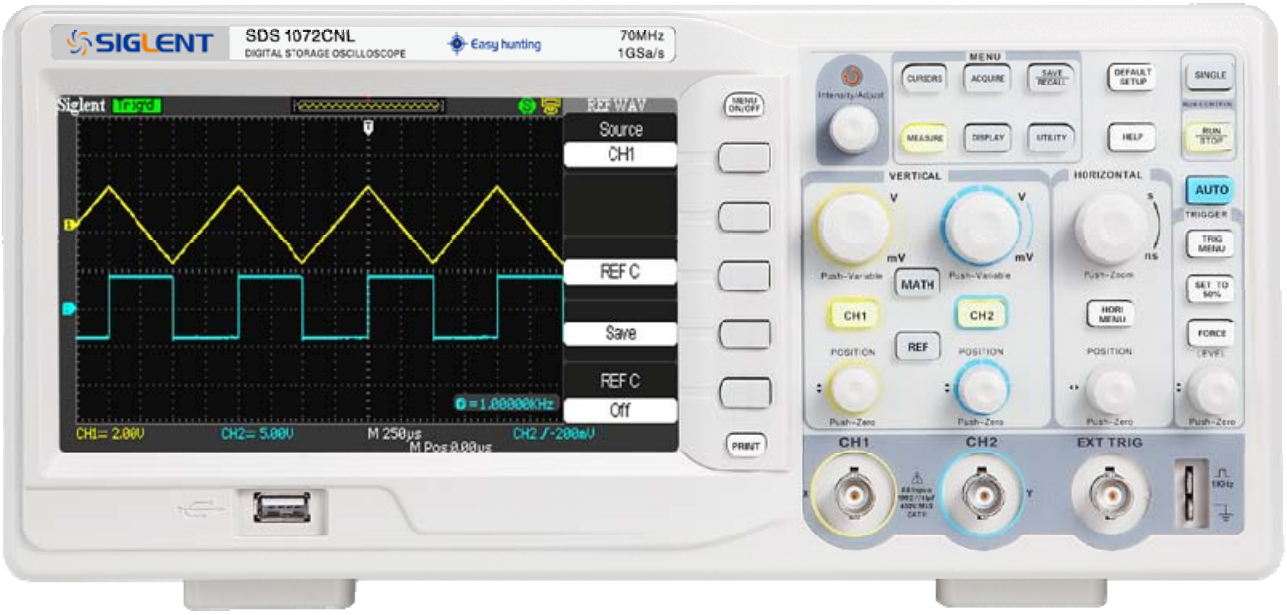
DataSheet

SDS1000CNL
Series Digital Oscilloscope



CHARACTERISTIC:

- The highest Single real-time sampling rate can be up to 2GSa/s; Equivalent sampling rate is up to 50GSa/s.
- Memory Depth: 40Kpts(70M/100MHz), 18Kpts (200MHz)
- Trigger types: Edge, Pulse Width, Video, Slope, Alternative
- Unique Digital Filter function and Waveform recorder function
- Support Pass/Fail function.
- Thirty two parameters Auto measure function.
- Save/recall types: Setups, Waveforms, CSV file, Picture.
- Support Multilingual On-line help system
- Waveform Intensity and Grid Brightness can be adjusted.
- Support twelve types Language
- Standard Configuration Port:
  USB Host: Support USB flash driver save/recall function and update firmware;
  USB Device: Support PictBridge compatible printer and support PC remote control;
  RS232;
  Pass/Fail Output.

Specifications

All specification applies to 10X probe and All the SDS1000CNL Series Digital Storage Oscilloscopes.

To verify that the oscilloscope meets specifications, the oscilloscope must first meet the following conditions:

- The oscilloscope must have been operating continuously for thirty minutes within the specified operating temperature.
- You must perform the Do Self Cal operation, accessible through the Utility menu, if the operating temperature changes by more than 5° C.
- The oscilloscope must be within the factory calibration interval

All specifications are guaranteed unless noted “typical.”

Inputs	
Input Coupling	AC, DC, GND
Input Impedance	1MΩ ±2% || 16Pf±3Pf, 50Ω+/-2%(SDS1202CNL+ contain this function)
Maximum Input voltage	400V （DC+AC PK-PK，1MΩ input impedance，X10），CAT I
Ch to Ch Isolation (Both channels in same V/div setting)	>100:1 at 100MHz: (SDS1202CNL+) >100:1 at 50MHz:(SDS1102CNL) >100:1 at 35MHz:(SDS1072CNL)
Probe Attenuator	1X,10X
Probe Attenuator Factors Set	1X,5X,10X,50X,100X, 500X,1000X

Vertical System	
Vertical Sensitivity	2mV/div -10V/div(1-2-5 order) [Except SDS1202CNL+ : 2mV/div -5V/div]
Channel Voltage Offset Range	2mV –200mV: ±1.6V 206mV - 10V: ±40V (SDS1202CNL+: 2mV-100mV: ±800mV 102mV-10V: ±40V)
Vertical Resolution	8 bit
Channels	2
Analog	200MHz(SDS1202CNL+)

Bandwidth	100MHz(SDS1102CNL) 70MHz(SDS1072CNL）
Single-shot Bandwidth	200MHz(SDS1202CNL+) 100MHz(SDS1102CNL) 70MHz(SDS1072CNL）
BW Flatness at BNC input	DC -10% of rated BW: +/- 1dB 10% - 50% of rated BW: +/- 2dB 50% - 100% of rated BW: + 2dB/-3dB
Lower frequency limit (AC -3dB)	≤10Hz(at input BNC)
Noise: Pk-Pk for 3K record	≤0.6 Div for average of 10 Pk-Pk readings, Fixed gain settings ≤0.7 Div for average of 10 Pk-Pk readings, Variable gain settings
SFDR including harmonics (measured with FFT)	>=35dB
DC Gain Accuracy	＜±3.0%: 5mv/div to 10V/div in Fixed Gain Ranges ＜±4.0%: 2mv/div Variable Gain Ranges
DC Measurement Accuracy: All Gain settings ≤ 100mv/div	± [3%* （ |reading|+|offset| ） +1% *of |offset| +0.2div+2mv]
DC Measurement Accuracy: All Gain settings ＞ 100mv/div	± [3%* （ |reading|+|offset| ） +1%* of |offset| +0.2div+100mv]
Rise time	<1.8ns (SDS1202CNL+) <3.5ns(SDS1102CNL) <5.0ns (SDS1072CNL）
Overshoot, Typical (using 500ps pulse)	<10% with probe or BNC input w/ 50 Ohm feed thru
Ch to Ch Skew (both channels in same V/div setting)	<1ns: SDS1202CNL+ SDS1102CNL <2ns: SDS1072CNL (Equivalent to 2 minor divisions in smallest t/div)
Math operation	+, -, *, /, FFT
FFT	Window mode: Hanning, Hamming, Blackman, Rectangular
	Sampling points: 1024
Bandwidth limited	20MHz ± 40% (Note: BW limited below

	20MHz when using probe in x1)

Horizontal System	
Real Time Sampling Rate	SDS1000CNL(70/100MHz): Single Channel:1GSa/s, Double Channel: 500MSa/s SDS1202CNL+: Single Channel:2GSa/s Double Channel: 1GSa/s
Equivalent Sampling Rate	50GSa/s
Measure Display Modes	MAIN, WINDOW, WINDOW ZOOM, ROLL, X-Y
Timebase Accuracy	±100ppm measured over 1ms interval
Horizontal Scan Range	5ns/DIV – 50s/DIV（SDS1072CNL）; 2.5ns/DIV – 50s/DIV（SDS1102CNL/1202CNL+）
	Scan: 100mS/DIV ～50S/DIV (1-2.5-5 sequence)

Trigger System	
Trigger Types	Edge, Pulse Width, Video, Slope, Alternative
Trigger Source	CH1,CH2,EXT,EXT/5,AC Line
Trigger Modes	Auto, Normal, Single
Trigger Coupling	AC, DC, LF rej, HF rej
Trigger Level Range	CH1,CH2: ±6divisions from center of screen
	EXT: ±1.2V
	EXT/5: ±6V
Trigger Displacement	Pre-trigger：（Memory depth/（2*sampling））, Delay Trigger: 271.04DIV
Trigger Level Accuracy (typical) applicable for the signal of rising and falling time ≥20ns	Internal： ±(0.2 div×V/div)(within±4 divisions from center of screen) EXT： ±(6% of setting + 40 mV) EXT/5： ±(6% of setting + 200 mV)
Trigger Sensitivity	For fixed gain ranges 1 Divisions: DC-10MHz 1.5 Divisions: 10MHz - Max BW
	EXT: 200mVpp DC-10MHz, 300mVpp 10MHz - Max BW
	EXT/5: 1Vpp DC-10MHz, 1.5Vpp 10MHz - Max BW
Pulse Width Trigger	Trigger Modes: (＞,＜, ＝)positive Pulse Width, (＞, ＜, ＝)Negative Pulse Width
	Pulse Width Range: 20ns – 10s
Video Trigger	Support signal Formats: PAL/SECAM, NTSC

	Trigger condition : odd field, even field, all lines, line Num
Slope Trigger	(>,<, =) Positive slope, (>,<, =) Negative slope
	Time: 20ns-10s
Alternative Trigger	CH1 trigger type: Edge, Pulse, Video, Slope
	CH2 trigger type: Edge, Pulse, Video, Slope

X-Y Mode	
X-pole Input / Y-Pole Input	Channel 1 (CH1) / Channel 2 (CH2)
Sample Frequency	XY mode has a breakthrough that trad oscilloscopes restrict sampling rate at 1MSa/s. Support 25Ksa/s～250Msa/s adjusted.

Hard Ware Frequency Counter	
Reading resolution	1Hz
Accuracy	±0.01%
Range	DC Couple, 10Hz to MAX Bandwidth
Signal Types	Satisfying all Trigger signals(Except Pulse width trigger and Video Trigger)

Control Panel Function	
Auto Set	Auto adjusting the Vertical, Horizontal system and Trigger Position
Save/Recall	Support 2 Group referenced Waveforms, 20 Group setups, 10 Group(SDS1202CNL+ 20group) captured Waveforms internal Storage/Recall function and USB flash driver storage function.

