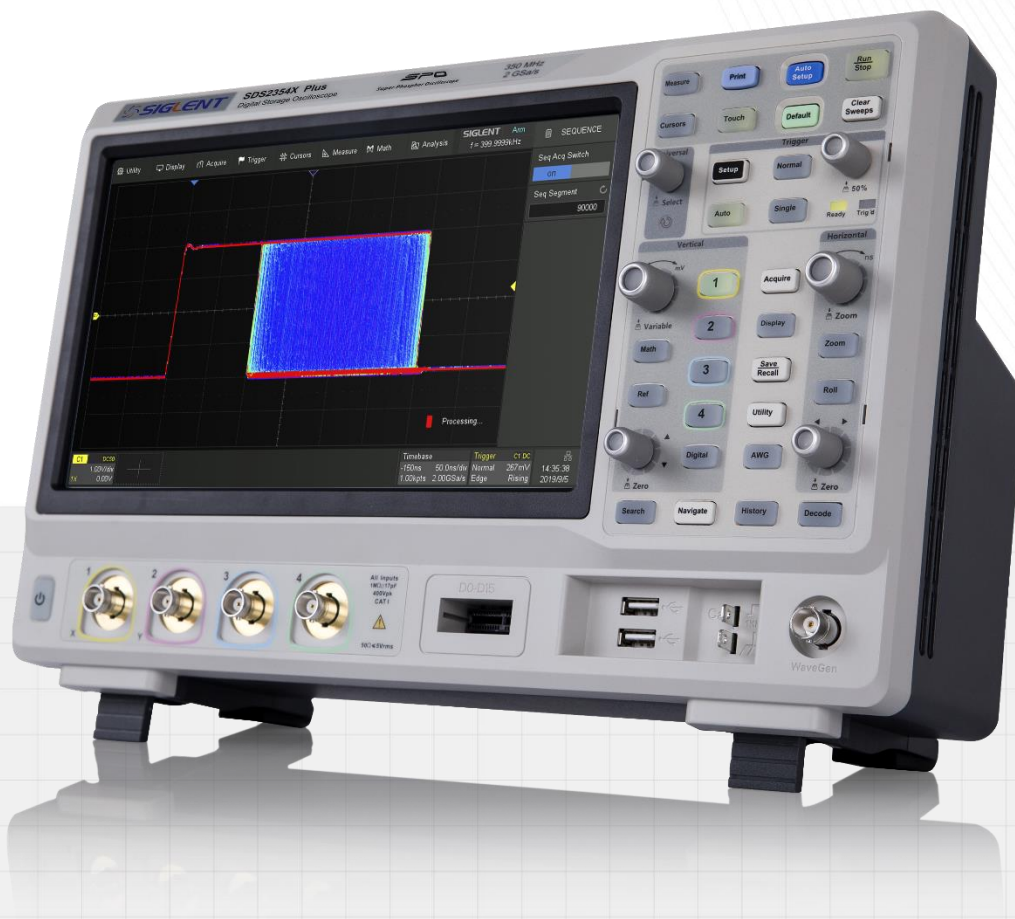


# SDS2000X Plus

## Digital Oscilloscope



Data Sheet  
EN01D



DataSheet-2024.06

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<sup>2</sup>C, SPI, UART, CAN, LIN (standard) and CAN FD, FlexRay, I<sup>2</sup>S, MIL-STD-1553B, SENT and Manchester (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 measurements on 50+ parameters, supports statistics with histogram, track, trend, Gating measurement, and measurements on Math, History and Ref
- 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
- Built-in 50 MHz DDS 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<br>SDS2102X Plus |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------|
| Analog channels                    | 4 + EXT                                                                                                                                                                      |                                                   | 2/4 + EXT                      |
| Bandwidth                          | 350 MHz,<br>(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;<br>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 <sup>2</sup> C, SPI, UART, CAN, LIN<br>Optional: CAN FD, FlexRay, I <sup>2</sup> S, MIL-STD-1553B, SENT, Manchester (decode only)                                |                                                   |                                |
| Measurement                        | More than 50 parameters , supports statistics with histogram, track and trend                                                                                                |                                                   |                                |
| Math                               | 2 traces<br>2 Mpts FFT, +, -, x, ÷, d/dt, ∫dt, √, Identity, Negation,  x , Sign, e <sup>x</sup> , 10 <sup>x</sup> , ln, lg, Interpolation, average, ERES, and formula editor |                                                   |                                |
| Data processing and analysis tools | Search, Navigate, History, Mask test, Bode plot, Power Analysis (optional) and Counter                                                                                       |                                                   |                                |
| Digital channel                    | 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, 10M/100M 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)                                                                                                                        |                                                   |                                |

