

# SDS1000X-E Series

Super Phosphor  
Oscilloscope



DataSheet-2020.11

# SDS1104X-E SDS1204X-E SDS1202X-E

## Product overview

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

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

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

## Key Features

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

## Models and key Specification

| Model  | SDS1104X-E   | SDS1204X -E<br>SDS1202X-E   |
|--|--|-----------------------------|
| Bandwidth  | 100 MHz  | 200 MHz                     |
| Sampling Rate (Max.)                                   | Two channel series have a single 1 GSa/s ADC, four channel series have two 1 GSa/s ADCs. When all channels are enabled, each channel has a maximum sample rate of 500 MSA/s. When a single channel per pair is active, that channel has sample rate of 1 GSa/s |                             |
| Channels   | 4 (four channel series)<br>2+EXT (two channel series)  |                             |
| Memory Depth (Max.)                                    | 7 Mpts/CH (not interleave mode);<br>14 Mpts/CH (interleave mode)   |                             |
| Waveform Capture Rate (Max.)                           | 100,000 wfm/s (normal mode), 400,000 wfm/s (sequence mode)   |                             |
| Trigger Type   | Edge, Slope, Pulse Width, Window, Runt, Interval, Dropout, Pattern, Video  |                             |
| Serial Trigger and decoder (Standard)                  | IIC, SPI, UART, CAN, LIN   |                             |
| 16 Digital Channels (four channel series only, option) | Maximum waveform capture rate up to 1 GSa/s, Record length up to 14 Mpts/CH  |                             |
| USB AWG module (four channel series only, option)      | One channel, 25 MHz, sample rate of 125 MHz, wave length of 16 kpts, isolated output (SAG1021I only)   |                             |
| Bode plot ( four channel series only)                  | Minimum start frequency of 10 Hz, minimum scan bandwidth of 500 Hz, maximum scan bandwidth of 120 MHz (dependent on Oscilloscope and AWG bandwidth), 500 maximum scan frequency points   |                             |
| USB WIFI adapter (four channel series only, option)    | 802.11b/g/n, WPA-PSK, the adapter must be supplied by Siglent to ensure working  |                             |
| I/O  | USB Host, USB Device, LAN, Pass/Fail, Trigger Out, Sbus (Siglent MSO)  |                             |
| Probe (Std)  | 4 pcs passive probe PP510  | 4/2 pcs passive probe PP215 |
| Display  | 7 inch TFT -LCD (800x480)  |                             |
| Weight   | Four channel series: Without package 2.6 kg; With package 3.8 kg<br>Two channel series: Without package 2.5 kg; With package 3.5 kg  |                             |

## Function & Characteristics

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



Front panel of the four channel series

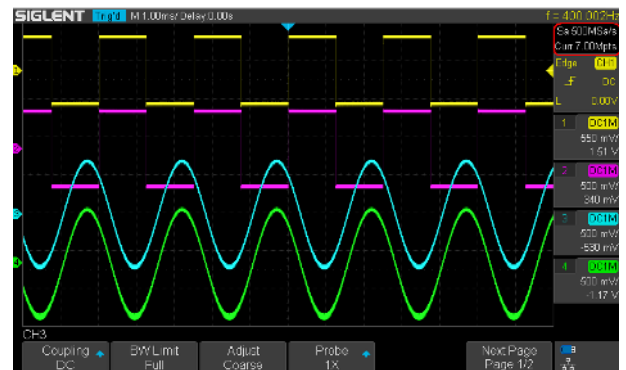
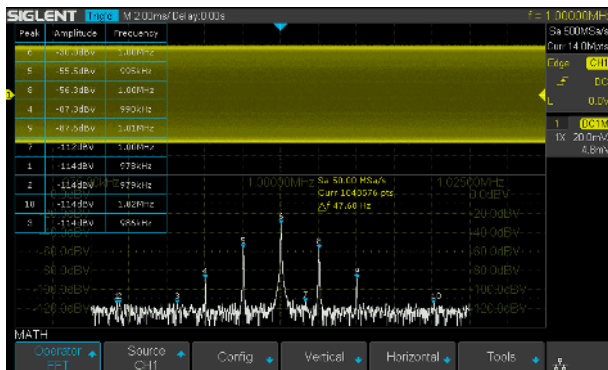