Measure System	
Auto Measure (32 Types)	Vpp, Vmax, Vmin, Vamp, Vtop, Vbase, Vavg, Mean,Crms, Vrms, ROVShoot, FOVShoot, RPREShoot, FPREShoot, Rise time, Fall time, Freq, Period,+ Wid,－Wid, ＋Dut, －Dut, BWid, Phase, FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF
Cursor Measure	Manual mode, Track mode and Auto mode

Generic Specification

Display System	
Display Mode	Color TFT 7.0in.(177.8mm)diagonal Liquid Crystal Display
Resolution	480 horizontal by 234 vertical pixels
Display Color	24bit
Display Contrast （Typical state）	150:1
Backlight Intensity（Typical state）	300nit
Wave display range	8 x 18 div
Wave Display Mode	Dots, Vector
Persist	Off, 1 sec, 2 sec, 5 sec, Infinite
Menu Display	2 sec, 5 sec, 10 sec, 20 sec, Infinite
Screen-Saver	Off,1min,2min,5min,10min,15min,30min,1hour,2hour,5hour
Skin	Classical, Modern, Tradition, Succinct
waveform interpolation	Sin(x)/x，Linear
Color model	Normal , Invert
Language	Simplified Chinese, Traditional Chinese, English, Arabic, French, German, Russian, Portuguese Spanish, Japanese, Korean, Italian

Environments	
Temperature	Operating:10℃ to +40℃ Not operating: -20℃ to +60℃
Cooling	The fan forces it cold.
Humidity	Operating: 85%RH, 40℃, 24 hours Not operating: 85%RH, 65℃, 24 hours
Height	Operating: 3000m Not operating: 15,266m

Power Supply	
Input Voltage	100-240 VAC, CAT II, Auto selection
Frequency Scope	45Hz to 440Hz
Power	50VA Max

Mechanical		
Dimension	length	323.1mm
	Width	135.6mm
	Height	157mm
weight	2.5kg	

Type Selections:

NAME:

SDS1000CNL series Digital Oscilloscope

TYPE:

SDS1072CNL 70MHz

SDS1102CNL 100MHz

SDS1202CNL+ 200MHz

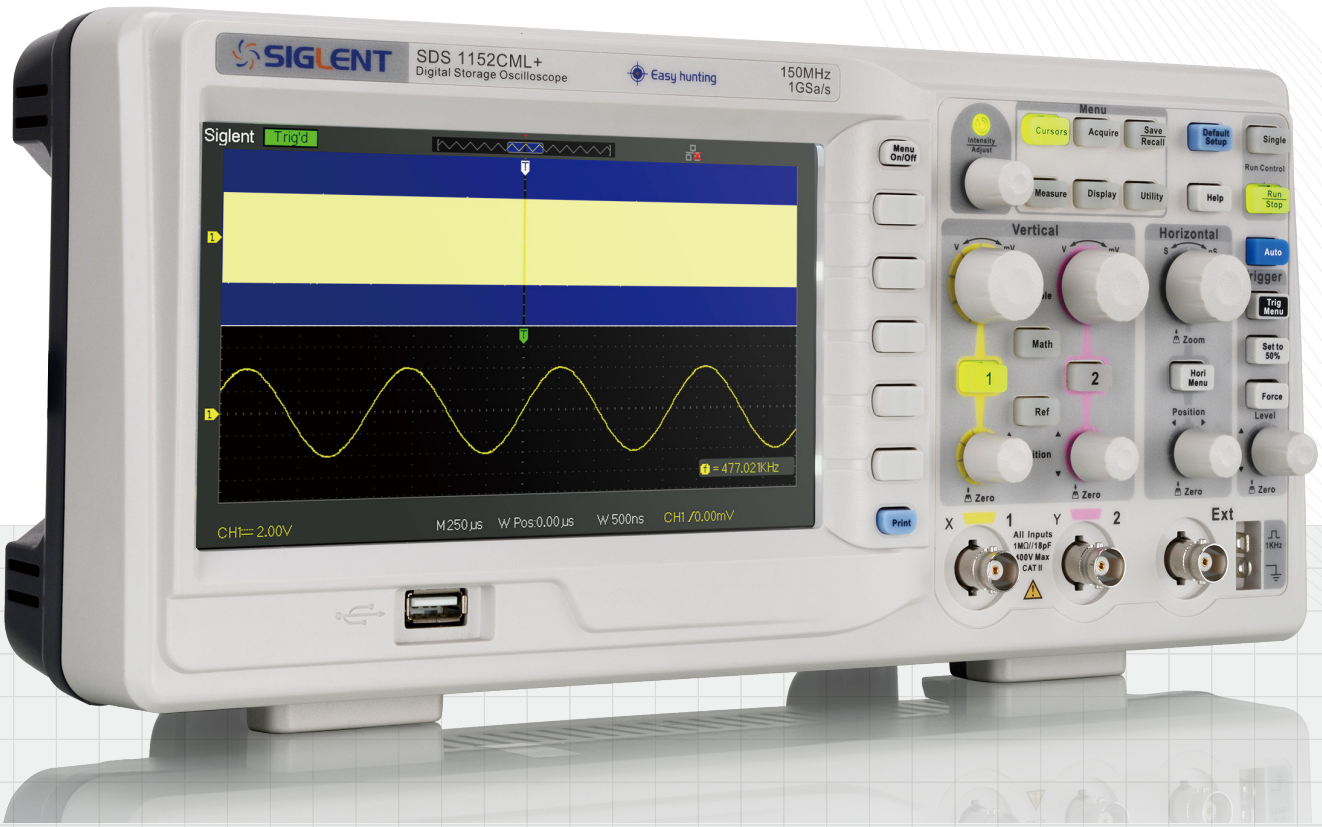
Standard Accessories:

- 1:1/10:1 probe (2 PCS)
- Power Cable that fits the standard of destination country
- Qualified Certification.
- Guaranty Card
- CD (including EasyScope computer software system)
- User Manual
- USB Cable

SDS1000DL+/CML+ Series Digital Oscilloscope

SIGLENT®

DataSheet-2016.5



SIGLENT TECHNOLOGIES CO.,LTD

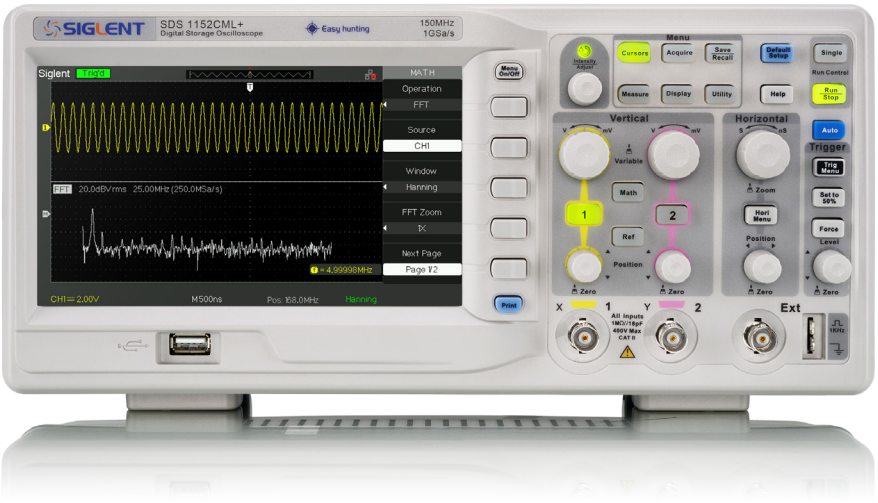
SDS1052DL+
SDS1072CML+
SDS1102CML+
SDS1152CML+

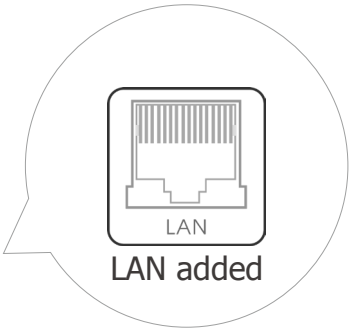
Product overview

SDS1000DL+/CML+ series is a dual-channel universal digital oscilloscope, available in 50 MHz, 70 MHz, 100 MHz and 150 MHz bandwidth models. It includes a 2 Mpts memory depth that helps to ensure accurate waveform resolution and to capture longer signal lengths. With its 7 inch TFT-LCD (800*480) screen, there is adequate screen space to help better see and analyze waveform details. Along with a 1 GSa/s sampling rate, the SDS1000CML+ supports 32 parameters measurements and common mathematical operations to speed up complex / repetitive measurements.

Key Features

- 150 MHz, 100 MHz, 70 MHz, 50 MHz bandwidth models
- Real-time sampling rate up to 1 GSa/s, Equivalent-time sampling rate up to 50 GSa/s
- Memory Depth up to 2 Mpts
- Trigger types: Edge, Pulse, Video, Slope, Alternate
- Waveform math functions:+, -, *, /, FFT
- 6 digital frequency counter
- Supports Multi-language display and embedded online help
- Screensaver from 1 minute to 5 hours
- Digital filter and waveform recorder function
- Shortcut storage function key
- 7 inch TFT-LCD display with 800 * 480 resolution
- Multiple interfaces: USB Host, USB Device (USBTMC), LAN (VXI-11), Pass / Fail



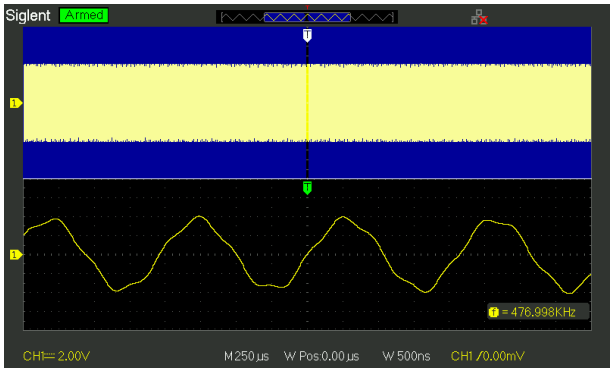


Models and Key Specifications

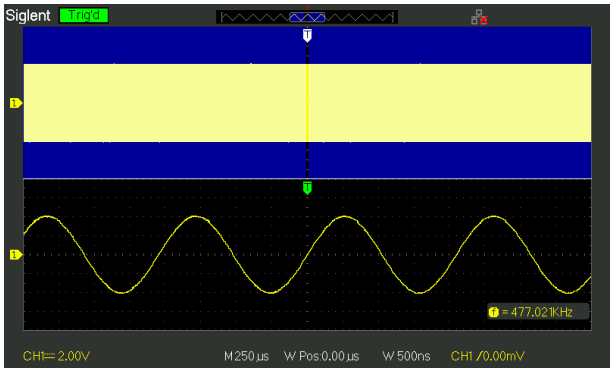
Model	SDS1052DL+	SDS1072CML+	SDS1102CML+	SDS1152CML+
Bandwidth	50 MHz	70 MHz	100 MHz	150 MHz
Sampling Rate (Max.)	500 MSa/s	1 GSa/s		
Channels	2+EXT			
Memory Depth (Max.)	32 Kpts	2 Mpts		
Trigger Types	Edge, Pulse, Video, Slope, Alternate			
I/O	USB Host, USB Device, LAN, Pass/Fail			
Probe (Std)	2 pcs passive probe, PB470		2 pcs passive probe, PP510	2 pcs passive probe, PP215
Display	7 inch TFT LCD (800x480)			
Net Weight	2.5 Kg			

Function & Characteristic

Memory Depth up to 2 Mpts



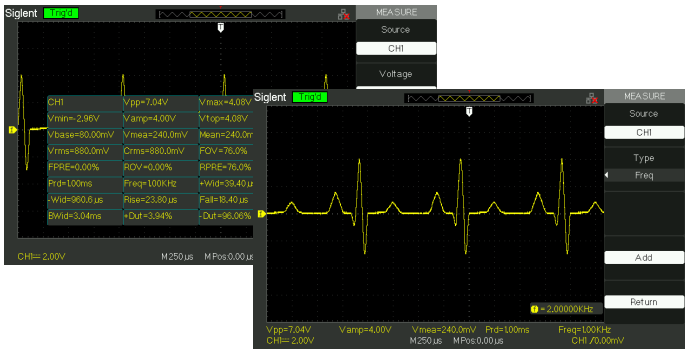
Normal Memory (40 Kpts)



Long Memory (2 Mpts)

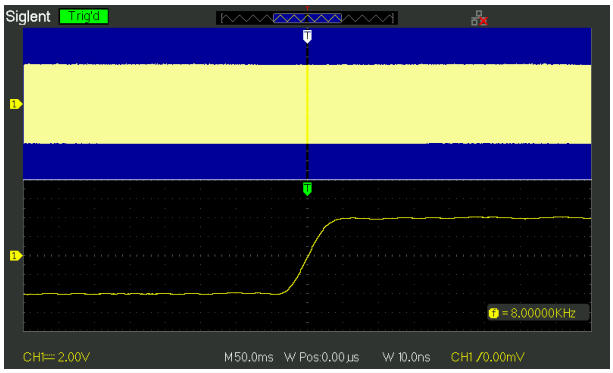
Using the long memory mode, users are able to use a higher sampling rate to capture more of the signal, and quickly zoom to focus on the area of interest.