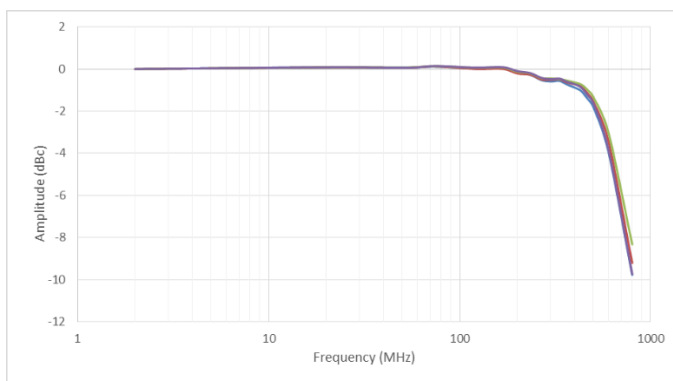
## Functions & Characteristics

### Excellent Operability

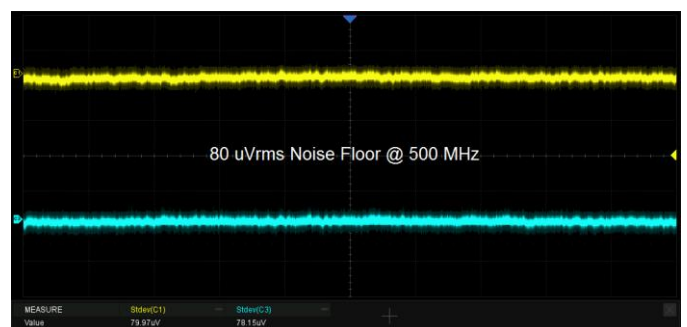


- 10.1" display with 1024x600 resolution
- Capacitive touch screen, supports multi-touch gestures, traces can be moved or scaled efficiently by a finger touch
- Built-in web server supports remote control over the LAN port using a web browser
- External mouse and keyboard support

### Competitive Front End Performance

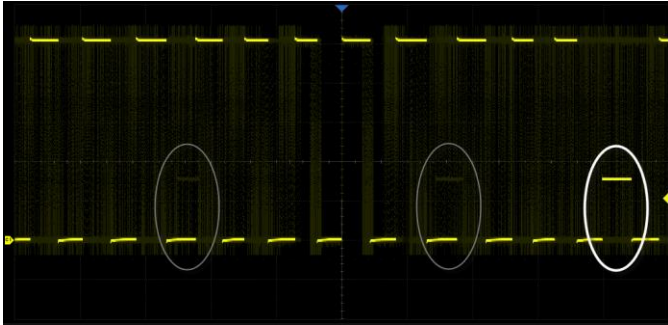


500 MHz bandwidth (at 2 GSa/s sample rate with 500 MHz bandwidth option).



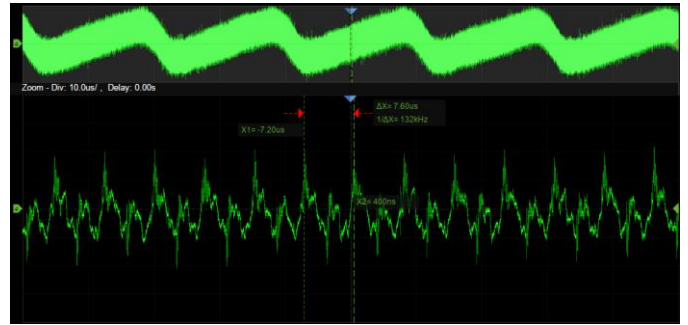
Low noise floor: Only 80  $\mu$ V rms at 500 MHz bandwidth.

### Up to 120,000 wfm/s waveform update rate



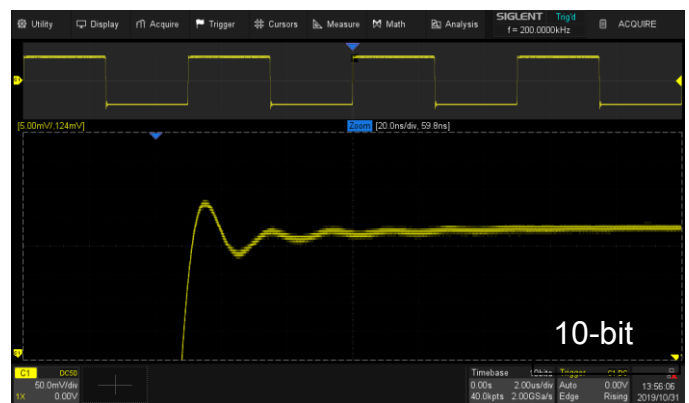
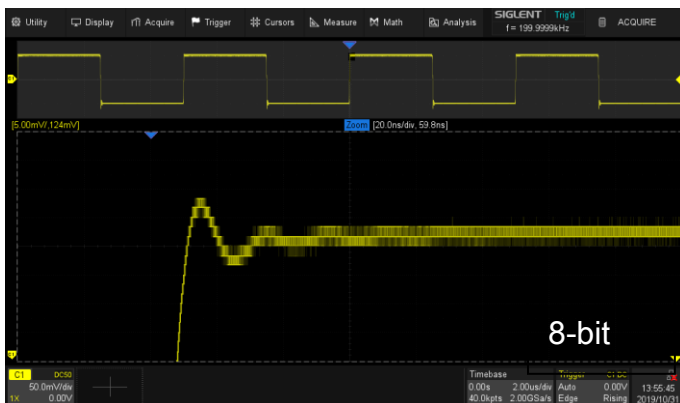
With a waveform update rate of up to 120,000 wfm/s, the oscilloscope can easily capture low-probability events. In Sequence mode the waveform capture rate can reach 500,000 wfm/s.