Front panel of the two channel series

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

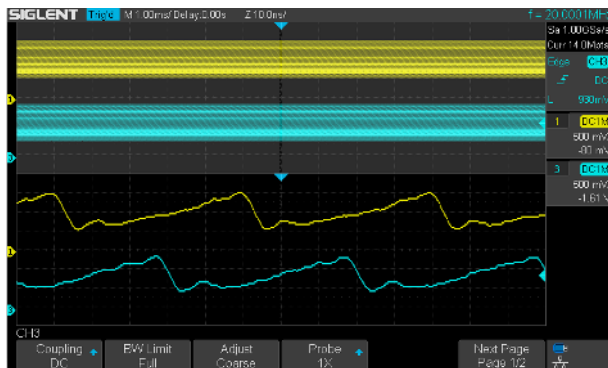
## Function & Characteristics

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



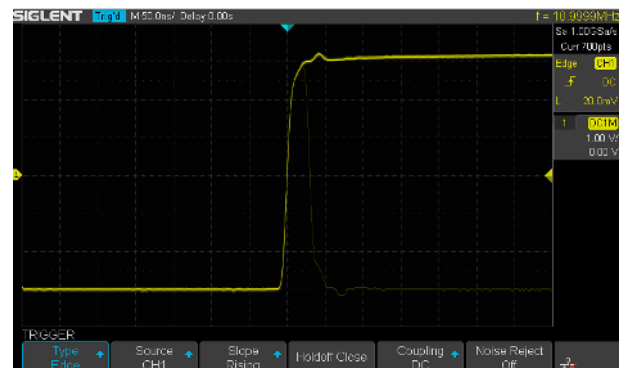
The four channel series has two 1 GSa/s ADC chips (channel 1 and 2 share one, channel 3 and 4 share another), so that each channel can achieve sample rates up to 500 MSa/s and work on bandwidths of 200 MHz when all channels are enabled.

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



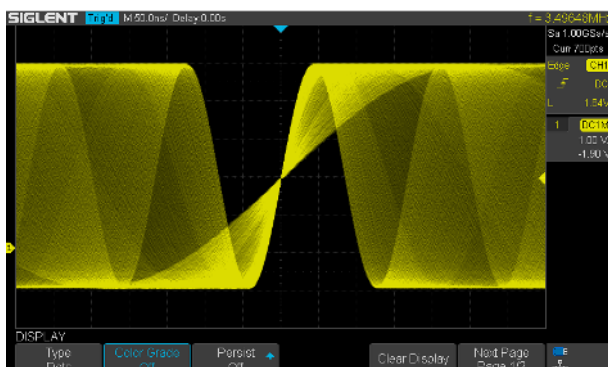
Using hardware-based Zoom technologies and max record length of up to 14 Mpts, users are able to oversample to capture for longer time periods at higher resolution and use the zoom feature to see more details within each signal.

- Waveform Capture Rate up to 400,000 wfm/s

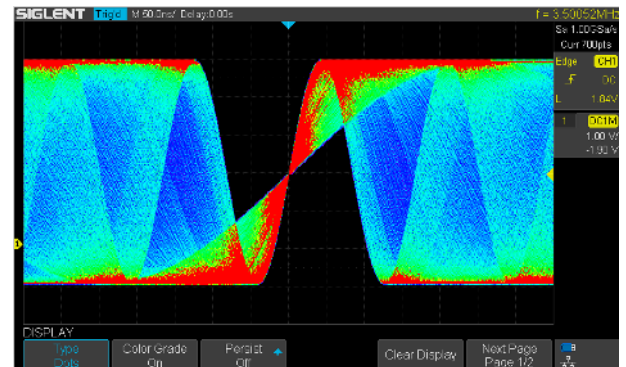


With a waveform capture rate of up to 400,000 wfm/s (sequence mode), the oscilloscope can easily capture the unusual or low-probability events.