32 parameters auto measurements and 5 parameters display



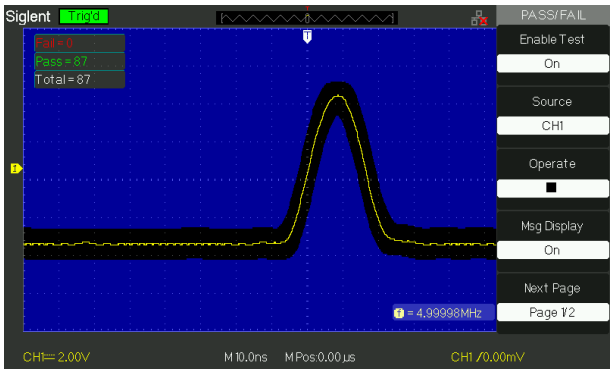
The SDS1000DL+/CML+ support voltage, time and delay measurement types, with a total of 32 different parameters. The user is able to select five measurements to display on the screen. All measurement parameters can also be displayed simultaneously.

Zoom Function



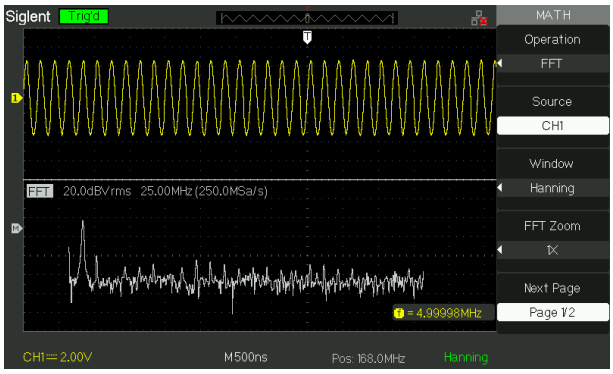
Zoom can extend a partial segment of the waveform, giving the user not only an overview of the whole signal but also a detailed view of the zoomed-in segment. The Zoom feature is a convenient way to locate a specific segment of a signal while zooming in to see the details.

Pass/Fail Function



With easy to generate user-defined test templates, the SDS1000DL+/CML+ compares the current measured trace to the template mask trace making it suitable for long-term signal monitoring or automated production line testing.

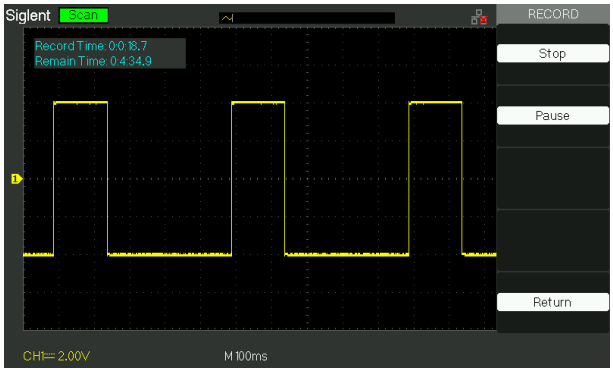
Math Function



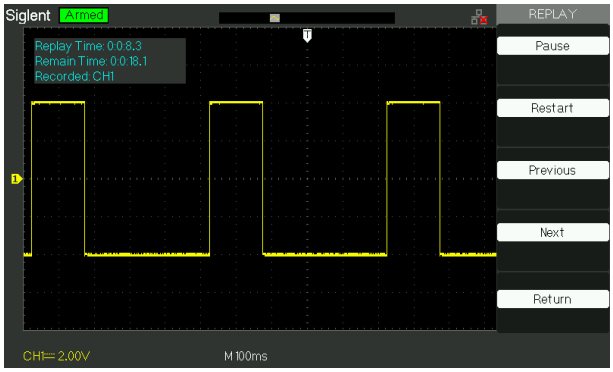
SDS1000DL+/CML+ provides 5 kinds of math operation: +, -, *, /, FFT, supporting channel waveform and FFT waveform in either split display windows or both signals appearing on the full screen.

Characteristics

Digital Recorder

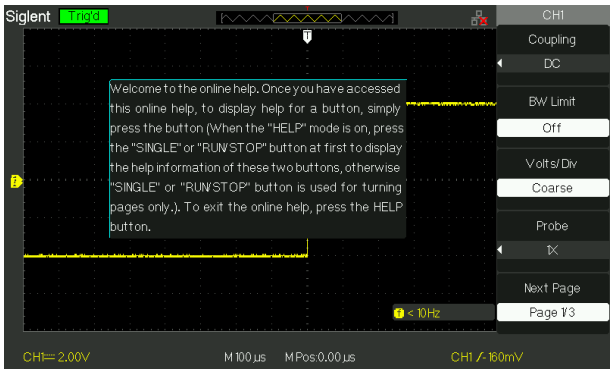


The digital recorder is able to record data in real-time and without any dead time. SDS1000DL+/CML+ supply 7 M of memory for the recorder and support a USB disk.



Replaying the data for user to observe and analyze.

Embedded Online Help



Supports Multi-language display and embedded online help, familiarizes the user with all the functions of in a short time.

Abundant interfaces

SDS1000DL+/CML+ support USB Host, USB Device (USBTMC), LAN (VXI-11), Pass / Fail.

Specifications

Acquire System	
Real-time Sampling Rate	SDS1052DL+ : 500 MSa/s SDS1072CML+/SDS1102CML+/SDS1152CML+ : 1 GSa/s
Memory Depth	SDS1052DL+ : 32 Kpts SDS1072CML+/SDS1102CML+/SDS1152CML+ : 40 Kpts (Normal Mode) ; 2 Mpts (Long Memory Mode)
Acquire Mode	Normal, Peak Detect, Average
Average	Averages: 4, 16, 32, 64, 128, 256
Waveform interpolation	Sinx,X
Input	
Channel	2
Coupling	DC, AC, GND
Impedance	DC: (1 MΩ±2%)||(18 pF ±3 pF) 50 Ω: 50 Ω±2%
Max. Input voltage	400 V , 1 MΩ
Channel Isolation	> 100:1
Probe attenuator	1 X, 10 X, 50 X, 100 X, 500 X , 1000 X

Horizontal System	
Timebase Scale	150 MHz 2.5 ns/div - 50 s/div 100 MHz 2.5 ns/div - 50 s/div 70 MHz 5.0 ns/div - 50 s/div 50 MHz 5.0 ns/div - 50 s/div
Channel Skew	<500 ps
Display Format	Y-T, X-Y, Scan
Timebase Accuracy	±50 ppm
Scan Mode	100 ms/div ~ 50 s/div
Vertical System	
Bandwidth (-3 dB)	150 MHz (SDS1152 CML+) 100 MHz (SDS1102 CML+) 70 MHz (SDS1072 CML+) 50 MHz (SDS1052 DL+)
Vertical Resolution	8 bit
Vertical Scale (Probe 1 X)	2 mV/div - 10 V/div (1-2-5)
Offset Range (Probe 1 X)	2 mV - 200 mV: ± 1.6 V; 206 mV ~ 10 V: ± 40 V
Bandwidth Limit	20 MHz ±40%
Bandwidth Flatness	DC - 10%(BW): ± 1 dB 10% - 50%(BW): ± 2 dB 50% - 100%(BW): + 2 dB/-3 dB
Low Frequency Response (AC-3 dB)	≤10 Hz (at input BNC)
Noise	STDEV≤0.6 div (≥ 5 mV/div) STDEV≤0.7 div (2 mV/div)
DC Gain Accuracy	≤ ±3.0%: 5 mV/div ~10 V/div ≤±4.0%: ≤2 mV/div
DC Measurement Accuracy	± [3%× (|reading|+|offset|) +1%×|offset| +0.2 div+2 mV] , ≤100 mV/div ±[3%× (|reading|+|offset|) +1%×|offset| +0.2 div+100 mV] , >100 mV/div
Rise time	Typical 2.3 ns (SDS1152 CML+) Typical 3.5 ns (SDS1102 CML+) Typical 5.0 ns (SDS1072 CML+) Typical 7.0 ns (SDS1052 DL+)
Overshoot (500 ps Pulse)	<10%
Trigger System	
Trigger Mode	Auto, Normal, Single
Trigger Level Range	Internal: ±6 divisions from center of screen EXT: ±1.2 V EXT/5: ±6 V
Hold off Range	100 ns ~ 1.5 s
Trigger Coupling	AC, DC, LF Rej, HF Rej
Trigger Sensitivity	1 Divisions: DC-10 MHz 1.5 Divisions: 10 MHz - Max BW
Trigger Displacement	Pre-trigger: Memory depth/ (2*sampling) Delay Trigger: 260 div
Edge Trigger	
Slope	Rising, Falling, Rising & Falling
Source	CH1/CH2/EXT/(EXT/5)/AC Line
Slope Trigger	
Slope	Rising, Falling
Limit Range	<, >, =
Source	CH1/CH2
Time Range	20 ns ~ 10 s
Pulse Trigger	
Polarity	+wid , -wid
Limit Range	<, >, =
Source	CH1/CH2
Pulse Range	20 ns - 10 s
Video Trigger	
Signal Standard	NTSC, PAL/Secam
Source	CH1/CH2
Trigger condition	odd field, even field, all lines, line num

Measure System

Source	CH1, CH2	
Measurement Parameters (32 Types)		
Vertical (Voltage)	Vmax	Highest value in input waveform
	Vmin	Lowest value in input waveform
	Vpp	Difference between maximum and minimum data values
	Vamp	Difference between top and base in a bimodal signal ,or between max and min in an unimodal signal
	Vtop	Value of most probable higher state in a bimodal waveform
	Vbase	Value of most probable lower state in a bimodal waveform
	Mean	Average of all data values
	Vmean	Average of data values in the first cycle (Condition: there is an entire period)
	Vrms	Root mean square of all data values
	Crms	Root mean square of all data values in the first cycle (Condition: there is an entire period)
	FOV	Overshoot after a falling edge; (base-min)/Amplitude
	FPRE	Overshoot before a falling edge; (max-top)/Amplitude
	ROV	Overshoot after a rising edge;(max-top)/Amplitude
	RPRE	Overshoot before a rising edge; (base-min)/Amplitude
Horizontal (Time)	Period	Period for every cycle in waveform at the 50% level ,and positive slope
	Freq	Frequency for every cycle in waveform at the 50% level, and positive slope
	+Wid	Width measured at 50% level and positive slope
	-Wid	Width measured at 50% level and negative slope
	Rise Time	Duration of rising edge from 10-90%
	Fall Time	Duration of falling edge from 90-10%
	Bwid	Time from the first rising edge to the last falling edge, or the first falling edge to the last rising edge at the 50% crossing
	+Dut	Ratio of positive width to period
	-Dut	Ratio of negative width to period
Delay	Phase	Calculates the phase difference between two edges (Condition: there is an entire period)
	FRR	Time between the first rising edges of the two channels
	FRF	Time from the first rising edge of channel A ,to the first falling edge of channel B
	FFR	Time from the first falling edge of channel A ,to the first rising edge of channel B
	FFF	Time from the first falling edge of channel A ,to the first falling edge of channel B
	LRR	Time from the first rising edge of channel A ,to the last rising edge of channel B (Condition: there is an entire period)
	LRF	Time from the first rising edge of channel A, to the last falling edge of channel B (Condition: there is an entire period)
	LFR	Time from the first falling edge of channel A, to the last rising edge of channel B (Condition: there is an entire period)
	LFF	Time from the first falling edge of channel A, to the last falling edge of channel B
Cursors	Manual mode, Track mode and Auto mode	
Counter	Hardware Counter (Resolution 1 Hz)	