### 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.

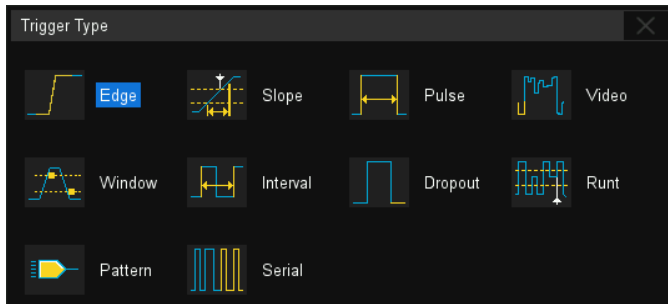
### 10-bit Mode



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

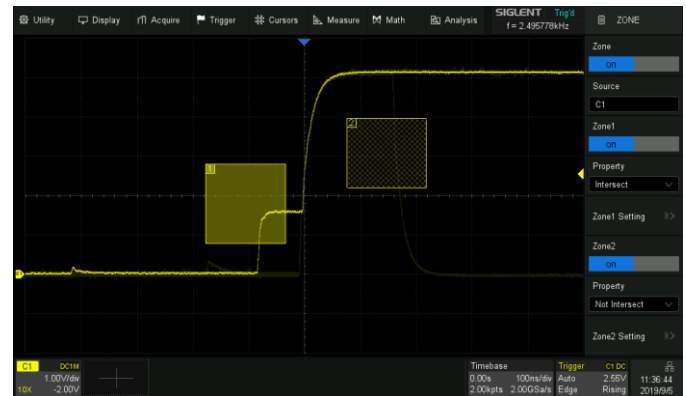


## Multiple Trigger Functions



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.

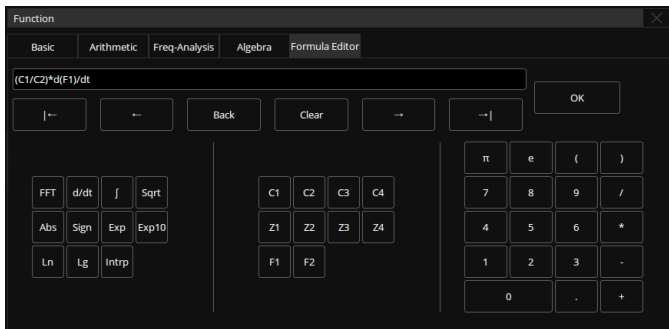


Measurements can be performed within a specified gate period. Measurements on Math, Reference and History frames are supported.

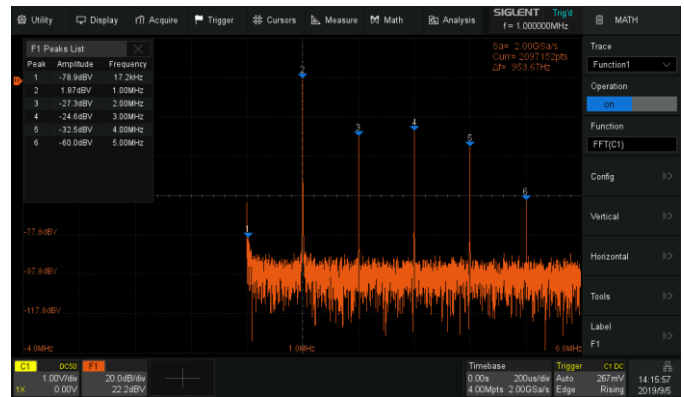
Statistics shows the current value, maximum value, minimum value, standard deviation and mean value of up to 12 parameters simultaneously. Histogram is available to show the probability distribution of a parameter. Trend and Track are available to show the parameter value vs. time.

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

## Advanced Math Function

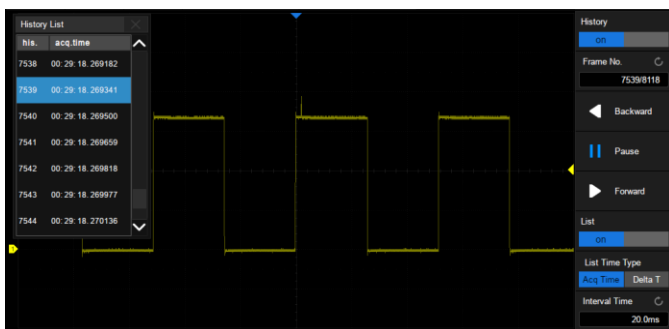


Two Math traces, support FFT, +, -, x, ÷, d/dt, ∫dt, √, Identity, Negation, |x|, Sign, e<sup>x</sup>, 10<sup>x</sup>, ln, lg, Interpolation, average, ERES, and formula editor.



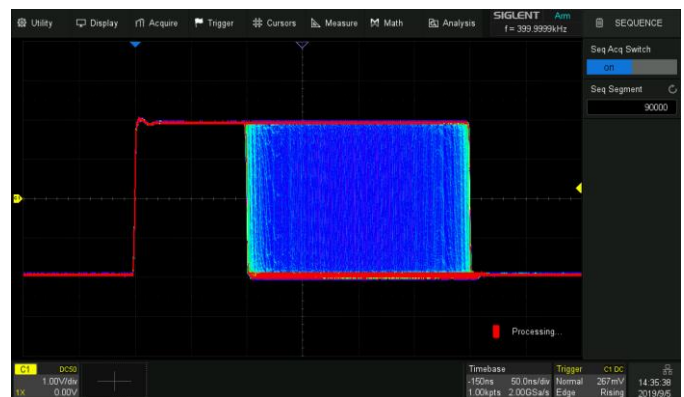
Hardware accelerated FFT up to 2 Mpts. This provides high frequency resolution with fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs. Three modes (Normal, Average and Max hold) can satisfy different requirements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