- 256 -Level Intensity Grading and Color Temperature Display

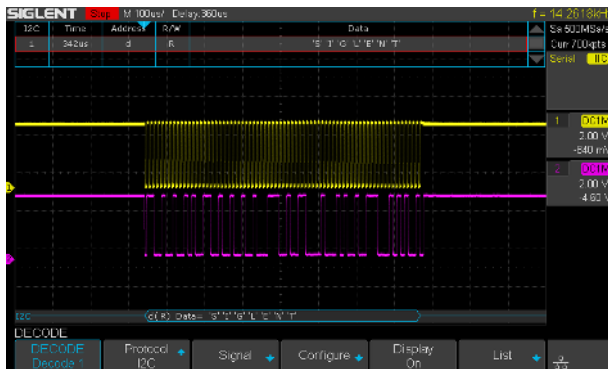


SPO display technology provides fast refresh rates. The resulting intensity-graded trace is brighter for events that occur with more frequency and dims when the events occur with less frequency.



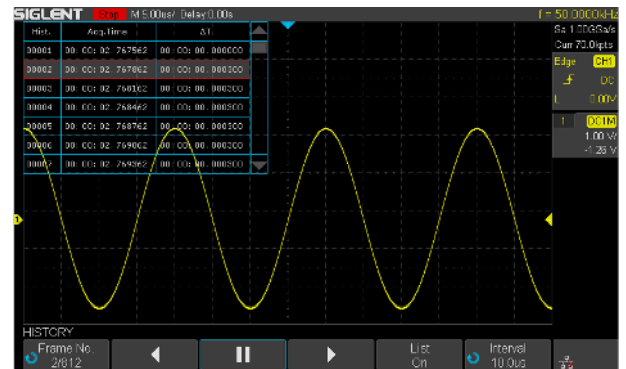
The color temperature display is similar to the intensity-graded trace function, but the trace occurrence is represented by different colors (color "temperature") as opposed to changes in the intensity of one color. Red colors represents the more frequent events, while blue is used to mark points that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

### Serial Bus Decoding Function (Standard)



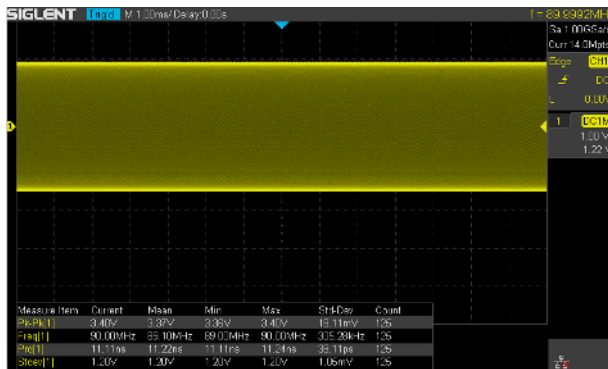
SDS1000X-E displays the decoding through the events list. Bus protocol information can be quickly and intuitively displayed in a tabular format.

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



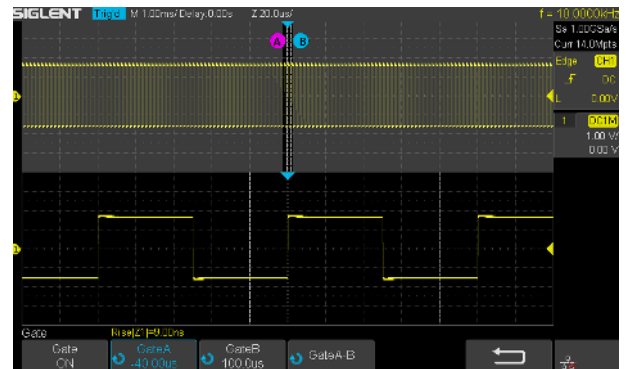
Playback the latest triggered events using the history function. Segmented memory collection will store trigger events into multiple (Up to 80,000) memory segments, each segment will store triggered waveforms and timestamp of each frame.

### True measurement to 14 M points



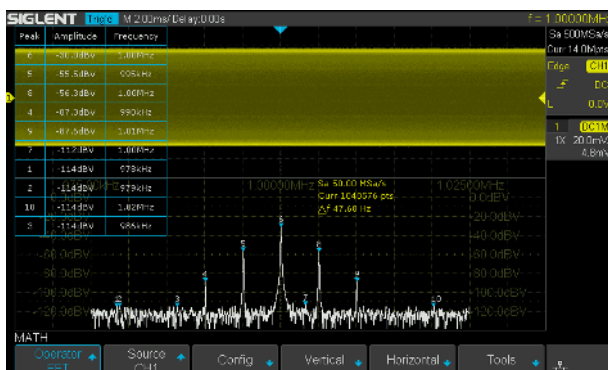
SDS1004X-E can measure all sampled data points up to 14 Mpts. This ensures the accuracy of measurements while the math co-processor decreases measurement time and increases ease-of-use.

