

# SDS6000L Low Profile Digital Storage Oscilloscope



Data Sheet

EN01A



SIGLENT TECHNOLOGIES CO.,LTD

**SDS6208L / SDS6204L**

**SDS6108L / SDS6104L**

**SDS6058L / SDS6054L**
















## Product Overview

SIGLENT's SDS6000L series Low Profile Digital Storage Oscilloscopes provide up to 8 analog channels + 16 digital channels in a space-saving chassis size. This series is available in bandwidths of 2 GHz / 1 GHz / 500 MHz, feature a maximum sample rate of 5 GSa/s (10 GSa/s ESR) for each channel, and a maximum record length of 500 Mpts/ch.

The SDS6000L series employs Siglent's SPO technology with a maximum waveform capture rate of up to 170,000 wfm/ s (normal mode, up to 750,000 wfm/s in Sequence mode), 256-level intensity grading display function plus a color temperature display mode. It also employs an innovative digital trigger system with high sensitivity and low jitter. The trigger system supports multiple powerful triggering modes including serial bus triggering. Tools such as History waveform recording, Search and Navigate functions, Mask Test, Power Analysis and Eye/ Jitter Analysis 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, and serial decoding are also features of the SDS6000L.

It can be used as a stand-alone oscilloscope by being connected to an external display and a mouse. It can also be remotely controlled over LAN thanks to the convenient built-in web server. Combined with a 64-channel synchronization distributor (SYN64), multiple SDS6000L modules can be organized as a high-speed acquisition system with up to 512 channels. A complete SCPI command set over the standard 1000M LAN connection provides very fast data acquisition to speed automated test applications.

## Key Features

-  8/4 analog channels + 1 external trigger. Designed for expansion. Combine multiple units for a high-speed acquisition system with up to 512 channels.
-  Up to 2 GHz bandwidth with 5 GSa/s (10 GSa/s ESR) sample rate at each channel
-  Low background noise, supports 0.5 mV/div to 10 V/div vertical scales
-  SPO technology
  - Waveform capture rates up to 170,000 wfm/s (normal mode), and 750,000 wfm/s (sequence mode)
  - Supports 256-level intensity grading and color temperature display modes
  - 500 Mpts Record length in total for all 4 channels
  - Digital trigger system
-  Intelligent trigger: Edge, Slope, Pulse, Window, Runt, Interval, Dropout, Pattern, Qualified, Nth edge, Setup / hold, Delay and Video (HDTV supported). Zone Trigger simplifies advanced triggering
-  Serial bus triggering and decoder, supports protocols I<sup>2</sup>C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I<sup>2</sup>S, MIL-STD-1553B, SENT and Manchester
-  Segmented acquisition (Sequence) mode, dividing the maximum record length into multiple segments (up to 80,000), according to trigger conditions set by the user, with a very small dead time between segments to capture the qualifying event
-  History waveform record (History) function, the maximum recorded waveform length is 80,000 frames
-  Automatic measurements on 50+ parameters, supports statistics with histogram, track, trend, Gating measurement, and measurements on Math, History, Memory and Ref
-  4 Math traces (8 Mpts FFT, addition, subtraction, multiplication, division, integration, differential, square root, etc.), supports formula editor
-  Abundant data analysis functions such as Search, Navigate, Digital Voltmeter, Counter, Waveform Histogram, Power Analysis and Eye/Jitter Analysis
-  16 digital channels (optional)
-  25 MHz function / arbitrary waveform generator, built-in multiple predefined waveforms
-  Interfaces include: 4x USB Hosts, USB Device (USBTMC), 1000M LAN (VXI-11/Telnet/ Socket) , micro SD card, Pass/Fail, Trigger Out, HDMI, 10MHz In、10MHz Out
-  Built-in web server supports remote control over the LAN port using a web browser. Supports SCPI remote control commands. Supports external mouse and keyboard.

## Models and Key Specifications

| Model<br>Channel | 2 GHz    | 1 GHz    | 500 MHz  |
|------------------|----------|----------|----------|
| 8                | SDS6208L | SDS6108L | SDS6058L |
| 4                | SDS6204L | SDS6104L | SDS6054L |