Math Function

Operation	+ , - , * , / , FFT
FFT	Rectangular, Blackman, Hanning, Hamming
FFT display	Full Screen, Split

Save/Recall

Type	Setting, Waveform, Bmp, CSV
	2 refs, 20 settings, 10 waveforms internal Save to USB disk

I/O

Standard I/O	USB Host, USB Device, LAN, Pass/Fail
Pass/Fail	3.3 V TTL Output

Display (Screen)

Display Type	7 inch TFT-LCD
Display Resolution	800×480
Display Color	24 bit
Contrast (Typical)	500:1
Backlight	300 nit
Wave display range	8 x 16 div
Wave Display Mode	Dots, Vectors
Persist	Off, 1 s, 2 s, 5 s, Infinite
Menu Display	2 sec, 5 sec, 10 sec, 20 sec, Infinite
Screen-Saver	Off, 1 min, 2 min, 5 min, 10 min, 15 min, 30 min, 1 hour, 2 hour, 5 hour
Color mode	Normal , Invert
Language	English, Simplified Chinese, Traditional Chinese, Arabic, French, German, Russian, Portuguese Spanish, Japanese, Korean, Italian

Environments

Temperature	Operating: 10 ℃ ~ +40 ℃ Non-operating: -20 ℃ ~ +60 ℃
Humidity	Operating: 85% RH, 40 ℃ , 24 Hours Non-operating: 85% RH, 65 ℃ , 24 Hours
Height	Operating: ≤3000 m Non-operating: ≤15,266 m

Power Supply

Input	100 ~ 240 Vrms 50/60 Hz 100 ~ 120 Vrms 400 Hz
Power	50 W Max

Mechanical

Dimensions	Length 323.1 mm Width 135.6 mm Height 157 mm
Weight	N.W: 2.5 Kg

SDS1000DL+/CML+ Probes & Accessories

Type	Model	Picture	Specifications
Passive Probe	PB470		70 MHz Bandwidth 1 X/10 X,1 M/10 Mohm, 300 V/600 V
	PP510		100 MHz Bandwidth 1 X/10X, 1 M/10 Mohm, 300 V/600 V
	PP215		200 MHz Bandwidth 1 X/10X,1 M/10 Mohm, 300 V/600 V
Current Probe	CP4020		Bandwidth: 100 KHz, Max. continuous current: 20 Arms, Peak current: 60 A Switch Ratio: 50 mV/A, 5 mV/A, Accuracy: 50 mV/A (0.4A-10ApK)±2%, 5 mV/A (1A-60ApK) ±2%, 9 V battery source
	CP4050		Bandwidth: 1 MHz; Maximum continuous current 50 Arms; Peak current 140 A; Switching ratio: 500 mV/A; 50 mV/A; DC measurement accuracy: 500 mV/A (20 mA-14 ApK) ±3%±20 mA; 50 mV/A (200 mA-100 ApK)±4%± 200 mA; 50 mV/A (100 A-140 ApK)±15% max; 9 V battery-powered
	CP4070		Bandwidth: 150 KHz; Maximum continuous current 70 Arms; Peak current 200 A;Switching ratio: 50 mV/A; 5 mV/A; DC measurement accuracy: 50 mV/A (0.4 A-10 ApK) ±2%, ±5 mV/A (1 A-200 ApK)±2%; 9 V battery-powered
	CP4070A		Bandwidth: 300 KHz; Maximum continuous current 70 Arms; Peak current 200 A;Switching ratio: 100 mV/A;10 mV/A; DC measurement accuracy: 100 mV/A (50 mA-10 ApK) ±3%±50 mA; 10 mV/A (500 mA-40 ApK) ±4%±50 mA; 10 mV/A (40 A-200 ApK) ±15%max; 9 V battery-powered
	CP5030		Bandwidth: 50 MHz; Maximum continuous current 30 Arms; Peak current 50 A;Switching ratio: 100 mV/A, 1 V/A; AC/DC measurement accuracy: 1 A (±1%±1 mA); 100 mV/A (±1%±10 mA); Standard DC12 V/1.2 A power adapter
	CP5030A		Bandwidth: 100 MHz; Maximum continuous current 30 Arms; Peak current 50 A;Switching ratio: 100 mV/A, 1 V/A; AC/DC measurement accuracy: 1 A (±1%±1 mA); 100 mV/A (±1%±10 mA); Standard DC12 V/1.2 A power adapter
	CP5150		Bandwidth: 12 MHz; Maximum continuous current 150 Arms; Peak current 300 A;Switching ratio: 100 mV/A, 1 V/A; AC/DC measurement accuracy: 100 mV/A(±1%±1 mA); 10 mV/A (±1%±10 mA); Standard DC12 V/1.2 A power adapter
	CP5500		Bandwidth: 5 MHz; Maximum continuous current 500 Arms; Peak current750 A; Switching ratio: 100 mV/A, 10 mV/A; AC/DC measurement accuracy: 100 mV/A (±1%±1 mA); 10 mV/A (±1%±10 mA); Standard DC12 V/1.2 A power adapter
High Voltage Differential Probe	DPB4080		Bandwidth: 50 MHz; Maximum input differential voltage 800 V (DC + Peak AC); Range selection (attenuation ratio):10 X/100 X; Accuracy: ±1%; Standard DC 9 V/1 A power adapter
	DPB5150		Bandwidth: 70 MHz; Maximum input differential voltage 1500 V (DC + Peak AC); Range selection (attenuation ratio): 50 X/500 X; Accuracy: ±2%; Standard 5 V/1 A USB power adapter
	DPB5150A		Bandwidth: 100 MHz; Maximum input differential voltage 1500 V (DC + Peak AC); Range selection (attenuation ratio): 50 X/500 X; Accuracy: ±2%; Standard 5 V/1 A USB power adapter

Type	Model	Picture	Specifications
High Voltage Differential Probe	DPB5700		Bandwidth: 70 MHz; Maximum input differential voltage 7000 V (DC + Peak AC); Range selection (attenuation ratio): 100 X/1000 X; Accuracy: ±2%; Standard 5 V/1 A USB power adapter
	DPB5700A		Bandwidth: 100 MHz; Maximum input differential voltage 7000 V (DC + Peak AC); Range selection (attenuation ratio): 100 X/1000 X; Accuracy: ±2%; Standard 5 V/1 A USB power adapter
High Voltage Probe	HPB4010		Bandwidth: 40 MHz; Maximum measurement voltage DC: 10 KV; AC (rms) : 7 KV (sine) ;AC (Vpp) :20 KV (Pulse); attenuation ratio1:1000; Accuracy: ≤3%
Isolated front end	ISFE		USB 5 V power supply, plug and play, the maximum input voltage 600 Vp-p, floating test. Work with oscilloscopes.
GPIB	USB-GPIB		USB-GPIB Adapter, USB Device expanded into GPIB interface.
Demo board	STB Test Board		Optional accessories For experimental teaching and product demos

Ordering information

Description	Model
50 MHz, 2 CH, 500 MSa/s (Max.) , 32 Kpts, 7 inch (800*480) LCD	SDS1052DL+
70 MHz, 2 CH, 1 GSa/s (Max.) , 2 Mpts, 7 inch (800*480) LCD	SDS1072CML+
100 MHz, 2 CH, 1 GSa/s (Max.) , 2 Mpts, 7 inch (800*480) LCD	SDS1102CML+
150 MHz, 2 CH, 1 GSa/s (Max.) , 2 Mpts, 7 inch (800*480) LCD	SDS1152CML+
Standard Accessories	
USB Cable -1	
Quick Start -1	
Certificate of Calibration -1	
Passive Probe -2	
Quality Certificate -1	
Power Cord -1	
CD (Included User Manual and EasyScopeX software) -1	
Optional Accessories	
Isolated Front End	ISFE
STB Demo board	STB
High Voltage Probe	HPB4010
Current Probe	CP4020/CP4050/CP4070/CP4070A/CP5030/CP5030A/ CP5150/CP5500
Differential Probe	DPB4080/DPB5150/DPB5150A/DPB5700/DPB5700A

SDS1000X
SDS1000X+
Series
Digital Oscilloscope

SIGLENT®

DataSheet-2016.05

SIGLENT TECHNOLOGIES CO.,LTD

SDS1000X-E Series

Super Phosphor Oscilloscope

SIGLENT®

DataSheet-2019.05

SIGLENT TECHNOLOGIES CO.,LTD

SDS1104X-E
SDS1204X-E
SDS1202X-E

Product overview

SIGLENT's new SDS1000X-E Super Phosphor Oscilloscopes feature two channel and four channel models. The two channel model is available with a 200 MHz analog bandwidth, a single ADC with 1 GSa/s maximum sample rate, and a single memory module with 14 Mpts of sample memory. The four channel scope is available in 100 and 200 MHz models and incorporates two 1 GSa/s ADCs and two 14 Mpts memory modules. When all channels are enabled, each channel has sample rate of 500 MSa/s and a standard record length of 7 Mpts. When only a single channel per ADC is active, the maximum sample rate is 1 GSa/s and the maximum record length is 14 Mpts. For ease-of-use, the most commonly used functions can be accessed with its user-friendly front panel design.

The SDS1000X-E series employs a new generation of SPO (Super-Phosphor Oscilloscope) technology that provides excellent signal fidelity and performance. The system noise is also lower than similar products in the industry. It comes with a minimum vertical input range of 500 uV/div, an innovative digital trigger system with high sensitivity and low jitter, and a waveform capture rate of 400,000 frames/sec (sequence mode). The SDS1000X-E also employs a 256-level intensity grading display function and a color temperature display mode not found in other models in this class. SIGLENT's latest oscilloscope offering supports multiple powerful triggering modes including serial bus triggering. Serial bus decoding for IIC, SPI, UART, CAN, LIN bus types are included. The X-E models also include History waveform recording, and sequential triggering that enable extended waveform recording and analysis. Another powerful addition is the new 1 million points FFT math function that gives the SDS1000X-E very high frequency resolution when observing signal spectra. The new digital design also includes a hardware co-processor that delivers measurements quickly and accurately without slowing acquisition and front-panel response. The features and performance of SIGLENT's new SDS1000X-E cannot be matched anywhere else in this price class.

The four channel series support even more functions, including: searching and navigating, on-screen Bode plot, 16 digital channels (Option), an external USB powered 25 MHz AWG module (Option), a USB WIFI adapter (Option), and an embedded application that allows remote control via web browser.