## History Mode



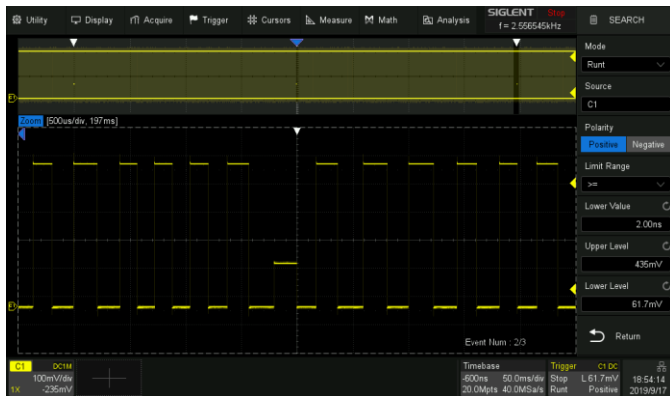
History function records up to 90,000 triggered waveforms (frames). This is done continuously in the background, so the history waveforms can be played back at any time to find and analyze past events. Serial decode, zoom and cursors measurements can be used.

## Sequence Mode



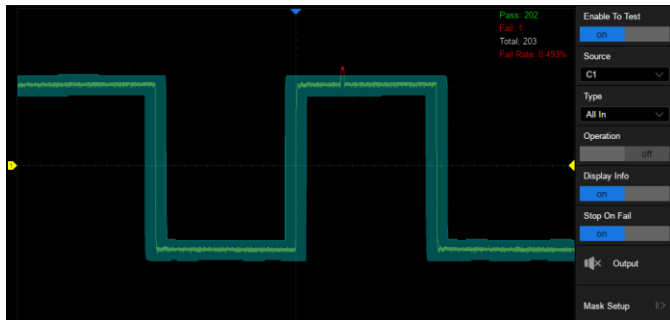
Segmented memory collection will store the waveform into multiple memory segments (up to 90,000) and each segment will store a triggered waveform together with the dead time information. The interval between segments can be as small as 2 μs. All segments can be played back at an arbitrary frame rate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

## Hardware-based High Speed Mask Test Function

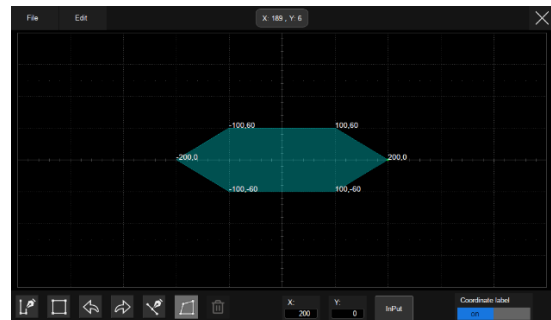


The SDS2000X Plus utilizes a hardware-based Mask Test function, performing up to 80,000 Pass / Fail decisions each second. It is easy to generate user defined test templates which the signal trace can be continuously compared to. The failed frames can be automatically stored as history frames or screen shots, making it suitable for long-term signal monitoring or automated production line testing.

## Serial Bus Decode



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



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)



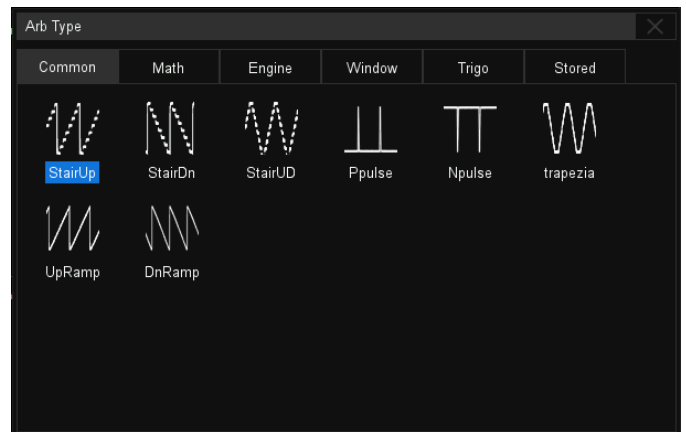
The Power Analysis option provides a full suite of power measurements and analysis, thus improving the efficiency of measurement in switching power supplies and power device designs.

## Digital Channels / MSO



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 DDS waveform generator can output waveforms with up to 50 MHz frequency and  $\pm 3$  V amplitude. Six basic waveforms together with multiple types of predefined waveforms and as user defined arbitrary waveforms are supported.

## Complete Connectivity



2 x USB 2.0 Host, 1 x USB 2.0 Device (USBTMC)

1 x 10M/10M 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 °C ~ 28 °C )