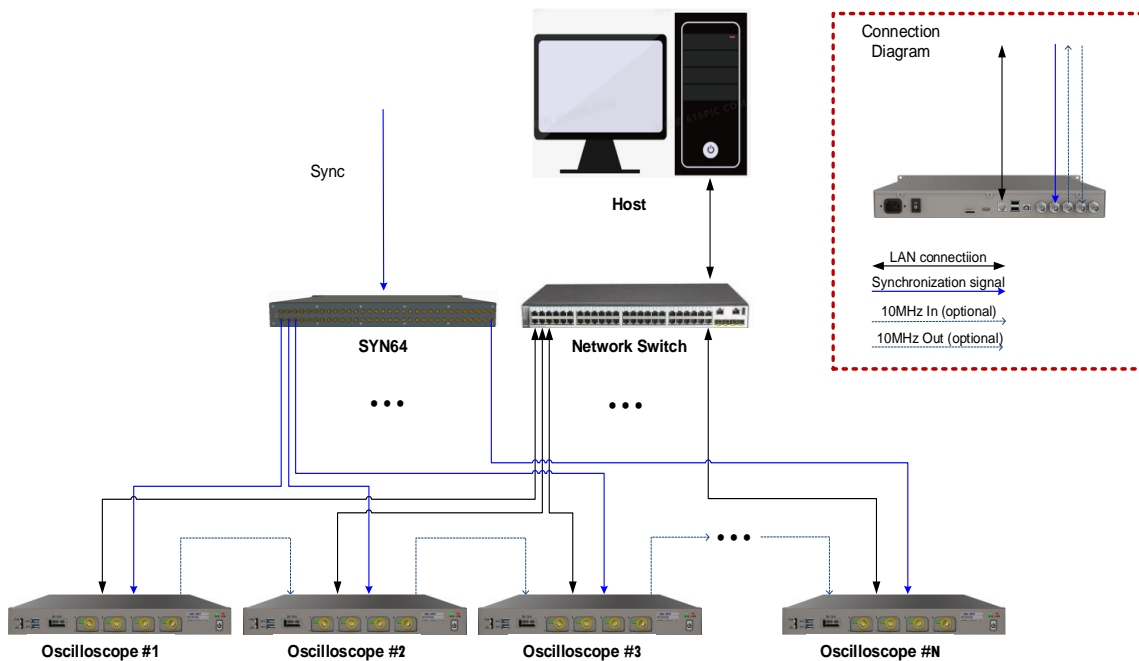
| Model                         | SDS6208L<br>SDS6204L   | SDS6108L<br>SDS6104L | SDS6058L<br>SDS6054L |
|-------------------------------|--|----------------------|----------------------|
| Channel                       | 8/4 + EXT  |                      |                      |
| Bandwidth                     | 2 GHz  | 1 GHz                | 500 MHz              |
| Sample rate (Max.)            | 5 GSa/s (10 GSa/s ESR) @ each channel  |                      |                      |
| Memory depth (Max.)           | 500 Mpts/ch (single-channel)<br>250 Mpts/ch (dual-channel)<br>125 Mpts/ch (3 or 4 channels)  |                      |                      |
| Waveform capture rate (Max.)  | Normal mode: 170,000 wfm/s;<br>Sequence mode: 750,000 wfm/s  |                      |                      |
| Vertical resolution           | 8-bit<br>Up to 12-bit in ERES mode, equivalent to 16-bit Hi-Res mode   |                      |                      |
| Trigger type                  | Edge, Slope, Pulse width, Window, Runt, Interval, Dropout, Pattern, Video, Qualified, Nth edge, Setup/hold, Delay, Serial  |                      |                      |
| Serial trigger and decode     | Standard: I2C, SPI, UART, CAN, LIN<br>Optional: CAN FD, FlexRay, I2S, MIL-STD-1553B, SENT, Manchester (decode only)  |                      |                      |
| Measurement                   | 50+ parameters, statistics, histogram, trend, and tracking supported   |                      |                      |
| Math                          | 4 traces<br>8 Mpts FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation, Absolute, Sign, ex, 10x, ln, lg, Interpolation, MaxHold, MinHold, ERES, Average. Supports formula editor   |                      |                      |
| Data analysis                 | Search, Navigate, History, Mask Test, Digital Voltmeter, Counter, Waveform Histogram, Power Analysis, Eye / Jitter Analysis  |                      |                      |
| Digital channel (optional)    | 16-channel; maximum sample rate up to 1 GSa/s; record length up to 50 Mpts   |                      |                      |
| Waveform generator (optional) | Single-channel external USB isolated waveform generator, frequency up to 25 MHz, 125 MSa/s sample rate, 16 kpts waveform memory  |                      |                      |
| I/O                           | HDMI (1280*800), USB 3.0 Host x2, USB 2.0 Host x2, USB 2.0 Device (USBTMC), 1000M LAN (SCPI over VXI-11, SCPI over Telnet (port:5024), SCPI over Socket (port:5025), micro SD card, External trigger, Auxiliary output (TRIG OUT,PASS / FAIL), 10 MHz In, 10 MHz Out |                      |                      |
| Probe (Standard)              | 1x 500 MHz passive probe supplied for each channel   |                      |                      |

### Multiple-channel Acquisition System

|         |   |  |
|---------|---|--|
| Channel | Up to 512   |  |
| Jitter  | Within a unit: < 100 ps,rms   | Between units:< 250 ps,rms                         |
| Skew    | Without skew calibration, within a unit: < 100 ps<br>With skew calibration, within a unit: < 100 ps | Between units: < 500 ps<br>Between units: < 150 ps |

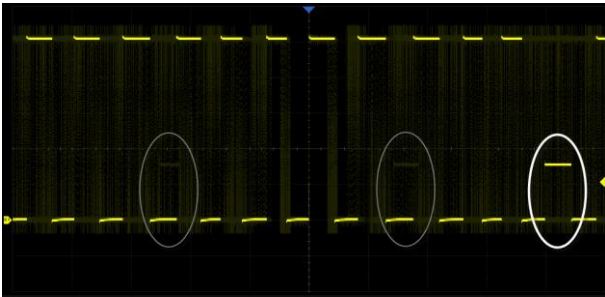
## Functions & Characteristics

### Flexible Multi-channel High-speed Acquisition System



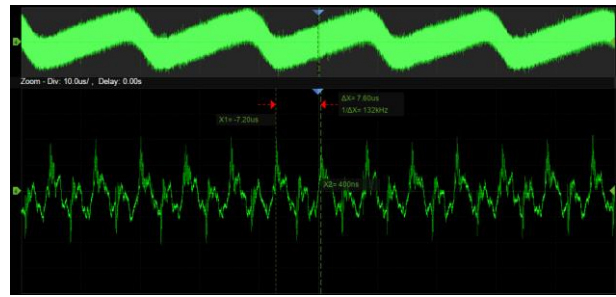
- Standard sizes: 4 - channel models – 1U, 8-channel models – 2U
- Multiple units are combined to create a high-speed acquisition system with up to 512 channels by being triggered with low-skew synchronization signals from the 64-channel synchronization distributor SYN64
- The host can access each unit over 1000M LAN. A complete SCPI command set as well as LabVIEW and IVI drivers are provided for easy data acquisition. The LAN port is LXI compliant.
- Sample clocks are synchronized between all units in the test system by cascading the 10 MHz In and 10 MHz Out clocks in a daisy chain

### High Waveform Update Rate



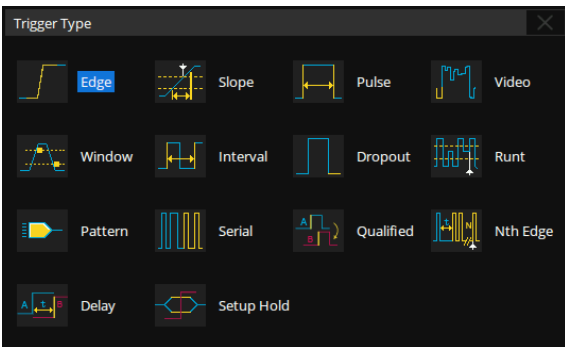
With a waveform update rate of up to 170,000 wfms/s, the oscilloscope can easily capture unusual or low-probability events. In Sequence mode, the waveform capture rate can reach 750,000 wfms/s.

### Deep Record Length



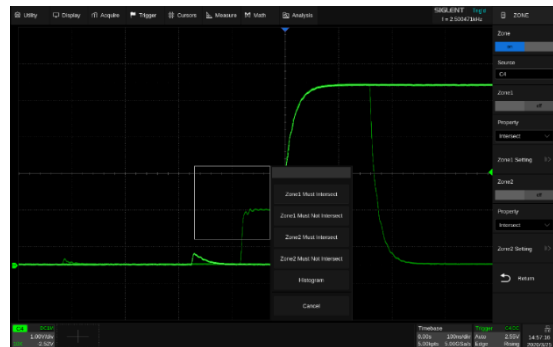
Using a hardware-based Zoom technique and record length of up to 500 Mpts, users can select a slower timebase without compromising the sample rate, and then quickly zoom in to focus on the area of interest.