### Gate and Zoom Measurement



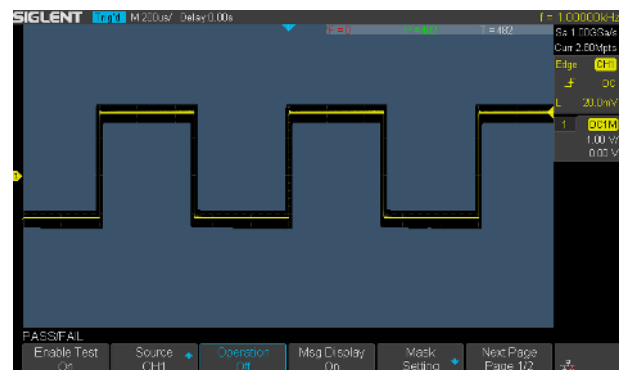
Through Gate and Zoom measurement, the user can specify an arbitrary interval of waveform data analysis and statistics. This helps avoid measurement errors that can be caused by invalid or extraneous data, greatly enhancing the measurements' validity and flexibility.

### 1 M point used to calculate the FFT



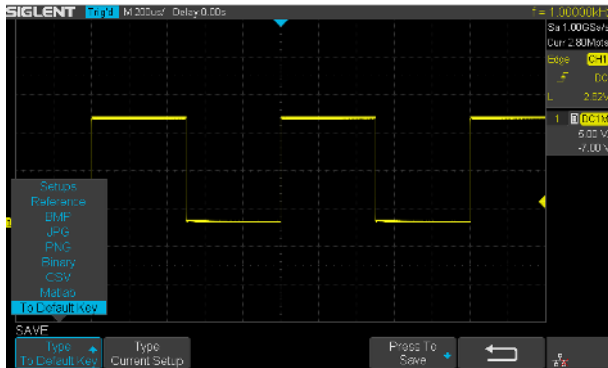
The new math co-processor enables FFT analysis of incoming signals using up to 1 M samples per waveform. This provides high frequency resolution with a fast refresh rate. The FFT function also supports Peaks, Markers, a variety of numbers, a variety of window functions so that it can adapt to different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

### Hardware-Based High Speed Pass/ Fail function



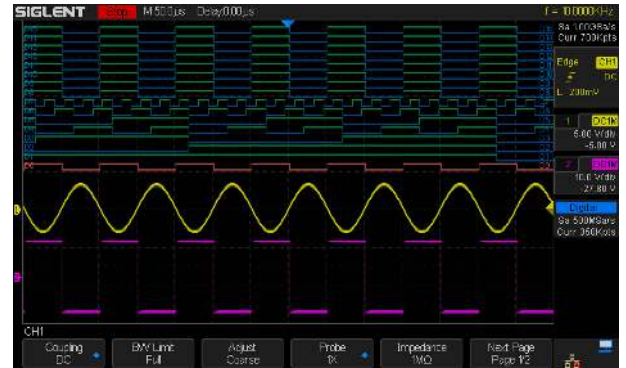
The SDS1000X-E utilizes a hardware-based Pass/Fail function, performing up to 40,000 Pass / Fail decisions each second. Easily generate user defined test templates provide trace mask comparison making it suitable for long-term signal monitoring or automated production line testing.

## Customizable Default Key



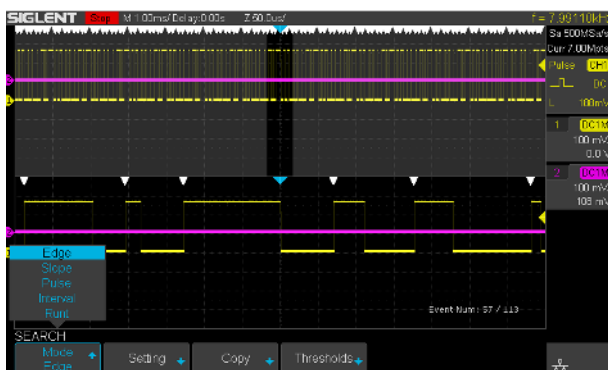
The current parameters of the oscilloscope can be preset to Default Key through the Save menu.