| Acquisition System (analog channels) |                                                                                                   |
|--------------------------------------|---------------------------------------------------------------------------------------------------|
| Sample rate                          | 2 GSa/s (interleaving mode <sup>*1</sup> ) , 1 GSa/s (non-interleaving mode <sup>*2</sup> )       |
| Memory depth                         | 200 Mpts/ch (interleaving mode) <sup>*3</sup> , 100 Mpts/ch (non-interleaving mode) <sup>*3</sup> |
| Waveform capture rate                | Normal mode: 120,000 wfm/s max.<br>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<br>SDS2102X Plus |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|
| Analog channels                               | 4 + EXT                                                                                                            |                       | 2/4 + EXT                      |
| Bandwidth (-3dB)<br>@ 50 Ω                    | 350 MHz (standard) <sup>*2</sup><br>500 MHz (optional) <sup>*1,2</sup>                                             | 200 MHz <sup>*2</sup> | 100 MHz                        |
| Rise time (typical)<br>@ 50 Ω                 | 1 ns (standard) <sup>*2</sup><br>800 ps (optional) <sup>*1,2</sup>                                                 | 1.7 ns <sup>*2</sup>  | 3.5 ns <sup>*2</sup>           |
| Resolution                                    | 8-bit. 10-bit mode (with typical 100 MHz bandwidth)                                                                |                       |                                |
| Vertical range                                | 8 divisions                                                                                                        |                       |                                |
| Vertical scale<br>(probe 1X)                  | 1 MΩ: 500 μV/div – 10 V/div<br>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<br>102 mV/div ~ 1 V/div: ± 20 V<br>1.02 V/div ~ 10 V/div: ± 200 V                   |                       |                                |
| Bandwidth flatness<br>@ 50 Ω                  | 10 kHz ~ BW/10: ±0.5 dB<br>BW/10 ~ BW/3: ±0.8 dB<br>BW/3 ~ BW2/3: +1.0 dB, -1.2 dB<br>BW2/3 ~ BW: +2.0 dB, -2.5 dB |                       |                                |
| Bandwidth limit                               | 20 MHz (-0, +20%)<br>200 MHz (-0, +20%)                                                                            |                       |                                |
| Low frequency response<br>(AC coupling -3 dB) | 5 Hz (typical)                                                                                                     |                       |                                |
| Overshoot (150ps fast<br>edge input @50Ω)     | <12% (typical)                                                                                                     |                       |                                |
| Coupling                                      | DC, AC, GND                                                                                                        |                       |                                |
| Impedance                                     | (1 MΩ ±2%)    (17 pF ±2 pF)<br>50 Ω: 50 Ω ±1%                                                                      |                       |                                |
| Max. Input voltage                            | 1 MΩ ≤400 Vpk(DC + AC), DC~10 kHz<br>50 Ω ≤5 Vrms, ±10 V Peak                                                      |                       |                                |
| SFDR                                          | ≥40 dB                                                                                                             |                       |                                |
| CH to CH Isolation<br>@ 50Ω                   | DC ~ 100 MHz: >40 dB<br>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<br>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 ( $\geq 50$ ms/div)                                                          |
| Skew (CH1~CH4)     | <100 ps                                                                                     |
| Time base Accuracy | $\pm 1$ ppm initial; $\pm 1$ ppm 1st year aging; $\pm 3.5$ ppm 10-year aging                |

**Trigger System**

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                               |                |                |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------|----------------|
| Mode                              | Auto, Normal, Single                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                               |                |                |
| Level                             | Internal: $\pm 4.1$ div from the center of the screen<br>EXT: $\pm 0.61$ V<br>EXT/5: $\pm 3.05$ V                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                               |                |                |
| Ext Trigger Channel input voltage | 1 M $\Omega$ $\leq$ 42 Vpk<br>50 $\Omega$ $\leq$ 5 Vrms                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                               |                |                |
| Hold off range                    | By time : 8 ns $\sim$ 30 s (8 ns step)<br>By event : 1 $\sim$ 10 <sup>8</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                               |                |                |
| Coupling                          | CH1~CH4<br>DC: Passes all components of the signal<br>AC: Blocks DC components and attenuates signals below 20 Hz<br>LFRJ: Attenuates the frequency components below 1.2 MHz<br>HFRJ: Attenuates the frequency components above 600 kHz<br>Noise RJ: Increases the trigger hysteresis<br>EXT<br>DC: Passes all components of the signal<br>AC: Blocks DC components and attenuates signals below 8 Hz<br>LFRJ: Attenuates the frequency components below 33 kHz<br>HFRJ: Attenuates the frequency components above 967 kHz |                                                               |                |                |
| Accuracy (typical)                | CH1 $\sim$ CH4: $\pm 0.2$ div<br>EXT: $\pm 0.3$ div                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                               |                |                |
| Sensitivity                       | CH1 $\sim$ CH4:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                               | Noise RJ = OFF | Noise RJ = ON  |
|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | >10 mV/div:                                                   | $\pm 0.26$ div | $\pm 0.33$ div |
|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 5 mV/div~10 mV/div:                                           | $\pm 0.26$ div | $\pm 0.33$ div |
|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | $\leq 2$ mV/div:                                              | $\pm 0.5$ div  | $\pm 0.5$ div  |
|                                   | EXT:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 200 mVpp, DC $\sim$ 10 MHz<br>300 mVpp, 10 MHz $\sim$ 300 MHz |                |                |
|                                   | EXT/5:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1 Vpp, DC $\sim$ 10 MHz<br>1.5 Vpp, 10 MHz $\sim$ 300 MHz     |                |                |
| Jitter                            | CH1 $\sim$ CH4: $<10$ ps rms, 6 divisions pk-pk, 2 ns edge<br>EXT: $<200$ ps rms                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                               |                |                |
| Displacement                      | Pre-Trigger: 0 $\sim$ 100% memory<br>Delay-Trigger: 0 $\sim$ 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                       | $\leq$ , $\geq$ , in range, out of range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                               |                |                |
| Time range                        | 2 ns $\sim$ 20 s , 1 ns resolution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                               |                |                |
| Pulse Width Trigger               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                               |                |                |
| Source                            | CH1~CH4/D0~D15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                               |                |                |
| Polarity                          | +wid, -wid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                               |                |                |
| Limit range                       | $\leq$ , $\geq$ , in range, out of range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                               |                |                |
| Time range                        | 2 ns $\sim$ 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                                                                                                   |
| <b>Window Trigger</b>               |                                                                                                               |
| Source                              | CH1~CH4                                                                                                       |
| Window type                         | Absolute, Relative                                                                                            |
| <b>Interval Trigger</b>             |                                                                                                               |
| Source                              | CH1~CH4/D0~D15                                                                                                |
| Slope                               | Rising, Falling                                                                                               |
| Limit range                         | $\leq$ , $\geq$ , in range, out of range                                                                      |
| Time range                          | 2 ns ~ 20 s , 1 ns resolution                                                                                 |
| <b>Dropout Trigger</b>              |                                                                                                               |
| Source                              | CH1~CH4/D0~D15                                                                                                |
| Timeout type                        | Edge, State                                                                                                   |
| Slope                               | Rising, Falling                                                                                               |
| Time range                          | 2 ns ~ 20 s , 1 ns resolution                                                                                 |
| <b>Runt Trigger</b>                 |                                                                                                               |
| Source                              | CH1~CH4                                                                                                       |
| Polarity                            | Positive, Negative                                                                                            |
| Limit range                         | $\leq$ , $\geq$ , in range, out of range                                                                      |
| Time range                          | 2 ns ~ 20 s , 1 ns resolution                                                                                 |
| <b>Pattern Trigger</b>              |                                                                                                               |
| Source                              | CH1~CH4/D0~D15                                                                                                |
| Pattern Setting                     | Don't Care, Low, High                                                                                         |
| Logic                               | AND, OR, NAND, NOR                                                                                            |
| Limit range                         | $\leq$ , $\geq$ , in range, out of range                                                                      |
| Time range                          | 2 ns ~ 20 s , 1 ns resolution                                                                                 |
| <b>Serial Trigger</b>               |                                                                                                               |
| Source                              | CH1~CH4/D0~D15                                                                                                |
| Protocol                            | Standard: I <sup>2</sup> C, SPI, UART, CAN, LIN<br>Optional: CAN FD, FlexRay, I <sup>2</sup> S, MIL-STD-1553B |
| I <sup>2</sup> C 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                                                                              |
| I <sup>2</sup> S trigger (optional) | Type: Data, Mute, Clip, Glitch, Rising Edge, Falling Edge                                                     |
| MIL-STD-1553B trigger (optional)    | Type: Transfer, Word, Error, Timing                                                                           |
| SENT (Optional)                     | Type: Start, Slow channel, Fast channel, Error                                                                |