Key Features

- 100 MHz, 200 MHz bandwidth models
- Two channel series have one 1 GSa/s ADC, four channel series have two 1 GSa/s ADCs. When all channels are enabled, each channel has a maximum sample rate of 500 MSa/s. When a single channel per ADC is active, it has sample rate of 1 GSa/s
- The newest generation of SPO technology
  - Waveform capture rate up to 100,000 wfm/s (normal mode), and 400,000 wfm/s (sequence mode)
  - Supports 256-level intensity grading and color display modes
  - Record length up to 14 Mpts
  - Digital trigger system
- Intelligent trigger: Edge, Slope, Pulse Width, Window, Runt, Interval, Time out (Dropout), Pattern
- Serial bus triggering and decoding (Standard), supports protocols IIC, SPI, UART, CAN, LIN
- Video trigger, supports HDTV
- Low background noise with voltage scales from 500 μV/div to 10 V/div
- 10 types of one-button shortcuts, supports Auto Setup, Default, Cursors, Measure, Roll, History, Display/Persist, Clear Sweep, Zoom and Print
- Segmented acquisition (Sequence) mode, divides 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 segment to capture the qualifying event.
- History waveform record (History) function, maximum recorded waveform length is 80,000 frames.
- Automatic measurement function for 38 parameters as well as Measurement Statistics, Zoom, Gating, Math, History and Reference functions
- 1 Mpts FFT, four-channel series support Peaks, Markers, a variety of numbers
- Math and measurement functions use all sampled data points (up to 14 Mpts)
- Math functions (FFT, addition, subtraction, multiplication,division, integration, differential, square root)
- Preset key can be customized for user settings or factory "defaults"
- Security Erase mode
- High Speed hardware based Pass/Fail function
- MSO, 16 digital channels (four channel series only, option)
- Bode plot, Measuring Power Supply Control Loop Response (four-channel series only)
- Search and navigate (four channel series only)
- USB AWG module (four channel series only, option)
- USB WIFI adapter (four channel series only, option)
- Web Browser based control (four channel series only)
- Large 7 inch TFT -LCD display with 800 * 480 resolution
- Multiple interface types: USB Host, USB Device (USB-TMC), LAN, Pass / Fail, Trigger Out
- Supports SCPI remote control commands
- VXI-11+SCPI, Telnet(Port 5024)+SCPI and Socket(Port 5025)+SCPI programming over LAN
- Supports web control and virtual panel for both PC and mobile terminals
- Web update rate of up-to 10times/s provides nearly real-time updating with SDS1000X-E(four channel series only)
- Supports Multi-language display and embedded online help

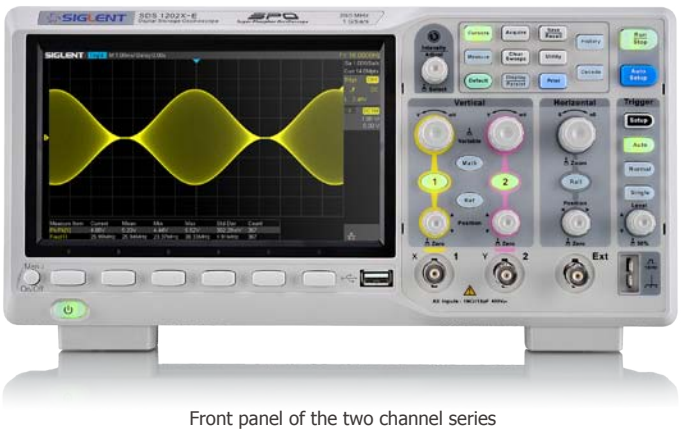
Models and key Specification

Model	SDS1104X-E	SDS1204X -E SDS1202X-E
Bandwidth	100 MHz	200 MHz
Sampling Rate (Max.)	Two channel series have a single 1 GSa/s ADC, four channel series have two 1 GSa/s ADCs. When all channels are enabled, each channel has a maximum sample rate of 500 MSa/s. When a single channel per pair is active, that channel has sample rate of 1 GSa/s	
Channels	4 (four channel series) 2+EXT (two channel series)	
Memory Depth (Max.)	7 Mpts/CH (not interleave mode); 14 Mpts/CH (interleave mode)	
Waveform Capture Rate (Max.)	100,000 wfm/s (normal mode), 400,000 wfm/s (sequence mode)	
Trigger Type	Edge, Slope, Pulse Width, Window, Runt, Interval, Dropout, Pattern, Video	
Serial Trigger and decoder (Standard)	IIC, SPI, UART, CAN, LIN	
16 Digital Channels (four channel series only, option)	Maximum waveform capture rate up to 1 GSa/s, Record length up to 14 Mpts/CH	
USB AWG module (four channel series only, option)	One channel, 25 MHz, sample rate of 125 MHz, wave length of 16 kpts	
Bode plot (four channel series only)	Minimum start frequency of 10 Hz, minimum scan bandwith of 500 Hz, maximum scan bandwidth of 120 MHz (dependent on Oscilloscope and AWG bandwidth), 500 maximum scan frequency points	
USB WIFI adapter (four channel series only, option)	802.11b/g/n, WPA-PSK, the adapter must be supplied by Siglent to ensure working	
I/O	USB Host, USB Device, LAN, Pass/Fail, Trigger Out, Sbus (Siglent MSO)	
Probe (Std)	4 pcs passive probe PP510	4/2 pcs passive probe PP215
Display	7 inch TFT -LCD (800x480)	
Weight	Four channel series: Without package 2.6 kg; With package 3.8 kg Two channel series: Without package 2.5 kg; With package 3.5 kg	

Function & Characteristics

7 inch TFT-LCD display and 10 one-button menus

Front panel of the four channel series



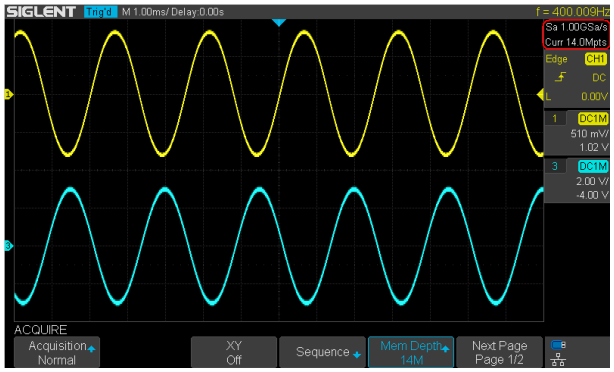
Front panel of the two channel series

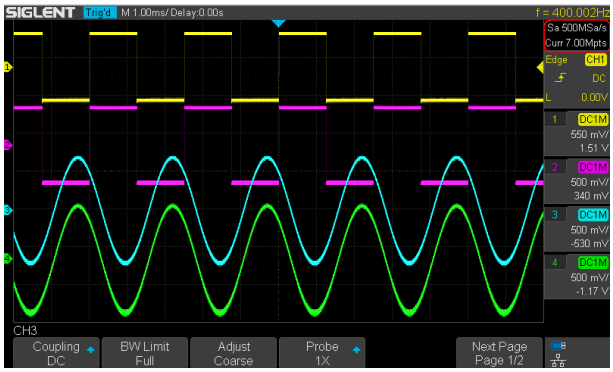
• 7 -inch TFT -LCD display with 800 * 480 resolution

• Most commonly used functions are accessible using 10 different one-button operation keys: Auto Setup, Default, Cursor, Measure, Roll, History, Persist, Clear Sweep, Zoom, Print

Function & Characteristics

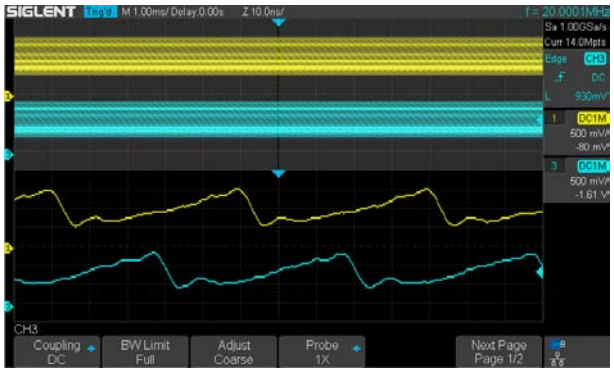
When all channels are enabled, each channel has a maximum sample rate of 500 MSa/s. When a single channel per pair is active, that channel has sample rate of 1 GSa/s





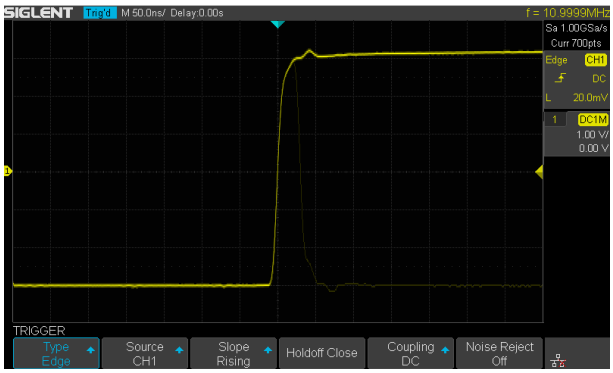
The four channel series has two 1 GSa/s ADC chips (channel 1 and 2 share one, channel 3 and 4 share another), so that each channel can achieve sample rates up to 500 MSa/s and work on bandwidths of 200 MHz when all channels are enabled.

Record Length of up to 14 Mpts (single channel/ pair mode), 7 Mpts/CH (two channels/pair mode)



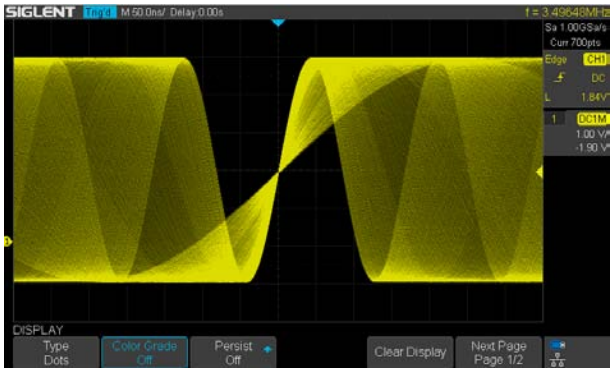
Using hardware-based Zoom technologies and max record length of up to 14 Mpts, users are able to oversample to capture for longer time periods at higher resolution and use the zoom feature to see more details within each signal.

Waveform Capture Rate up to 400,000 wfm/s

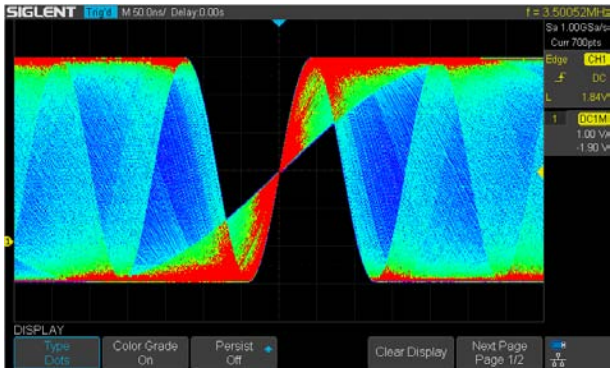


With a waveform capture rate of up to 400,000 wfm/s (sequence mode), the oscilloscope can easily capture the unusual or low-probability events.