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



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

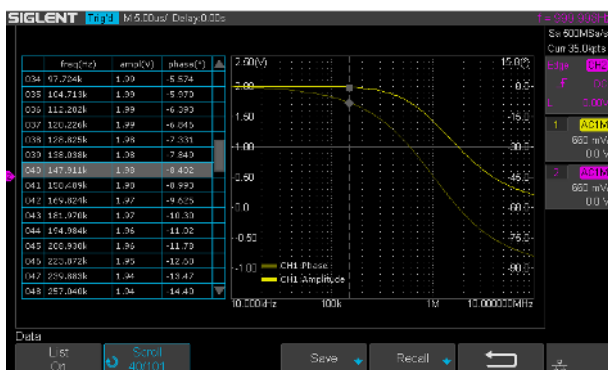
## Search and Navigate (four channel series only)



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



## Bode Plot (four channel series only)



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

**USB WIFI Adapter (four channel series only, option)**



**USB WIFI Adapter**

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

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



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

**Complete Connectivity**



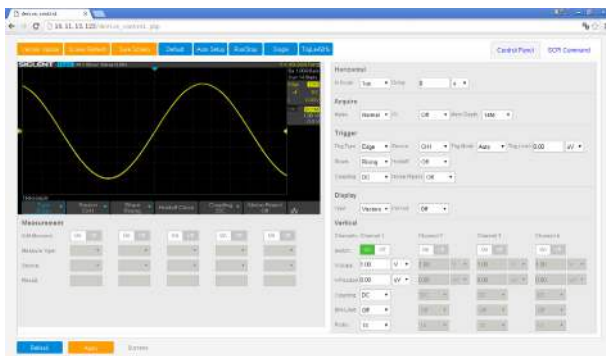
**Back panel of the four channel series**



**Back panel of the two channel series**

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

**Web control (four channel series only)**



With the new embedded web server, users can control the 4 channel scopes from a simple web page. This provides wonderful remote troubleshooting and monitoring capabilities.

## Specifications

### Acquire System

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

### Input

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

### Vertical System

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



## Horizontal System

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

## Trigger System

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

## Edge Trigger

|        |   |
|--------|---|
| Slope  | Rising, Falling, Rising&Falling   |
| Source | All channels/ EXT/ (EXT/5)/ AC Line (Two channel series)<br>All channels/ AC Line (Four channel series) |

## Slope Trigger

|            |                 |
|------------|-----------------|
| Slope      | Rising, Falling |
| LimitRange | < , > , <> , >< |
| Source     | All channels    |
| TimeRange  | 2 ns- 4.2 s     |
| Resolution | 1 ns            |

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

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

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

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

## Measurement

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

## Math Function

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

## USB AWG Module (four channel series only, option)

|                       |  |
|-----------------------|--|
| Channel               | 1  |
| Max. Output Frequency | 25 MHz   |
| Sampling Rate         | 125 MSa/s  |
| Frequency Resolution  | 1 μHz  |
| Frequency Accuracy    | ±50 ppm  |
| Vertical Resolution   | 14-bit   |
| Amplitude Range       | -1.5 ~ +1.5 V (50Ω load)<br>-3 ~ +3 V (High-Z load)            |
| Waveform Type         | Sine, Square, Ramp, Pulse, Noise, DC and 45 built-in waveforms |
| Output impedance      | 50 Ω±2%  |
| Protection            | Over-Voltage Protection, Current-Limiting Protection           |
| Insulation Voltage    | ±42 Vpk (for SAG2021I only)                                    |

## Sine

|                                    |                                    |
|------------------------------------|------------------------------------|
| Frequency                          | 1 μHz ~ 25 MHz                     |
| Offset Accuracy (10 kHz)           | ±(1%*Offset Setting Value +3 mVpp) |
| Amplitude flatness (10 kHz, 5 Vpp) | ±0.3 dB                            |
| SFDR                               | DC ~ 1 MHz    -60 dBc              |
|                                    | 1 MHz ~ 5 MHz    -55 dBc           |
|                                    | 5 MHz ~ 25 MHz    -50 dBc          |
| HD                                 | DC ~ 5 MHz    -50 dBc              |
|                                    | 5 MHz ~ 25 MHz    -45 dBc          |