### Multiple Trigger Functions



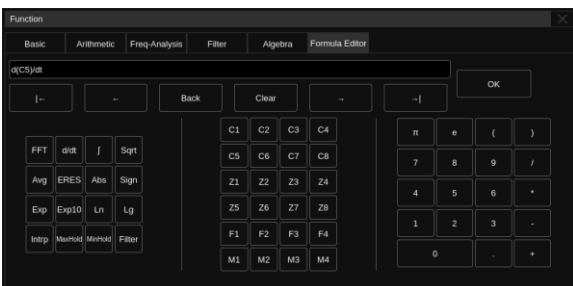
Edge, Slope, Pulse, Video, Windows, Runt, Interval, Dropout, Pattern, Qualified, Nth edge, Setup/ hold, Delay, and serial trigger.

### Trigger Zone

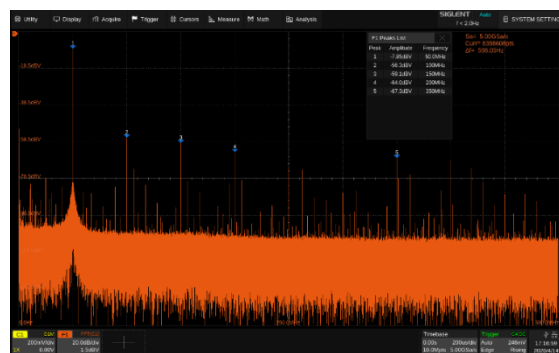


Trigger Zone is available for advanced triggering.

### Advanced Math Function



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



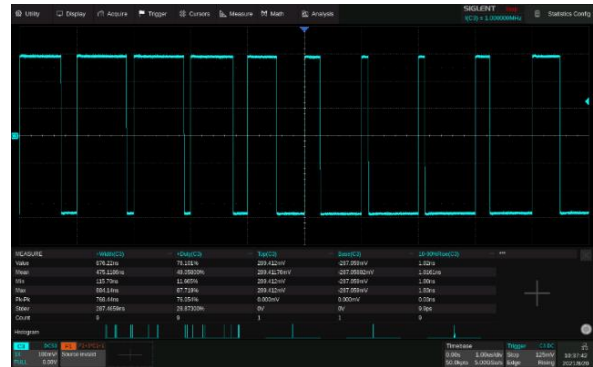
Hardware-accelerated FFT supports up to 8 Mpts operation. This provides high-frequency resolution with a fast refresh rate. The FFT function also supports a variety of window functions so that it can adapt to different spectrum measurement needs. Three modes (Normal, Average, and Max hold) can satisfy different requirements for observing the power spectrum. Auto peak detection and markers are supported.

## Measurements of a Variety of Parameters



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

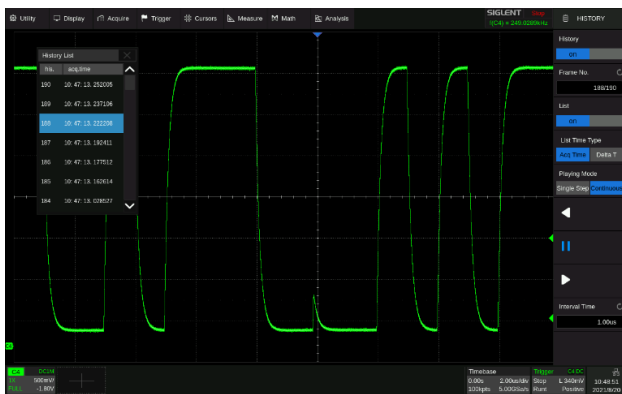
## Parameter Statistics Function



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

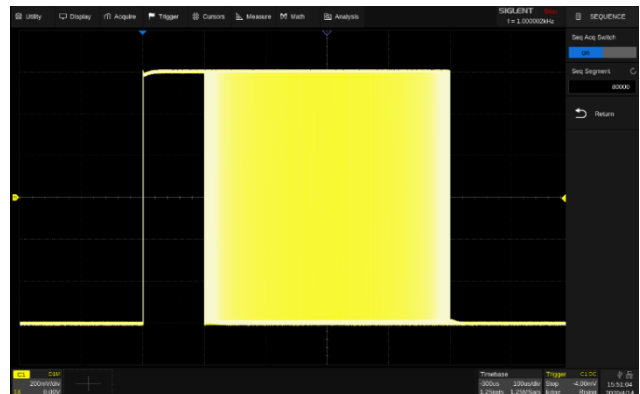
For horizontal parameters such as period, all results are extracted from a frame, instead of just calculating the first one. This accelerates statistics on horizontal measurements much more and enables distribution observation in a frame using Histogram and Track.

## History Mode



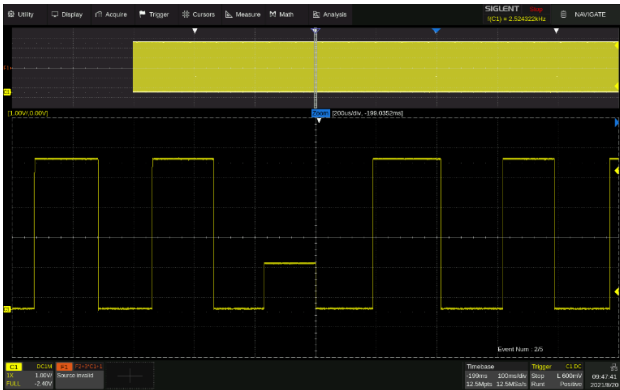
The history function can record up to 80,000 frames of waveforms. The recording is executed automatically so that the customer can playback the history waveforms at any time to observe unusual events and quickly locate the area of interest using cursors or measurements. The failed frames of the Mask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

## Sequence Mode



Segmented memory collection will store the waveform into multiple memory segments (up to 80,000) and each segment will store a triggered waveform as well as the dead time information. The interval between segments can be as small as 1.3µs. All of the segments can be played back using the History function.

## Search and Navigate



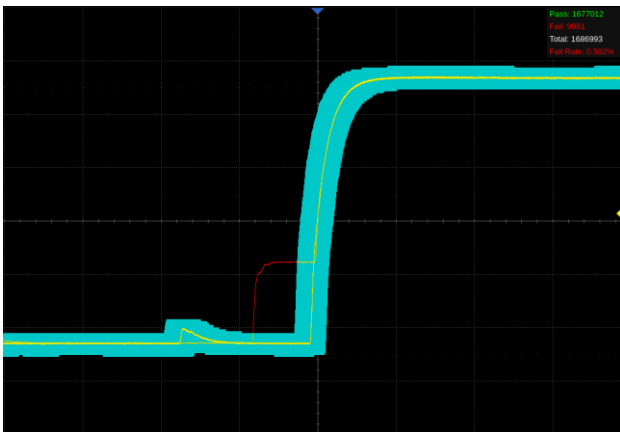
The oscilloscope can search events specified by the user in a frame. Events flagged by the Search can be recalled automatically using Navigate. It can also navigate by time (delay position) and history frames.