## Serial Decoder

|                       |                                        |
|-----------------------|----------------------------------------|
| Decoders              | 2                                      |
| Decoder Type          | Full duplex                            |
| Threshold             | -4.1 ~ 4.1 div                         |
| List                  | 1 ~ 7 lines                            |
| <b>I<sup>2</sup>C</b> |                                        |
| Signal                | SCL , SDA                              |
| Address               | 7bit , 10bit                           |
| Decoded frames (Max.) | 2,000                                  |
| <b>SPI</b>            |                                        |
| Signal                | CLK , MISO , MOSI , CS                 |
| Edge Select           | Rising, Falling                        |
| Chip select           | Active high, active low, clock timeout |
| Bit Order             | LSB, MSB                               |



## SDS2000X Plus Series Digital Oscilloscope

|                                    |                                                                    |
|------------------------------------|--------------------------------------------------------------------|
| Decoded frames (Max.)              | 15,000                                                             |
| <b>UART</b>                        |                                                                    |
| 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                                                             |
| <b>CAN</b>                         |                                                                    |
| Source                             | CH1~CH4/D0~D15                                                     |
| Decoded frames (Max.)              | 2,000                                                              |
| <b>LIN</b>                         |                                                                    |
| 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                                                              |
| <b>CAN FD (optional)</b>           |                                                                    |
| 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                                                              |
| <b>FlexRay (optional)</b>          |                                                                    |
| Source                             | CH1~CH4                                                            |
| Data Baud Rate                     | 2.5 Mbps, 5 Mbps, 10 Mbps, custom                                  |
| Decoded frames (Max.)              | 1,000                                                              |
| <b>I<sup>2</sup>S (optional)</b>   |                                                                    |
| 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                                                             |
| <b>MIL-STD-1553B (optional)</b>    |                                                                    |
| Source                             | CH1~CH4                                                            |
| Decoded frames (Max.)              | 10,000                                                             |
| <b>SENT (Optional)</b>             |                                                                    |
| Source                             | CH1~CH4/D0~D15                                                     |
| <b>Manchester (Optional)</b>       |                                                                    |
| Source                             | CH1~CH4                                                            |
| Baud Rate                          | 500 bps~5 Mbps                                                     |

## 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, Frequency, Time@max, Time@min, +Width, -Width, 10-90%Rise time, 90-10%Fall time, Rise time, Fall time, +Burst Width, -Burst Width, +Duty Cycle, -Duty Cycle, Delay, Time@Middle, Cycle-Cycle jitter |
| Miscellaneous | +Area@DC, -Area@DC, Area@DC, Absolute Area@DC, +Area@AC, -Area@AC, Area@AC, Absolute Area@AC, Cycles, Rising Edges, Falling Edges, Edges, Positive pulses, Negative pulses, Positive Slope, Negative Slope  |
| Delay         | Phase, FRFR, FRFF, FFFR, FFFF, FRLR, FRLF, FFLR, FFLF, Skew, tsu@R, tsu@F, th@R, th@F                                                                                                                       |
| Statistics    | Current, Mean, Min, Max, Sdev, Count, Histogram, Trend, Track                                                                                                                                               |