256 -Level Intensity Grading and Color Temperature Display

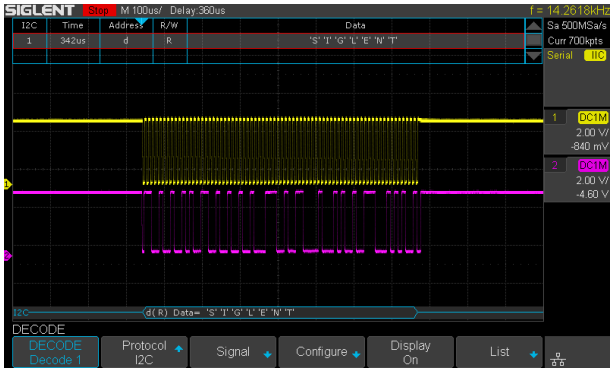


SPO display technology provides fast refresh rates. The resulting intensity-graded trace is brighter for events that occur with more frequency and dims when the events occur with less frequency.



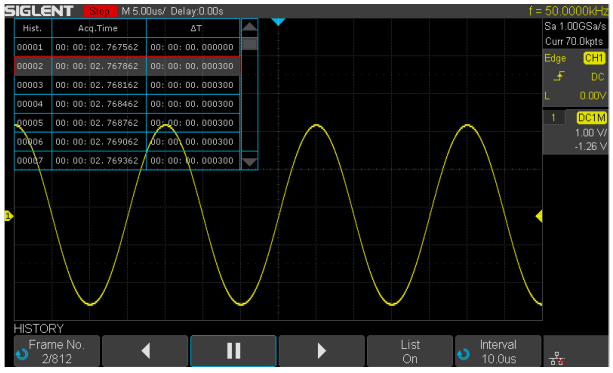
The color temperature display is similar to the intensity-graded trace function, but the trace occurrence is represented by different colors (color "temperature") as opposed to changes in the intensity of one color. Red colors represents the more frequent events, while blue is used to mark points that occur lest frequently.

Serial Bus Decoding Function (Standard)



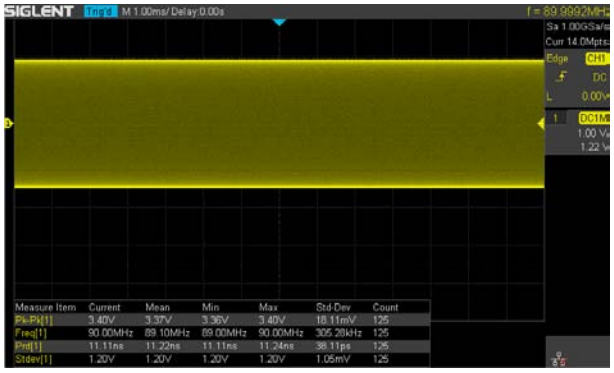
SDS1000X-E displays the decoding through the events list. Bus protocol information can be quickly and intuitively displayed in a tabular format.

History Waveforms (History) Mode and Segmented Acquisition (Sequence)



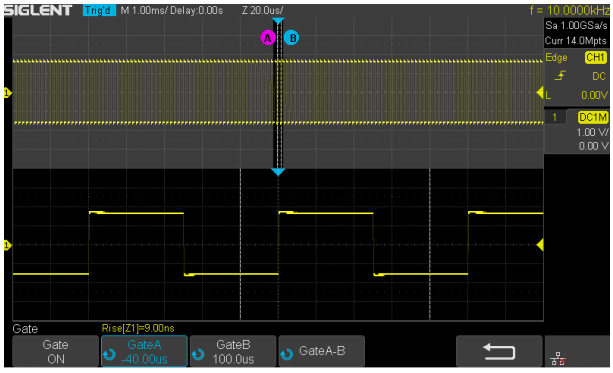
Playback the latest triggered events using the history function. Segmented memory collection will store trigger events into multiple (Up to 80,000) memory segments, each segment will store triggered waveforms and timestamp of each frame.

True measurement to 14 M points



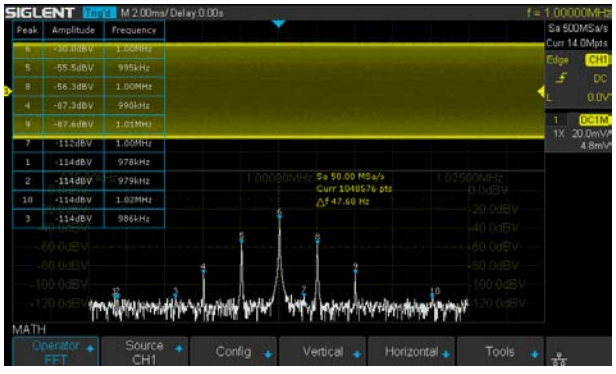
SDS1004X-E can measure all sampled data points up to 14 Mpts. This ensures the accuracy of measurements while the math co-processor decreases measurement time and increases ease-of-use.

Gate and Zoom Measurement



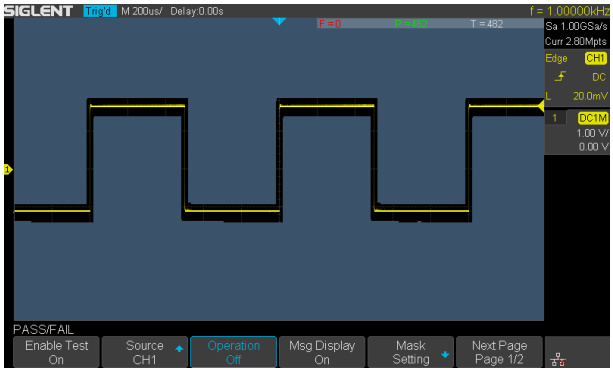
Through Gate and Zoom measurement, the user can specify an arbitrary interval of waveform data analysis and statistics. This helps avoid measurement errors that can be caused by invalid or extraneous data, greatly enhancing the measurements' validity and flexibility.

1 M point used to calculate the FFT



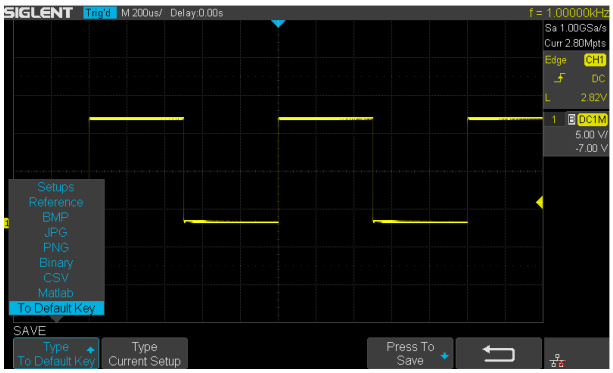
The new math co-processor enables FFT analysis of incoming signals using up to 1 M samples per waveform. This provides high frequency resolution with a fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs. Four-channel series support Peaks, Markers, a variety of numbers.

Hardware-Based High Speed Pass/ Fail function



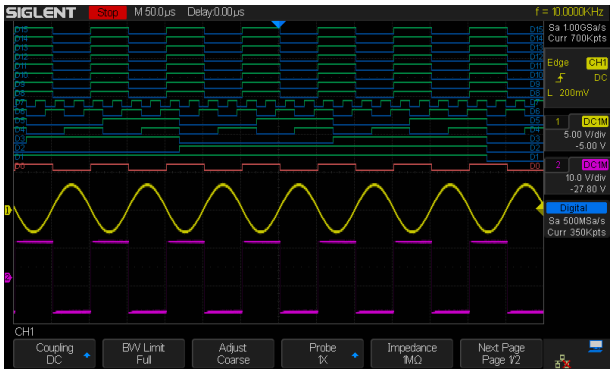
The SDS1000X-E utilizes a hardware-based Pass/Fail function, performing up to 40,000 Pass / Fail decisions each second. Easily generate user defined test templates provide trace mask comparison making it suitable for long-term signal monitoring or automated production line testing.

Customizable Default Key



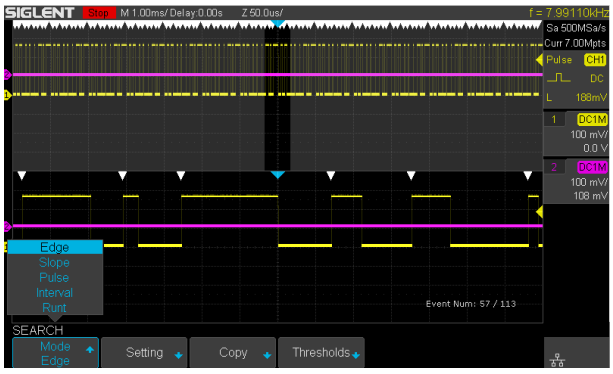
The current parameters of the oscilloscope can be preset to Default Key through the Save menu.

16 Digital Channels/MSO (four channel series only, option)



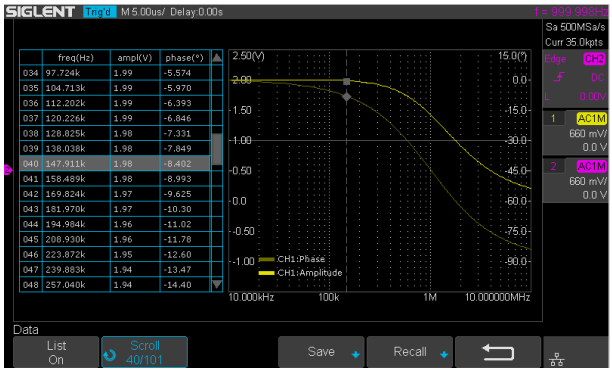
16 digital channels enables users to acquire and trigger on the waveforms then analyze the pattern, simultaneously with one instrument.

Search and Navigate (four channel series only)



The SDS1000X-E can search events specified by the user in a frame. It can also navigate by time (delay position) and historical frames.

Bode Plot (four channel series only)



SDS1000X-E can control the USB AWG module or control an independent SIGLENT SDG instrument, scan a devices amplitude and phase frequency response, and display the data as a Bode Plot. There is also a Vari-level Mode for accurately measuring Power Supply Control Loop Response (PSRR). It can also show the result lists, and export the data to a USB disk.

USB WIFI Adapter (four channel series only, option)

USB WIFI Adapter

WiFi control of instrumentation can provide a convenient and safe method of configuring and collecting data. This new feature works with a SIGLENT approved WiFi adapter to provide wireless control and communications with SIGLENT 4 channel scopes. The adapter must be supplied by Siglent to ensure working.

USB 25 MHz AWG Module (four channel series only, option)

The four channel series supports a USB 25 MHz function/arbitrary waveform generator that is operated from the USB host connection. Functions include Sine, Square, Ramp, Pulse, Noise, DC and 45 built-in waveforms. The arbitrary waveforms can be accessed and edited by the SIGLENT EasyWave PC software.

Web control (four channel series only)

With the new embedded web server, users can control the SDS1xx4X-E from a simple web page. This provides wonderful remote troubleshooting and monitoring capabilities. The web page has PC and mobile styles that include an embedded virtual control panel

Real-time update screen in web page (four channel series only)

With 100 Mbps LAN connection, the web page can update the waveforms at a rate of up to 10 times/s. The new information on SDS1000X-E can be updated to web page in real-time, including waveform data and measurements. When viewed on a PC, the screen can be displayed in full screen mode. With this feature and a PC VGA interface, you can easily use a projector or other video display device to deliver the screen information to a larger audience.