## Serial Bus Decode

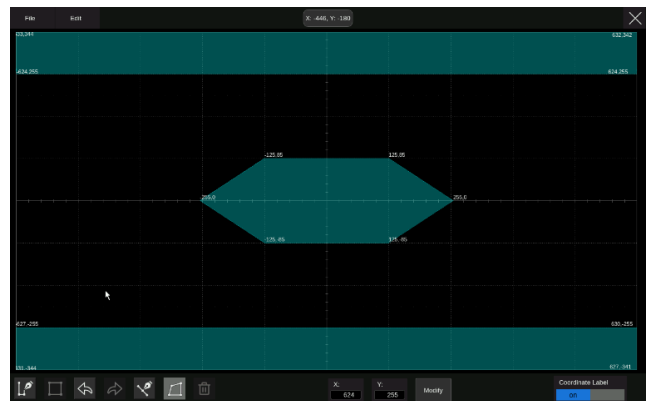


Display the decoded characters through the events list. Bus protocol information can be quickly and intuitively displayed in tabular form. I<sup>2</sup>C, SPI, UART, CAN, LIN, CAN FD, FlexRay, I<sup>2</sup>S, MIL-STD-1553B, SENT, and Manchester are supported.

## Hardware-based High Speed Mask Test Function

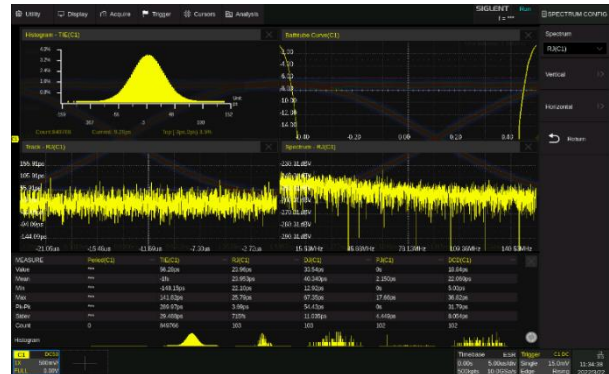


The oscilloscope utilizes a hardware-based Mask Test function, performing up to 18,000 Pass / Fail decisions each second. It is easy to generate user-defined test templates to provide trace mask comparisons, making it suitable for long-term signal monitoring or automated production line testing.



Built-in Mask Editor application helps to create custom masks.

## Eye / Jitter Analysis



Supports eye diagram and jitter analysis / measurement. It can automatically extract the embedded reference clock from serial data and create an eye diagram. Measurement on multiple eye / jitter parameters is provided and mask testing of eye diagrams is supported.

## Power Analysis (Optional)

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

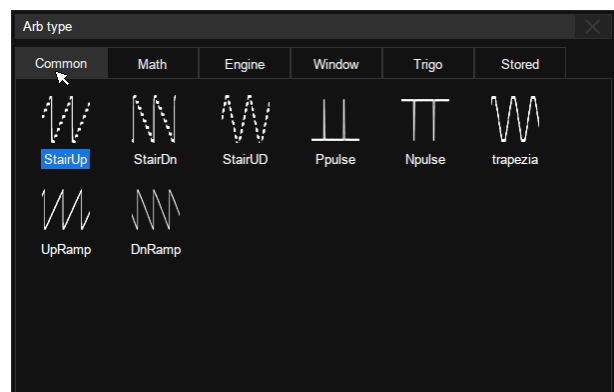


## Digital Channels / MSO (Optional)



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

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



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



## Complete Connectivity



HDMI (1280 x 800) x1, USB Host 3.0 x2, USB Host 2.0 x2, USB Device 2.0 (USBTMC) x1, 1000M LAN (VXI-11 / Telnet / Socket)x1, micro SD card x1, Auxiliary output (Pass / Fail, Trigger Out) x1, 10 MHz In x1, 10 MHz Out x1

## Specifications

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

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

| Acquire (analog)             |   |
|------------------------------|---|
| Sample rate                  | 5 GSa/s (10 GSa/s (ESR <sup>*1</sup> ) @ each channel                                       |
| Memory depth <sup>*2,3</sup> | 500 Mpts/ch (single-channel)<br>250 Mpts/ch (dual-channel)<br>125 Mpts/ch (3 or 4 channels) |
| Waveform update rate         | Normal mode: up to 170,000 wfm/s<br>Sequence mode: up to 750,000 wfm/s                      |
| Intensity grading            | 256-level   |
| Peak detect                  | 200 ps  |
| Average                      | 4, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192  |
| ERES                         | Enhanced bit: 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4 bit  |
| Sequence                     | Up to 80,000 segments, interval between triggers = 1.3 μs min.                              |
| History                      | Up to 80,000 frames   |
| Interpolation                | sinx/x, x   |

\* 1: ESR: Enhanced Sample Rate provides better measurement accuracy by using 2x interpolation

\* 2: In Average and ERES modes, the memory depth is 25 Mpts/ch

\* 3: C1~C4 as a group and C5~C8 as another group. In a group:

Single-channel: Only one channel is enabled in a group

Dual-channel: Two channels are enabled in a group

| Vertical (analog)                | SDS6208L<br>SDS6204L   | SDS6108L<br>SDS6104L | SDS6058L<br>SDS6054L |
|----------------------------------|--|----------------------|----------------------|
| Channel                          | 8/4 + EXT  |                      |                      |
| Resolution                       | 8-bit<br>Up to 12-bit in ERES mode, equivalent to 16-bit Hi-Res mode   |                      |                      |
| Bandwidth (-3dB)@50Ω             | 2 GHz <sup>*1</sup>  | 1 GHz                | 500 MHz              |
| Rise time@50Ω (typical)          | 230 ps   | 350 ps               | 550 ps               |
| Bandwidth (-3dB)@1MΩ, with probe | 500 MHz  |                      |                      |
| Bandwidth in ERES mode (typical) | 0.5-bit: 0.25*Sample rate, up to the analog bandwidth<br>1-bit: 0.115*Sample rate, up to 1.15 GHz, limited by the analog bandwidth<br>1.5-bit: 0.055*Sample rate, up to 550 MHz, limited by the analog bandwidth<br>2-bit: 0.028*Sample rate, up to 280 MHz<br>2.5-bit: 0.014*Sample rate, up to 140 MHz<br>3-bit: 0.007*Sample rate, up to 70 MHz |                      |                      |