### Cursors

|        |                                                                                                                                                                     |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source | CH1~CH4, D0~D15, Math, Ref                                                                                                                                          |
| Type   | Manual: Time X1, X2, (X1-X2), (1/ΔT)<br>Voltage/Current: Y1, Y2, (Y1-Y2)<br>Track: Time X1, X2, (X1-X2)<br>Measure: indicates the measurement on specific parameter |

| <b>Math</b> |                                                                                                                                                                                                                                                                           |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Traces      | F1, F2                                                                                                                                                                                                                                                                    |
| Source      | CH1~CH4, Z1~Z4, F1~F2                                                                                                                                                                                                                                                     |
| Operation   | +, -, *, ÷, FFT, d/dt, ∫dt, √, Identity, Negation,  x , Sign, e <sup>x</sup> , 10 <sup>x</sup> , ln, lg, Interpolation, Average, ERES, 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<br>Window: Rectangular, Blackman, Hanning, Hamming, Flattop<br>Display: Full Screen, Split, Exclusive<br>Mode: Normal, Max hold, Average<br>Tools: Peaks, Markers |

| <b>Analysis</b>                  |                                                                                                                                                                |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Search</b>                    |                                                                                                                                                                |
| Source                           | CH1~CH4, History                                                                                                                                               |
| Mode                             | Edge, Slope, Pulse, Interval, Runt                                                                                                                             |
| Copy setting                     | Copy from trigger, Copy to trigger                                                                                                                             |
| <b>Navigate</b>                  |                                                                                                                                                                |
| Type                             | Search event, Time, History frame                                                                                                                              |
| <b>Mask Test</b>                 |                                                                                                                                                                |
| Source                           | CH1~CH4, Z1~Z4                                                                                                                                                 |
| Mask creating                    | Auto (Create mask), Custom (Mask Editor)                                                                                                                       |
| Mask test speed                  | Up to 80,000 frames/s                                                                                                                                          |
| Store failed frames              | To history, To screenshot                                                                                                                                      |
| <b>Code Plot</b>                 |                                                                                                                                                                |
| Source                           | CH1~CH4                                                                                                                                                        |
| Supported signal sources         | Built-in waveform generator<br>SDG series waveform generators, Connection: USB, LAN                                                                            |
| Sweep type                       | Simple, Vari-level                                                                                                                                             |
| Frequency                        | Mode: Linear, Logarithmic<br>Range: 10 Hz ~ 120 MHz                                                                                                            |
| Measure                          | Upper cutoff frequency, Lower cutoff frequency, Bandwidth, Gain margin, Phase margin                                                                           |
| <b>Power Analysis (Optional)</b> |                                                                                                                                                                |
| Measure                          | Power quality, Current Harmonics, Inrush current, Switching loss, Slew rate, Modulation, Output ripple, Turn on/turn off, Transient response, PSRR, Efficiency |
| <b>Counter</b>                   |                                                                                                                                                                |
| Source                           | CH1~CH4                                                                                                                                                        |
| Frequency resolution             | 7 digits                                                                                                                                                       |
| Totalizer                        | Counter on edges, support Gate and Trigger                                                                                                                     |

| <b>500 MHz Bandwidth Extension (optional)</b> |                                                     |
|-----------------------------------------------|-----------------------------------------------------|
| Channels                                      | 2 (CH1&CH3, CH1&CH4, CH2&CH3 or CH2&CH4)            |
| Bandwidth (-3dB)<br>@50 Ω                     | 500 MHz                                             |
| Rise time (typical)<br>@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                                         |

| <b>Digital Channels</b> |                                                                                  |
|-------------------------|----------------------------------------------------------------------------------|
| 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<br>Digital to Analog: ± (1 sampling interval +1 ns) |

| <b>Waveform Generator (optional)</b> |           |
|--------------------------------------|-----------|
| Channels                             | 1         |
| Max. Output Frequency                | 50 MHz    |
| Sampling Rate                        | 125 MSa/s |
| Frequency Resolution                 | 1 μHz     |