## Square/Pulse

|                                   |                             |
|-----------------------------------|-----------------------------|
| Frequency                         | 1 μHz ~ 10 MHz              |
| Duty Cycle                        | 1% ~ 99%                    |
| Rise/Fall time                    | < 24 ns (10% ~ 90%)         |
| Overshoot (1 kHz, 1 Vpp, Typical) | < 3% (typical 1 kHz, 1 Vpp) |
| Pulse Width                       | > 50 ns                     |
| Jitter                            | < 500 ps + 10 ppm           |

## Ramp

|                     |   |
|---------------------|---|
| Frequency           | 1 μHz ~ 300 kHz                                       |
| Linearity (Typical) | < 0.1% of Pk-Pk (Typical, 1 kHz, 1 Vpp, 50% Symmetry) |
| Symmetry            | 0% ~ 100%   |

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

## Environments

|             |  |
|-------------|--|
| Temperature | Operating: 0°C ~ +40°C                 |
|             | Non-operating: -20°C ~ +60°C           |
| Humidity    | Operating: 85% RH, 40°C , 24 hours     |
|             | Non-operating: 85% RH, 65°C , 24 hours |
| Height      | Operating: ≤3000 m                     |
|             | Non-operating: ≤15,000 m               |

## Standards

|                               |  |  |
|-------------------------------|--|--|
| 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, 150kHz-30MHz   |
|                               | Radiated disturbance   | CISPR 11/EN 55011<br>CLASS A group 1, 30MHz-1GHz   |
|                               | Electrostatic discharge (ESD)  | IEC 61000-4-2/EN 61000-4-2<br>4.0 kV (Contact), 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 (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  |
| Safety                        | 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 |
|                               | 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 | 100 - 240 Vrms (± 10%), 50 / 60 Hz |
|               | 100 - 120 Vrms (± 10%), 400 Hz     |
| Power         | 50W Max(Four channel series)       |
|               | 25W Max(Two channel series)        |

## Mechanical (Four channel series)




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









## Mechanical (Two channel series)

|            |                          |
|------------|--------------------------|
| Dimensions | Length: 312 mm           |
|            | Width: 134 mm            |
|            | Height: 150 mm           |
| Weight     | N.W: 2.5 kg; G.W: 3.5 kg |



## Probes and Accessories

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

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

## Ordering information

|                      |   |   |
|----------------------|---|---|
| Product Name         | SDS1000X-E Series Digital Oscilloscope                      |   |
|                      | SDS1104X-E 100 MHz Four Channels                            |   |
|                      | SDS1204X-E 200 MHz Four Channels                            |   |
|                      | SDS1202X-E 200 MHz Two Channels                             |   |
| Standard Accessories | USB Cable -1  |   |
|                      | Quick Start -1  |   |
|                      | Passive Probe -4/2  |   |
|                      | Certification -1  |   |
|                      | Power Cord -1   |   |
| Optional Accessories | 16 Channels MSO Software (four channel series only)         | SDS1000X-E-16LA   |
|                      | 16 Channels Logic Analyzer (four channel series only)       | SLA1016   |
|                      | AWG Software (four channel series only)                     | SDS1000X-E-FG   |
|                      | USB Isolated AWG Module Hardware (four channel series only) | SAG1021I  |
|                      | WIFI Software (four channel series only)                    | SDS1000X-E-WIFI   |
|                      | USB WIFI Adapter (four channel series only)                 | TL_WN725N   |
|                      | Isolated Front End  | ISFE  |
|                      | STB Demo Source   | STB-3   |
|                      | High Voltage Probe  | HPB4010   |
|                      | Current Probes  | CP4020/CP4050/CP4070/CP4070A/CP5030/CP5030A/CP5150/CP5500 |
|                      | Differential Probes   | DPB4080/DPB5150/DPB5150A/DPB5700/DPB5700A                 |
|                      | Rack Mount  | SDS1X-E-RMK   |

# SDS1000X-E Series

Super Phosphor  
Oscilloscope



## About SIGLENT

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

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, 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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