|  |   |     |    |
|--|---|-----|----|
|  | 3.5-bit: 0.0035*Sample rate, up to 35 MHz<br>4-bit: 0.0017*Sample rate, up to 17 MHz  |     |    |
| Range  | 8 divisions   |     |    |
| Vertical scale (probe 1X)                                  | 1 M $\Omega$ : 0.5 mV/div – 10 V/div<br>50 $\Omega$ : 0.5 mV/div – 1 V/div  |     |    |
| DC gain accuracy   | $\pm 1.5\%$   |     |    |
| Offset accuracy  | $\pm (1\% \text{ of the offset setting} + 0.5\% \text{ of full scale} + 0.02\% \text{ of max offset} + 1\text{mV})$   |     |    |
| Offset range (probe 1X)                                    | 1M $\Omega$ : 0.5 mV/div ~ 5 mV/div: $\pm 1.6 \text{ V}$<br>5.1 mV/div ~ 10 mV/div: $\pm 4 \text{ V}$<br>10.2 mV/div ~ 20 mV/div: $\pm 8 \text{ V}$<br>20.5 mV/div ~ 100 mV/div: $\pm 16 \text{ V}$<br>102 mV/div ~ 200 mV/div: $\pm 80 \text{ V}$<br>205 mV/div ~ 1 V/div: $\pm 160 \text{ V}$<br>1.02 V/div ~ 10 V/div: $\pm 400 \text{ V}$<br><br>50 $\Omega$ : 0.5 mV/div ~ 5 mV/div: $\pm 1.6 \text{ V}$<br>5.1 mV/div ~ 10 mV/div: $\pm 4 \text{ V}$<br>10.2 mV/div ~ 20 mV/div: $\pm 8 \text{ V}$<br>20.5 mV/div ~ 1 V/div: $\pm 10 \text{ V}$ |     |    |
| Bandwidth limit  | Hardware Bandwidth limit: 20 MHz, 200 MHz   |     |    |
| Low-frequency response (AC coupling -3 dB)                 | 6 Hz (typical)  |     |    |
| Overshoot (100 mV/div, 150 ps edge @50 $\Omega$ , typical) | 15%   | 10% | 5% |
| Coupling   | DC, AC, GND   |     |    |
| Impedance  | (1 M $\Omega \pm 2\%$ )    (20 pF $\pm 3\text{pF}$ )<br>50 $\Omega$ : 50 $\Omega \pm 2\%$   |     |    |
| Max. Input voltage   | 1 M $\Omega$ < 400 Vpk(DC + AC), DC~10 kHz<br>50 $\Omega$ < 5 Vrms, $\pm 10\text{V Peak}$   |     |    |
| SFDR   | > 45 dBc  |     |    |
| CH to CH Isolation (@50 $\Omega$ )                         | 70 dB up to 200 MHz<br>60 dB up to 500 MHz<br>50 dB up to 1 GHz<br>40 dB up to 2 GHz  |     |    |
| Probe Attenuation  | 1X, 10X, 100X, custom   |     |    |

\* 1: The bandwidth is 1 GHz below 2.3 mV/div

| Horizontal   | SDS6208L<br>SDS6204L    | SDS6108L<br>SDS6104L    | SDS6058L<br>SDS6054L    |
|--------------|-------------------------|-------------------------|-------------------------|
| Time scale   | 0.1 ns/div – 1000 s/div | 0.2 ns/div – 1000 s/div | 0.5 ns/div – 1000 s/div |
| Range        | 10 divisions            |                         |                         |
| Display mode | Y-T, X-Y, Roll          |                         |                         |

|                    |   |
|--------------------|---|
| Roll mode          | $\geq 50$ ms/div  |
| Skew (CH1~CH8)     | $< 100$ ps  |
| Time base Accuracy | $\pm 2$ ppm initial (0~50°C); $\pm 0.5$ ppm 1st year aging; $\pm 3$ ppm 20-year aging |

| Trigger            |   |   |                |                |
|--------------------|---|---|----------------|----------------|
| Mode               | Auto, Normal, Single  |   |                |                |
| Level              | Internal: $\pm 4.5$ div from the center of the screen<br>EXT: $\pm 0.61$ V<br>EXT/5: $\pm 3.05$ V   |   |                |                |
| Hold off range     | By time: 8 ns ~ 30 s (8 ns step)<br>By event: 1 ~ 108   |   |                |                |
| Coupling           | CH1~CH8<br>DC: Passes all components of the signal<br>AC: Blocks DC components and attenuates signals below 15 Hz<br>LFRJ: Attenuates the frequency components below 2.4 MHz<br>HFRJ: Attenuates the frequency components above 1.3 MHz<br>Noise RJ: Increases the trigger hysteresis   |   |                |                |
|                    | EXT<br>DC: Passes all components of the signal<br>AC: Blocks DC components and attenuates signals below 15 Hz<br>LFRJ: Attenuates the frequency components below 2.5 MHz<br>HFRJ: Attenuates the frequency components above 1.3 MHz   |   |                |                |
| Accuracy (typical) | CH1 ~ CH8: $\pm 0.2$ div<br>EXT: $\pm 0.3$ div  |   |                |                |
| Sensitivity        | CH1 ~ CH8:  |   | 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 ~ 10 MHz<br>300 mVpp, 10 MHz ~ bandwidth (300 MHz) |                |                |
|                    | EXT/5:  | 1 Vpp, DC ~ 10 MHz<br>1.5 Vpp, 10 MHz ~ bandwidth (300 MHz)     |                |                |
| Jitter             | CH1 ~ CH8:<br>< 9 ps RMS (typical) for $\geq 300$ MHz sine and $\geq 6$ divisions peak to peak amplitude for vertical gain settings from 2.5 mV/div to 10 V/div<br>< 5 ps RMS (typical) for $\geq 500$ MHz sine and $\geq 6$ divisions peak to peak amplitude for vertical gain settings from 2.5 mV/div to 10 V/div<br>EXT: < 200 ps rms |   |                |                |
| Displacement       | Pre-Trigger: 0 ~ 100% memory<br>Delay-Trigger: 0 ~ 10,000 div   |   |                |                |
| Zone               | Up to 2 zones<br>Source: CH1~CH8<br>Property: Intersect, Not Intersect  |   |                |                |
| Edge Trigger       |   |   |                |                |
| Source             | CH1~CH8 / EXT / (EXT/5) / AC Line / D0~D15  |   |                |                |
| Slope              | Rising, Falling, Rising & Falling   |   |                |                |
| Slope Trigger      |   |   |                |                |
| Source             | CH1 ~ CH8   |   |                |                |
| Slope              | Rising, Falling   |   |                |                |