## SDS2000X Plus Series Digital Oscilloscope

|                          |                                                                                              |
|--------------------------|----------------------------------------------------------------------------------------------|
| Frequency Accuracy       | ±50 ppm                                                                                      |
| Vertical Resolution      | 14 bit                                                                                       |
| Amplitude Range          | -1.5 V ~ +1.5 V (into 50Ω)<br>-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                                                       |
| <b>Sine</b>              |                                                                                              |
| Frequency                | 1 μHz ~ 50 MHz                                                                               |
| Offset accuracy (10 kHz) | ±(1%*offset setting value +3 mVpp)                                                           |
| Amplitude flatness       | Compare to 10 kHz, 2.5 Vpp (into 50Ω):<br>±0.3 dB , ≤25 MHz<br>±0.5 dB , >25 MHz             |
| SFDR                     | DC~1 MHz: -60 dBc<br>1 MHz~5 MHz: -55 dBc<br>5 MHz~25 MHz: -50 dBc<br>25 MHz~50 MHz: -40 dBc |
| Harmonic distortion      | DC~5 MHz: -50dBc<br>5 MHz~25MHz: -45dBc<br>25 MHz~50 MHz: -40 dBc                            |
| <b>Square/Pulse</b>      |                                                                                              |
| Frequency                | 1 μHz ~ 10 MHz                                                                               |
| Duty cycle               | 1% ~ 99%                                                                                     |
| Edge                     | < 24 ns (10% ~ 90%)                                                                          |
| Overshoot                | < 3% (typical , 1 kHz, 1 Vpp)                                                                |
| Pulse width              | > 50 ns                                                                                      |
| Jitter (cycle-cycle)     | < 500 ps + 10 ppm                                                                            |
| <b>Ramp</b>              |                                                                                              |
| Frequency                | 1 μHz ~ 300 kHz                                                                              |
| Linearity                | < 0.1% of Pk-Pk (typical, 1 kHz, 1 Vpp, 50% symmetry)                                        |
| Channels                 | 0% ~ 100%                                                                                    |
| <b>DC</b>                |                                                                                              |
| Offset range             | ±1.5 V (into 50 Ω)<br>±3 V (into Hi-Z)                                                       |
| Accuracy                 | ±( setting value *1%+3 mV)                                                                   |
| <b>Noise</b>             |                                                                                              |
| Bandwidth (-3 dB)        | >25 MHz                                                                                      |
| <b>Arb</b>               |                                                                                              |
| Frequency                | 1 μHz ~ 5 MHz                                                                                |
| Waveform memory          | 16 kpts DDS memory                                                                           |
| 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<br>Probe compensation: 1 kHz, 3 V <sub>PP</sub> square wave                                                                              |
| Rear panel  | USB 2.0 Device<br>LAN: 10M/100M<br>EXT trigger: EXT ≤1.5 Vrms , EXT/5 ≤7.5Vrms<br>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; Supports customer trace 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<br>Non-operating: -20 °C ~ 60 °C                                                                           |                              |                                                                                                                                                          |
| Humidity                      | Operating: 85% RH, 40 °C, 24 hours<br>Non-operating: 85% RH, 65 °C, 24 hours                                                       |                              |                                                                                                                                                          |
| Altitude                      | Operating: ≤3,000 m<br>Non-operating: ≤15,000 m                                                                                    |                              |                                                                                                                                                          |
| Electromagnetic Compatibility | Meets EMC directive (2014/30/EU), meets or exceeds IEC 61326-1:2012/EN61326-1:2013 (Basic)                                         |                              |                                                                                                                                                          |
|                               | Conducted disturbance                                                                                                              | CISPR 11/EN 55011            | CLASS A group 1, 150kHz-30MHz                                                                                                                            |
|                               | Radiated disturbance                                                                                                               | CISPR 11/EN 55011            | CLASS A group 1, 30MHz-1GHz                                                                                                                              |
|                               | Electrostatic discharge (ESD)                                                                                                      | IEC 61000-4-2/EN 61000-4-2   | 4.0 kV (Contact), 8.0 kV (Air)                                                                                                                           |
|                               | Radio-frequency electromagnetic field Immunity                                                                                     | IEC 61000-4-3/EN 61000-4-3   | 10 V/m (80 MHz to 1 GHz);<br>3 V/m (1.4 GHz to 2 GHz);<br>1 V/m (2.0 GHz to 2.7GHz)                                                                      |
|                               | Electrical fast transients (EFT)                                                                                                   | IEC 61000-4-4/EN 61000-4-4   | 2kV (Input AC Power Ports)                                                                                                                               |
|                               | Surges                                                                                                                             | IEC 61000-4-5/EN 61000-4-5   | 1kV (Line to line)<br>2kV (Line to ground)                                                                                                               |
|                               | Radio-frequency continuous conducted Immunity                                                                                      | IEC 61000-4-6/EN 61000-4-6   | 3 V, 0.15-80MHz                                                                                                                                          |
| Safety                        | Voltage dips and interruptions                                                                                                     | IEC 61000-4-11/EN 61000-4-11 | Voltage Dips :<br>0% UT during half cycle;<br>0% UT during 1 cycle;<br>70% UT during 25/30 cycles<br>Voltage interruptions : 0% UT during 250/300 cycles |
|                               | UL 61010-1:2012/R: 2018-11; CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11.<br>UL 61010-2-030:2018; CAN/CSA-C22.2 No. 61010-2-030:2018. |                              |                                                                                                                                                          |

### Power Supply

|                           |                                                      |
|---------------------------|------------------------------------------------------|
| Input Voltage & Frequency | 100 ~ 240 Vrms 50/60Hz                               |
| Power consumption         | 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)<br>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                                                       |
|---------------------------------|-------------------------------------------------------------------|
| 16-channel logic probe          | SPL2016                                                           |
| Power Analysis deskew fixture   | DF2001A                                                           |
| STB3 demo signal source         | STB3                                                              |
| High voltage probe              | HPB4010                                                           |
| High voltage differential probe | DPB1300/DPB4080/DPB5150/DPB5150A/DPB5700/DPB5700A                 |
| Current probe                   | CPL5100/CP4020/CP4050/CP4070/CP4070A/CP6030/CP6030A/CP6150/CP6500 |
| Bag                             | BAG-S2                                                            |

| Options                                                      | Part Number       |
|--------------------------------------------------------------|-------------------|
| Waveform generator option (software)                         | SDS2000XP-FG      |
| Power Analysis (software)                                    | SDS2000XP-PA      |
| I <sup>2</sup> S 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   |
| SENT trigger & decode (software)                             | SDS2000XP-SENT    |
| Manchester decode (software)                                 | SDS2000XP-Manch   |
| 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   |



## About SIGLENT

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

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

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