Complete Connectivity

Back panel of the four channel series

Back panel of the two channel series

SDS1000X -E supports USB Host, USB Device (USB -TMC), LAN(VXI -11), Pass/Fail and Trigger Out

Specifications

Acquire System	
Sampling Rate	1 GSa/s (single channel/pair), 500 MSa/s (two channels/pair)
Memory Depth	Max 14 Mpts/Ch (single channel/pair), 7 Mpts/Ch (two channels/pair)
Peak Detect	2 ns (Four channel series)
	4 ns (Two channel series)
Average	Averages:4, 16, 32, 64, 128, 256, 512, 1024
Eres	Enhance bits:0.5, 1.5, 2, 2.5, 3
Waveform interpolation	Sin(x)/x, Linear

Input	
Channels	4 (Four channel series) 2+EXT (Two channel series)
Coupling	DC, AC, GND
Impedance	DC: (1 MΩ±2%) || (15 pF ±2 pF) (Four channel series) DC: (1 MΩ±2%) || (18 pF ±2 pF) (Two channel series)
Max.Input voltage	1 MΩ: ≤400 Vpk(DC + Peak AC <=10 kHz)
CH to CH Isolation	DC-Max BW: >40 dB
Probe attenuation	0.1X, 0.2X, 0.5X, 1X, 2X, 5X, 10X……1000X, 2000X, 5000X, 10000X

Vertical System	
Bandwidth (-3 dB)	200 MHz (SDS1204X-E/SDS1202X-E) 100 MHz (SDS1104X-E)
Vertical Resolution	8-bit
Vertical Scale (Probe 1X)	500 μV/div - 10 V/div (1-2-5 sequence)
Offset Range (Probe 1X)	500uV~118mV: ±2V
	120mV~1.18V: ±20V
	1.2V~10V: ±200V
Bandwidth Limit	20 MHz ±40%
Bandwidth Flatness	DC- 10% (BW): ± 1 dB
	10%- 50% (BW): ± 2 dB
	50%- 100% (BW): + 2 dB/-3 dB
Low Frequency Response (AC -3 dB)	≤2 Hz (at input BNC)
Noise	ST-DEV ≤0.5 division (<1 mV/div)
	ST-DEV ≤0.2 division (<2 mV/div)
	ST-DEV ≤0.1 division (≥2 mV/div)
SFDR including harmonics	≥35 dB
DC Gain Accuracy	≤±3.0%: 5 mV/div-10 V/div
	≤±4.0%: ≤2 mV/div
Offset Accuracy	±(1%* Offset+1.5%*8*div+2 mV): ≥2 mV/div
	±(1%* Offset+1.5%*8*div+500 uV): ≤1 mv/div
Risetime	Typical 1.8 ns (SDS1204X-E/SDS1202X-E)
	Typical 3.5 ns (SDS1104X-E)
Overshoot (500 ps Pulse)	<10%

Horizontal System	
Timebase Scale	1.0 ns/div-100 s/div
Channel Skew	<100 ps
Waveform Capture Rate	Up to 100,000 wfm/s (normal mode), 400,000 wfm/s (sequence mode)
Intensity grading	256 Levels
Display Format	Y-T, X-Y,Roll
Timebase Accuracy	±25 ppm
Roll Mode	50 ms/div-100 s/div (1-2-5 sequence)

Trigger System	
Trigger Mode	Auto, Normal, Single
Trigger Level	Internal: ±4.5 div from the center of the screen
	EXT: ±0.6 V (Two channel series)
	EXT/5: ±3 V (Two channel series)
Holdoff Range	80 ns- 1.5 s
Trigger Coupling	AC DC LFRJ HFRJ Noise RJ
Coupling Frequency Response	DC: Passes all components of the signal
	AC: Blocks DC components and attenuates signals below 8 Hz
	LFRJ: Blocks the DC component and attenuates the low-frequency components below 2 MHz
	HFRJ: Attenuates the high-frequency components above 1.2 MHz
Coupling Frequency Response (EXT, Two channels series)	DC: Passes all components of the signal
	AC: Blocks DC components and attenuates signals below 20 Hz
	LFRJ: Blocks the DC components and attenuates low-frequency components below 7 khz
	HFRJ: Attenuates high-frequency components above 160 khz
Trigger Accuracy (typical)	Internal: ±0.2 div
	EXT (Two channel series): ±0.4 div
Trigger Sensitivity	DC - Max BW 0.6 div
	EXT (Two channel series): 200 mVpp DC– 10 MHz
	300 mVpp 10 MHz - BW frequency
	EXT/5 (Two channel series): 1 Vpp DC – 10 MHz
	1.5 Vpp 10 MHz -BW frequency
Trigger Jitter	< 100 ps
Trigger Displacement	Pre-Trigger: 0 - 100% Memory
	Delay Trigger: 0 to 10,000 div
Edge Trigger	
Slope	Rising, Falling, Rising&Falling
Source	All channels/ EXT/ (EXT/5)/ AC Line (Two channel series) All channels/ AC Line (Four channel series)
Slope Trigger	
Slope	Rising, Falling
LimitRange	<, >, <>, ><
Source	All channels
TimeRange	2 ns- 4.2 s
Resolution	1 ns

Pulse Trigger	
Polarity	+wid , -wid
Limit Range	< , > , <> , ><
Source	All channels
Pulse Range	2 ns ～ 4.2 s
Resolution	1 ns
Video Trigger	
Signal Standard	NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom
Source	All channels
Sync	Any, Select
Trigger condition	Line, Field
Window Trigger	
Window Type	Absolute, Relative
Source	All channels
Interval Trigger	
Slope	Rising, Falling
Limit Range	< , > , <> , ><
Source	All channels
Time Range	2 ns ～ 4.2 s
Resolution	1 ns
Dropout Trigger	
Timeout Type	Edge, State
Source	All channels
Slope	Rising, Falling
Time Range	2 ns ～ 4.2 s
Resolution	1 ns
Runt Trigger	
Polarity	+wid , -wid
Limit Range	< , > , <> , ><
Source	All channels
Time Range	2 ns ～ 4.2 s
Resolution	1 ns
Pattern Trigger	
Pattern Setting	Invalid, Low, High
Logic	AND, OR, NAND, NOR
Source	All channels
Limit Range	< , > , <> , ><
Time Range	2 ns ～ 4.2 s
Resolution	1 ns

Serial Trigger	
I2C Trigger	
Condition	Start, Stop, Restart, No Ack, EEPROM, 7 bits Address & Data, 10 bits Address & Data, Data Length
Source (SDA/SCL)	All channels
Data format	Hex
Limit Range	EEPROM: =, >, <
Data Length	EEPROM: 1 byte Addr & Data: 1 ~ 2 byte Data Length: 1 ~ 12 byte
R/W bit	Addr & Data: Read, Write, Do not care
SPI Trigger	
Condition	Data
Source (CS/CL/Data)	All channels
Data format	Binary
Data Length	4 ~ 96 bit
Bit Value	0, 1, X
Bit Order	LSB, MSB
UART Trigger	
Condition	Start, Stop, Data, Parity Error
Source (RX/TX)	All channels
Data format	Hex
Limit Range	=, >, <
Data Length	1 byte
Data Width	5 bit, 6 bit, 7 bit, 8 bit
Parity Check	None, Odd, Even
Stop Bit	1 bit, 1.5 bit, 2 bit
Idle Level	High, Low
Baud Rate (Selectable)	600/1200/2400/4800/960019200/38400/57600/115200 bit/s
Baud Rate (Custom)	300 bit/s ~ 5000000 bit/s
CAN Trigger	
Condition	Start Remote, ID, ID + Data, Error
Source	All channels
ID	STD (11 bit), EXT (29 bit)
Data Format	Hex
Data Length	1~2 byte
Baud Rate	5 k/10 k/20 k/50 k/100 k/125 k/250 k/500 k/800 k/1 M bit/s
LIN Trigger	
Condition	Break, Frame ID, ID+Data, Error
Source	All channels
ID	1 byte
Data Format	Hex
Data Length	1 ~ 2 byte
Baud Rate (Selectable)	600/1200/2400/4800/9600/19200 bit/s
Baud Rate (Custom)	300 bit/s ~ 20 kbit/s

Serial Decoder	
Number of Decoders	2
I2C Decoder	
Signal	SCL, SDA
Address	7 bits, 10 bits
Threshold	-4.5 ~ 4.5 div
List	1 ~ 7 lines
SPI Decoder	
Signal	SCL,MISO, MOSI, CS (2 channel scopes can only use 2 signal identifiers)
Edge Select	Rising, Falling
Bit Order	MSB, LSB
Threshold	-4.5 ~ 4.5 div
List	1 ~ 7 lines
UART Decoder	
Signal	RX, TX
Data Width	5 bit，6 bit，7 bit，8 bit
Parity Check	None, Odd, Even
Stop Bit	1 bit, 1.5 bit, 2 bit
Idle Level	Low, High
Threshold	-4.5 ~ 4.5 div
List	1 ~ 7 lines
CAN Decoder	
Signal	CAN_H, CAN_L
Source	CAN_H, CAN_L, CAN_H-CAN_L
Threshold	-4.5 ~ 4.5 div
List	1 ~ 7 lines
LIN Decoder	
LIN Specification Package Revision	Ver1.3, Ver2.0
Threshold	-4.5 ~ 4.5 div
List	1 ~ 7 lines

Measurement		
Source	All channels, All channels in Zoom, Math, All References, History	
Number of Measurements	Display 4 measurements at the same time . 5 measurements displayed in statistics table.	
Measurement Range	Screen region, Gate region	
Measurement Parameters (38 Types)		
Vertical (Voltage)	Max	Highest value in input waveform
	Min	Lowest value in input waveform
	Pk-Pk	Difference between maximum and minimum data values
	Ampl	Difference between top and base in a bimodal signal, or between max and min in an unimodal signal
	Top	Value of most probable higher state in a bimodal waveform
	Base	Value of most probable lower state in a bimodal waveform
	Mean	Average of all data values
	Cmean	Average of data values in the first cycle
	Stdev	Standard deviation of all data values
	Cstd	Standard deviation of all data values in the first cycle
	VRMS	Root mean square of all data values
	Crms	Root mean square of all data values in the first cycle
	FOV	Overshoot after a falling edge; (base-min)/Amplitude
	FPRE	Overshoot before a falling edge; (max-top)/Amplitude
	ROV	Overshoot after a rising edge; (max-top)/Amplitude
	RPRE	Overshoot before a rising edge; (base-min)/Amplitude
	Level@X	the voltage value of the trigger point
Horizontal (Time)	Period	Time between the middle threshold points of two consecutive, like-polarity edges
	Freq	Reciprocal of period
	+Wid	Time difference between the 50% threshold of a rising edge to the 50% threshold of the next falling edge of the pulse
	-Wid	Time difference between the 50% threshold of a falling edge to the 50% threshold of the next rising edge of the pulse
	Rise Time	Duration of rising edge from 10-90%
	Fall Time	Duration of falling edge from 90-10%
	Bwid	Time from the first rising edge to the last falling edge, or the first falling edge to the last rising edge at the 50% crossing
	+Dut	Ratio of positive width to period
	-Dut	Ratio of negative width to period
	Delay	Time from the trigger to the first transition at the 50% crossing
	Time@Level	Time from the trigger to each rising edge at the 50% crossing. When Statistics is Off, it shows the time from the trigger to the last rising edge at the 50% crossing. When Statistics is On, it shows the Current, Mean, Min, Max, Standard Deviation of time from the trigger to each rising edge at the 50% crossing in multiple frames (number = Count).
Delay	Phase	Phase difference between two edges
	FRR	Time from the first rising edge of channel A to the following first rising edge of channel B
	FRF	Time from the first rising edge of channel A to the following first falling edge of channel B
	FFR	Time from the first falling edge of channel A to the following first rising edge of channel B
	FFF	Time from the first falling edge of channel A to the following first falling edge of channel B
	LRR	Time from the first rising edge of channel A to the last rising edge of channel B
	LRF	Time from the first rising edge of channel A to the last falling edge of channel B
	LFR	Time from the first falling edge of channel A to the last rising edge of channel B
	LFF	Time from the first falling edge of channel A to the last falling edge of channel B
	Skew	Time of source A edge minus time of nearest source B edge