|                            |   |
|----------------------------|---|
| Limit range                | <, >, in range, out of range  |
| Time range                 | 2 ns ~ 20 s, Resolution = 1 ns  |
| <b>Pulse Width Trigger</b> |   |
| Source                     | CH1~CH8 / D0~D15  |
| Polarity                   | +wid, -wid  |
| Limit range                | <, >, in range, out of range  |
| Time range                 | 2 ns ~ 20 s, Resolution = 1 ns  |
| <b>Video Trigger</b>       |   |
| Source                     | CH1 ~ CH8   |
| 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 ~ CH8   |
| Window type                | Absolute, Relative  |
| <b>Interval Trigger</b>    |   |
| Source                     | CH1 ~ CH8 / D0~D15  |
| Slope                      | Rising, Falling   |
| Limit range                | <, >, in range, out of range  |
| Time range                 | 2 ns ~ 20 s, Resolution = 1 ns  |
| <b>Dropout Trigger</b>     |   |
| Source                     | CH1 ~ CH8 / D0~D15  |
| Timeout type               | Edge, State   |
| Slope                      | Rising, Falling   |
| Time range                 | 2 ns ~ 20 s, Resolution = 1 ns  |
| <b>Runt Trigger</b>        |   |
| Source                     | CH1 ~ CH8   |
| Polarity                   | Positive, Negative  |
| Limit range                | <, >, in range, out of range  |
| Time range                 | 2 ns ~ 20 s, Resolution = 1 ns  |
| <b>Pattern Trigger</b>     |   |
| Source                     | CH1 ~ CH8 / D0 ~ D15  |
| Pattern Setting            | Don't Care, Low, High   |
| Logic                      | AND, OR, NAND, NOR  |
| Limit range                | <, >, in range, out of range  |
| Time range                 | 2 ns ~ 20 s, Resolution = 1 ns  |
| <b>Qualified Trigger</b>   |   |
| Type                       | State, State with Delay, Edge, Edge with Delay                              |
| Qualified Source           | CH1~CH8 / D0~D15  |

|                          |   |
|--------------------------|---|
| Edge Trigger Source      | CH1~CH8 / D0~D15  |
| <b>Nth Edge Trigger</b>  |   |
| Source                   | CH1 ~ CH8 / D0 ~ D15  |
| Slope                    | Rising, Falling   |
| Idle time                | 8 ns ~ 20 s, Resolution = 1 ns  |
| Edge Number              | 1 ~ 65535   |
| <b>Delay Trigger</b>     |   |
| Source A                 | CH1 ~ CH8 / D0~D15  |
| Source B                 | CH1 ~ CH8 / D0~D15  |
| Slope                    | Rising, Falling   |
| Limit range              | <, >, in range, out of range  |
| Time range               | 2 ns ~ 20 s, Resolution = 1 ns  |
| <b>Serial Trigger</b>    |   |
| Source                   | CH1~CH8 / D0~D15  |
| Protocol                 | Standard: I2C, SPI, UART, CAN, LIN<br>Optional: CAN FD, FlexRay, I2S, MIL-STD-1553B, SENT |
| I2C                      | Type: Start, Stop, Restart, No Ack, EEPROM, Address & Data, Data Length                   |
| SPI                      | Type: Data  |
| UART                     | Type: Start, Stop, Data, Parity Error   |
| CAN                      | Type: All, Remote, ID, ID+Data, Error   |
| LIN                      | Type: Break, Frame ID, ID+Data, Error   |
| CAN FD (Optional)        | Type: Start, Remote, ID, ID+Data, Error   |
| FlexRay (Optional)       | Type: TSS, Frame, Symbol, Errors  |
| I2S (Optional)           | Type: Data, Mute, Clip, Glitch, Rising Edge, Falling Edge                                 |
| MIL-STD-1553B (Optional) | Type: Transfer, Word, Error, Timing   |
| SENT (Optional)          | Type: Start, Slow channel, Fast channel, Error  |

| Serial Decoder |                      |
|----------------|----------------------|
| Decoders       | 2                    |
| Threshold      | - 4.1 ~ 4.1 div      |
| List           | 1 ~ 7 lines          |
| Decoder type   | Full duplex          |
| <b>I2C</b>     |                      |
| Source         | CH1 ~ CH8 / D0 ~ D15 |
| Signal         | SCL, SDA             |
| Address        | 7-bit, 10-bit        |
| <b>SPI</b>     |                      |

|                                 |  |
|---------------------------------|--|
| Source                          | CH1 ~ CH8 / D0 ~ D15   |
| Signal                          | CLK, MISO, MOSI, CS  |
| Edge Select                     | Rising, Falling  |
| Chip select                     | Active high, Active low, Clock timeout                             |
| Bit Order                       | LSB, MSB   |
| <b>UART</b>                     |  |
| Source                          | CH1 ~ CH8 / D0 ~ D15   |
| Signal                          | RX, TX   |
| Data Width                      | 5-bit, 6-bit, 7-bit, 8-bit   |
| Parity Check                    | None, Odd, Even, Mark, Space                                       |
| Stop Bit                        | 1-bit, 1.5-bit, 2-bit  |
| Idle Level                      | Low, High  |
| Bit Order                       | LSB, MSB   |
| <b>CAN</b>                      |  |
| Source                          | CH1 ~ CH8 / D0 ~ D15   |
| <b>LIN</b>                      |  |
| LIN Version                     | Ver 1.3, Ver 2.0   |
| Source                          | CH1 ~ CH8 / D0 ~ D15   |
| Baud Rate                       | 600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, Custom |
| <b>CAN FD (Optional)</b>        |  |
| Source                          | CH1 ~ CH8 / D0 ~ D15   |
| Nominal Baud Rate               | 10 kbps, 25 kbps, 50 kbps, 100 kbps, 250 kbps, 1 Mbps, Custom      |
| Data Baud Rate                  | 500 kbps, 1 Mbps, 2 Mbps, 5 Mbps, 8 Mbps, 10 Mbps, Custom          |
| <b>FlexRay (Optional)</b>       |  |
| Source                          | CH1 ~ CH8 / D0 ~ D15   |
| Baud Rate                       | 2.5 Mbps, 5 Mbps, 10 Mbps, Custom                                  |
| <b>I2S (Optional)</b>           |  |
| Source                          | CH1 ~ CH8 / D0 ~ D15   |
| Signal                          | BCLK, WS, DATA   |
| Audio Variant                   | Audio-I2S, Audio-LJ, Audio-RJ                                      |
| Start Bits                      | 0 ~ 31   |
| Data Bits                       | 1 ~ 32   |
| <b>MIL-STD-1553B (Optional)</b> |  |
| Source                          | CH1 ~ CH8  |
| <b>SENT (Optional)</b>          |  |
| Source                          | CH1 ~ CH8 / D0 ~ D15   |
| <b>Manchester (Optional)</b>    |  |
| Source                          | CH1 ~ CH8  |
| Baud Rate                       | 500 bps ~ 5 Mbps   |



| Measurement                  |   |
|------------------------------|---|
| <b>Automatic Measurement</b> |   |
| Source                       | CH1 ~ CH8, D0 ~ D15, Math, Ref, History, Zoom   |
| Mode                         | Simple, Advanced  |
| Range                        | Screen<br>Gated: inside screen, definable with separate Gate cursors  |
| Custom Threshold             | Upper, Middle, Lower  |
| No. of Measurements          | Display 12 measurements at the same time (Display mode = M2)  |
| Vertical Parameters          | Max, Min, Pk-Pk, Top, Base, Amplitude, Mean, Cycle Mean, Stdev, Cycle Stdev, RMS, Cycle RMS, Median, Cycle Median, FOV, FPPE, ROV, RPPE, Level@Trigger  |
| Horizontal Parameters        | Period, Frequency, Time@max, Time@min, +Width, -Width, 10-90% Rise time, 90-10% Fall time, Rise time, Fall time, +Burst Width, -Burst Width, +Duty Cycle, -Duty Cycle, Delay, Time@Middle, Cycle-Cycle jitter |
| Miscellaneous Parameters     | +Area@DC, -Area@DC, Area@DC, Absolute Area@DC, +Area@AC, -Area@AC, Area@AC, Absolute Area@AC, Cycles, Rising Edges, Falling Edges, Edges, Positive pulses, Negative pulses, Positive Slope, Negative Slope    |
| Delay Parameters             | Phase, FRFR, FRFF, FFFR, FFFF, FRLR, FRLF, FFLR, FFLF, Skew, Tsu@R, Tsu@F, Th@R, Th@F   |
| Statistics                   | Current, Mean, Min, Max, Sdev, Count, Histogram, Trend, Track   |
| Statistics Count             | Unlimited, 1~1024   |
| <b>Cursors</b>               |   |
| Source                       | CH1~CH8, D0~D15, Math, Ref, Histogram   |
| Type                         | Manual: Time X1, X2, (X1-X2), (1/ΔT); Vertical Y1, Y2, (Y1-Y2)<br>Track: Time X1, X2, (X1-X2)<br>Measure: Indicates the measurement of a specific parameter   |

| Math      |   |
|-----------|---|
| Trace     | F1, F2, F3, F4  |
| Source    | CH1~CH8, Z1~Z8, F1~F4   |
| Operation | FFT, +, -, x, ÷, ∫dt, d/dt, √, Identity, Negation,  x , Sign, ex, 10x, ln, lg, Interpolation, Max hold, Min hold, ERES, Average, Formula Editor   |
| FFT       | Length: 8 Mpts, 4 Mpts, 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 ~ CH8, 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 ~ CH8, Z1 ~ Z8  |
| Mask creating                     | Auto (Create mask), Customized (Mask Editor)  |
| Mask test speed                   | Up to 18,000 frames/s   |
| <b>DVM</b>                        |   |
| Source                            | CH1 ~ CH8   |
| Mode                              | DC mean, DC RMS, AC RMS, Peak-peak, Amplitude   |
| Plot                              | Bar, Histogram, Trend   |
| Gate                              | 20 ms   |
| <b>Bode Plot</b>                  |   |
| Source                            | CH1 ~ CH4   |
| Supported signal sources          | SAG1021I (Connection: USB),<br>SDG series waveform generators (Connection: USB, LAN)  |
| <b>Power Analysis (optional)</b>  |   |
| Source                            | CH1 ~ CH4   |
| Measure                           | Power quality, Current Harmonics, Inrush current, Switching loss, Slew rate, Modulation, Output ripple, Turn on/turn off, Transient response, PSRR, Efficiency, SOA |
| <b>Histogram</b>                  |   |
| Source                            | CH1 ~ CH8   |
| Type                              | Horizontal, Vertical, Both  |
| <b>Counter</b>                    |   |
| Source                            | CH1 ~ CH8   |
| Frequency resolution              | 7 digits  |
| Totalizer                         | Counter on edges, supports Gate and Trigger   |
| <b>Eye Diagram (optional)</b>     |   |
| Source                            | CH1 ~ CH8   |
| Clock recovery                    | Constant frequency, PLL   |
| Measure                           | Eye height, "1" level, "0" level, Eye amplitude, Eye width, Eye crossing, Average power, Q factor, TIE  |
| Mask Test                         | Supported   |
| <b>Jitter Analysis (optional)</b> |   |
| Source                            | CH1 ~ CH8   |

|                      |  |
|----------------------|--|
| Clock recovery       | Constant frequency, PLL  |
| Measure              | Period, Frequency, +Width, -Width, +Duty cycle, -Duty cycle, Cycle-cycle jitter, Cycle-cycle +width, Cycle-cycle -Width, Cycle-cycle +Duty cycle, Cycle-cycle -Duty cycle, Bit Rate, Unit interval |
| Jitter decomposition | TIE, RJ, DJ, DCD, DDJ, PJ, TJ@BER<br>Statistics: Histogram, Track, Spectrum  |

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

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

|                       |   |
|-----------------------|---|
| Harmonic distortion   | DC ~ 5 MHz    -50 dBc<br>5 MHz ~ 25 MHz    -45 dBc                          |
| <b>Square / Pulse</b> |   |
| Frequency             | 1 $\mu$ Hz ~ 10 MHz   |
| Duty cycle            | 1% ~ 99%  |
| Edge                  | < 24 ns (10% ~ 90%)   |
| Overshoot             | < 3% (typical, 1 kHz, 1 Vpp)  |
| Pulse width           | > 50 ns   |
| Jitter (cycle-cycle)  | < 500 ps + 10 ppm   |
| <b>Ramp</b>           |   |
| Frequency             | 1 $\mu$ Hz ~ 300 kHz  |
| Linearity             | < 0.1% of Pk-Pk (typical, 1 kHz, 1 Vpp, 50% symmetry)                       |
| Channels              | 0% ~ 100%   |
| <b>DC</b>             |   |
| Offset range          | $\pm$ 1.5 V (into 50 $\Omega$ )<br>$\pm$ 3 V (into Hi-Z)                    |
| Accuracy              | $\pm$ ( setting value *1% + 3 mV)   |
| <b>Noise</b>          |   |
| Bandwidth (-3 dB)     | >25 MHz   |
| <b>Arb</b>            |   |
| Frequency             | 1 $\mu$ Hz ~ 5 MHz  |
| Waveform memory       | 16 kpts   |
| Sample rate           | 125 MSa/s   |
| Wave import           | From EasyWaveX, from U-disk, directly from waveform data of analog channels |