Measurement	
Cursors	Manual : Time X1, X2, (X1-X2), (1/ΔT) Voltage Y1, Y2, (Y1-Y2) Track: Time X1, X2, (X1-X2)
Statistics	Current, Mean, Min, Max, Stdev, Count
Counter	Hardware 6 bit 6-digit counter (channels are selectable)

Math Function	
Operation	+ , - , * , / , FFT , d/dt , ∫dt , √
FFT window	Rectangular, Blackman, Hanning, Hamming, Flattop
FFT display	Full Screen, Split, Exclusive

USB AWG Module (four channel series only, option)	
Channel	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 ~ +1.5 V (50Ω load)
	-3 ~ +3 V (High-Z load)
Waveform Type	Sine, Square, Ramp, Pulse, Noise, DC and 45 built-in waveforms
Output impedance	50 Ω±2%
Protection	Over-Voltage Protection, Current-Limiting Protection
Sine	
Frequency	1 μHz ~ 25 MHz
Offset Accuracy (10 kHz)	±(1%*Offset Setting Value +3 mVpp)
Amplitude flatness (10 kHz, 5 Vpp)	±0.3 dB
SFDR	DC ~ 1 MHz -60 dBc
	1 MHz ~ 5 MHz -55 dBc
	5 MHz ~ 25 MHz -50 dBc
HD	DC ~ 5 MHz -50 dBc
	5 MHz ~ 25 MHz -45 dBc
Square/Pulse	
Frequency	1 μHz ~ 10 MHz
Duty Cycle	1% ~ 99%
Rise/Fall time	< 24 ns (10% ~ 90%)
Overshoot (1 kHz,1 Vpp, Typical)	< 3% (typical 1 kHz, 1 Vpp)
Pulse Width	> 50 ns
Jitter	< 500 ps + 10 ppm
Ramp	
Frequency	1 μHz ~ 300 kHz
Linearity (Typical)	< 0.1% of Pk-Pk (Typical, 1 kHz, 1 Vpp, 50% Symmetry)
Symmetry	0% ~ 100%

DC	
Offset range	±1.5 V (50 Ω load)
	±3 V (High-Z load)
Accuracy	±(|offset|*1%+3 mV)
Noise	
Bandwidth	>25 MHz (-3 dB)
Arbitrary Wave	
Frequency	1 μHz ~ 5 MHz
Wave Length	16 kpts
Sampling Rate	125 MSa/s
Lead in	EasyWave and U-Disk
Digital Channels (four channel series only, option)	
No. of Channels	16
Max. Sampling Rate	1 GSa/s
Memory Depth	14 Mpts/CH
Min. Detectable Pulse Width	4 ns
Level Group	D0~D7, D8~D15
Level Range	-8 V ~ 8 V
Logic Type	TTL, CMOS, LVCMOS3.3, LVCMOS2.5, custom
Skew	D0~D15: ±1 sampling interval Digital to Analog: ± (1 sampling interval +1 ns)
I/O	
Standard	USB Host (1 for two channel series, and 2 for four channel series), USB Device, LAN, Pass/Fail, Trigger Out
Pass/Fail	3.3 V TTL Output
Display (Screen)	
Display Type	7-inch TFT LCD
Display Resolution	800×480
Display Color	24 bit
Contrast (Typical)	500:1
Backlight	300 nit
Range	8 x 14 divisions
Display (Waveform)	
Display Mode	Dot, Vector
Persist Time	Off, 1 Sec, 5 Sec, 10 Sec, 30 Sec, Infinite
Color Display	Normal, Color
Screen Saver	1 min, 5 min, 10 min, 30 min, 1 hour, Off
Language	Simplified Chinese, Traditional Chinese, English, French, Japanese, Korean, German, Russian, Italian, Portuguese

Environments	
Temperature	Operating: 10℃ ~ +40℃
	Non-operating: -20℃ ~ +60℃
Humidity	Operating: 85% RH, 40℃ , 24 hours
	Non-operating: 85% RH, 65℃ , 24 hours
Height	Operating: ≤3000 m
	Non-operating: ≤15,266 m
Compliance	LVD IEC 61010-1:2010
	EMC EN61326-1:2013

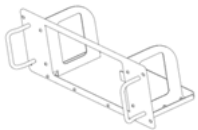
Power Supply	
Input Voltage	100 - 240 Vrms (± 10%), 50 / 60 Hz 100 - 120 Vrms (± 10%), 400 Hz
Power	50W Max(Four channel series) 25W Max(Two channel series)

Mechanical (Four channel series)	
Dimensions	Length: 312 mm
	Width: 132.6 mm
	Height: 151 mm
Weight	N.W: 2.6 kg; G.W: 3.8 kg

Mechanical (Two channel series)	
Dimensions	Length: 312 mm
	Width: 134 mm
	Height: 150 mm
Weight	N.W: 2.5 kg; G.W: 3.5 kg

Probes and Accessories

Probe	Model	Picture	Description
Passive	PP510		Bandwidth: 100 MHz, 1X/10X, 1M/10 Mohm,300 V/600 V
	PP215		Bandwidth: 200 MHz, 1X/10X, 1M/10 Mohm, 300 V/600 V
Current Probe	CP4020		Bandwidth: 100 KHz, Max. continuous current: 20 Arms, Peak current: 60 A Switch Ratio: 50 mV/A, 5 mV/A, Accuracy: 50 mV/A (0.4 A-10 Apk)±2%, 5 mV/A (1 A-60 Apk) ±2%, 9 V battery source
	CP4050		Bandwidth: 1 MHz, Max. continuous current: 50 Arms, Peak current: 140 A Switch Ratio: 500 mV/A, 50 mV/A Accuracy: 500 mV/A (20 mA-14 ApK)±3% ±20 mA , 50 mV/A (200 mA-100 ApK) ±4%±200 mA, 50 mV/A (100 A-140 ApK) ±15% max, 9V battery source
	CP4070		Bandwidth: 150 KHz, Max. continuous current: 70 Arms, Peak current: 200 A Switch Ratio: 50 mV/A, 5 mV/A, Accuracy: 50 mV/A (0.4 A-10 ApK)±2% , 5 mV/A (1 A-200 ApK) ±2%, 9V battery source
	CP4070A		Bandwidth: 300 KHz, Max. continuous current: 70 Arms, Peak current: 200 A Switch Ratio: 100 mV/A, 10 mV/A, Accuracy: 100 mV/A (50 m A-10 ApK)±3%±50 mA , 10 mV/A (500 mA-40 ApK)±4%±50 mA, 10 mV/A (40 A-200 ApK)±15% max, 9 V battery source
	CP5030		Bandwidth: 50 MHz, Max. continuous current: 30 Arms, Peak current: 50 A Switch Ratio: 100 mV/A, 1 V/A, Accuracy: 1 V/A (±1%±1 mA), 100 mV/A (±1%±10 mA), DC 12 V/ 1.2 A power adapter
	CP5030A		Bandwidth: 100 MHz, Max. continuous current: 30 Arms, Peak current: 50 A Switch Ratio: 100 mV/A, 1 V/A, Accuracy: 1 V/A (±1%±1 mA), 100 mV/A (±1%±10 mA), DC 12V/1.2A power adapter
	CP5150		Bandwidth: 12 MHz, Max. continuous current: 150 Arms, Peak current: 300 A Switch Ratio: 100 mV/A, 10 mV/A, Accuracy: 100 mV/A (±1%±10 mA), 10 mV/A (±1%±100 mA), DC 12 V/1.2 A power adapter
	CP5500		Bandwidth: 5 MHz, Max. continuous current: 500 Arms, Peak current: 750 A Switch Ratio: 100 mV/A, 10 mV/A, Accuracy: 100 mV/A (±1%±10 mA), 10 mV/A (±1%±100 mA), DC 12 V/1.2 A power adapter
Differential Probe	DPB4080		Bandwidth: 50 MHz, Differential Range: 800 V (DC + Peak AC), 100 X/200 X/500 X/1000 X, Accuracy: ±1%, DC 9 V/1 A power adapter

Probe	Model	Picture	Description
Differential Probe	DPB5150		Bandwidth: 70 MHz, Differential Range: 1500 V (DC + Peak AC),50 X/500 X Accuracy: ±2%, DC 5 V/1 A USB adapter
	DPB5150A		Bandwidth: 100 MHz, Differential Range: 1500 V (DC + Peak AC), 50X/500X , Accuracy: ±2% DC 5 V/1 A USB adapter
	DPB5700		Bandwidth: 70 MHz, Differential Range: 7000 V (DC + Peak AC), 100X/1000X , Accuracy: ±2%, DC 5 V/1 A USB adapter
	DPB5700A		Bandwidth: 100 MHz Differential Range: 7000 V (DC + Peak AC), 100X/1000X Accuracy: ±2% DC 5 V/1 A USB adapter
High Voltage	HPB4010		Bandwidth: 40 MHz Differential Range: DC 10 KV, AC (rms): 7 KV (sine), AC (Vpp): 20 KV (Pulse) 1000X Accuracy: ≤3%
Isolated front end	ISFE		The USB Device interface allows a connection into the GPIB interface. USB-GPIB adapter allows the oscilloscope to easily send and receive commands through the GPIB. USB follows the USB2.0 specification. GPIB follows the IEEE488.2 standard.
Demo Board	STB-3		Output signals include square waves, sine, AM, fast edge , pulse, PWM, I2C, CAN, LIN etc. Used in teaching and demonstrations.
USB AWG Module	SAG1021		Output Sine, Square, Ramp, pulse, Noise, DC and 45 built-in waveforms. The arbitrary waveforms can be accessed and edited by the EasyWave PC software
Rack Mount	SDS1X-E-RMK		The height is 4U, shared by Two Channels and For Channels

Ordering information

Product Name	SDS1000X-E Series Digital Oscilloscope	
	SDS1104X-E 100 MHz Four Channels	
	SDS1204X-E 200 MHz Four Channels	
	SDS1202X-E 200 MHz Two Channels	
Standard Accessories	USB Cable -1	
	Quick Start -1	
	Passive Probe -4/2	
	Certification -1	
	Power Cord -1	
Optional Accessories	16 Channels MSO Software (four channel series only)	SDS1000X-E-16LA
	16 Channels Logic Analyzer (four channel series only)	SLA1016
	AWG Software (four channel series only)	SDS1000X-E-FG
	USB AWG Module Hardware (four channel series only)	SAG1021
	WIFI Software (four channel series only)	SDS1000X-E-WIFI
	USB WIFI Adapter (four channel series only)	TL_WN725N
	Isolated Front End	ISFE
	STB Demo Source	STB-3
	High Voltage Probe	HPB4010
	Current Probes	CP4020/CP4050/CP4070/CP4070A/CP5030/CP5030A/CP5150/CP5500
	Differential Probes	DPB4080/DPB5150/DPB5150A/DPB5700/DPB5700A
	Rack Mount	SDS1X-E-RMK