| I/O   |  |
|-------|--|
| Front | USB 3.0 Host x2,<br>Calibration Signal: 1 kHz, 3 V Square  |
| Rear  | USB 2.0 Host x2,<br>USB 2.0 Device,<br>LAN: 10 / 100M / 1000M BaseT (RJ45),<br>Micro SD Card,<br>External Trigger, EXT: $\leq$ 1.5 Vrms, EXT/5: $\leq$ 7.5Vrms,<br>Auxiliary Output: TRIG OUT(3.3 V LVCMOS), PASS/FAIL OUT(3.3 V TTL),<br>HDMI<br>10 MHz In, 10 MHz Out<br>AWG |

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

| Environmental                 |  |   |
|-------------------------------|--|---|
| Temperature                   | Operating: 0°C ~ 50°C<br>Non-operating: -30°C ~ 70°C   |   |
| Humidity                      | Operating: 5% ~ 90%RH, 30°C, degraded to 50%RH at 40°C<br>Non-operating: 5% ~ 95%  |   |
| Altitude                      | Operating: ≤ 3,048 m, 25°C<br>Non-operating: ≤12,192 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<br>CLASS A group 1<br>150 kHz - 30 MHz  |
|                               | Radiated disturbance   | CISPR 11 / EN 55011<br>CLASS A group 1<br>30 MHz - 1 GHz  |
|                               | Electrostatic discharge (ESD)  | IEC 61000-4-2 / EN 61000-4-2<br>4.0 kV (Contact),<br>8.0 kV (Air)   |
|                               | Radio-frequency electromagnetic field Immunity   | IEC 61000-4-3 / EN 61000-4-3<br>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<br>2kV<br>(Input AC Power Ports)   |
|                               | Surges   | IEC 61000-4-5 / EN 61000-4-5<br>1kV (Line to line)<br>2kV (Line to ground)  |
|                               | Radio-frequency continuous conducted Immunity  | IEC 61000-4-6 / EN 61000-4-6<br>3 V, 0.15-80MHz   |
|                               | Voltage dips and interruptions   | IEC 61000-4-11/EN 61000-4-11<br>Voltage Dips:<br>0% UT during 1 cycle;<br>40% UT during 10/12 cycles;<br>70% UT during 25/30 cycles<br>Voltage interruptions: 0% UT during 250/300 cycles |
| Safety                        | UL 61010-1:2012/R: 2018-11; CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11.<br>UL 61010-2-030:2018; CAN/CSA-C22.2 No. 61010-2-030:2018. |   |
| RoHS                          | EU 2015/863  |   |

| Power Supply              | 8-channel  | 4-channel  |
|---------------------------|--|--|
| Input Voltage & Frequency | 100 ~ 240 Vrms 50/60Hz<br>100 ~ 120 Vrms 400 Hz        |  |
| Power consumption         | 380 W max., 240 W typical, 8 W typical in standby mode | 193 W max., 120 W typical, 4 W typical in standby mode |

| Mechanical | 8-channel  | 4-channel  |
|------------|--|--|
| Dimensions | Length × Height × Width =<br>395 mm × 86 mm × 414 mm<br>Including rear I/O:<br>395 mm × 86 mm × 431 mm | Length × Height × Width =<br>395 mm × 43 mm × 414 mm<br>Including rear I/O:<br>395 mm × 43 mm × 431 mm |
| Weight     | Net Weight 9.1 kg  | Net Weight 6.1 kg  |

## Ordering Information

| Model    | Description   |
|----------|---|
| SDS6208L | 2 GHz bandwidth, 5 GSa/s sample rate, 8-bit, 500 Mpts memory depth, 8-channel   |
| SDS6204L | 2 GHz bandwidth, 5 GSa/s sample rate, 8-bit, 500 Mpts memory depth, 4-channel   |
| SDS6108L | 1 GHz bandwidth, 5 GSa/s sample rate, 8-bit, 500 Mpts memory depth, 8-channel   |
| SDS6104L | 1 GHz bandwidth, 5 GSa/s sample rate, 8-bit, 500 Mpts memory depth, 4-channel   |
| SDS6058L | 500 MHz bandwidth, 5 GSa/s sample rate, 8-bit, 500 Mpts memory depth, 8-channel |
| SDS6054L | 500 MHz bandwidth, 5 GSa/s sample rate, 8-bit, 500 Mpts memory depth, 4-channel |

| Standard Accessories       | Quantity  |
|----------------------------|-----------|
| USB cable                  | 1         |
| Quick start                | 1         |
| Passive probe              | 1/channel |
| Certificate of calibration | 1         |
| Wireless mouse             | 1         |
| Power cord                 | 1         |

| Optional Accessories                      | Part No.  |
|---|---|
| Waveform generator (software)             | SDS6000L-FG   |
| 16 digital channels (software)            | SDS6000L-16LA   |
| 16-channel logic probe                    | SPL2016   |
| Power Analysis (software)                 | SDS6000L-PA   |
| Power Analysis deskew fixture             | DF2001A   |
| Eye Diagram/Jitter Analysis (software)    | SDS6000L-EJ   |
| I2S trigger & decode (software)           | SDS6000L-I2S  |
| MIL-STD-1553B trigger & decode (software) | SDS6000L-1553B  |
| FlexRay trigger & decode (software)       | SDS6000L-FlexRay  |
| CAN FD trigger & decode (software)        | SDS6000L-CANFD  |
| SENT trigger & decode (software)          | SDS6000L-SENT   |
| Manchester decode (software)              | SDS6000L-Manch  |
| STB3 demo signal source                   | STB3  |
| High-speed active probe                   | SAP1000, SAP2500  |
| High voltage probe                        | HPB4010   |
| High-speed differential probe             | SAP2500D  |
| High voltage differential probe           | DPB1300 / DPB4080 / DPB5150 / DPB5150A / DPB5700 / DPB5700A                       |
| Current probe                             | CPL5100 / CP4020 / CP4050 / CP4070 / CP4070A / CP6030 / CP6030A / CP6150 / CP6500 |
| 64-channel synchronization distributor    | SYN64   |



## 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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