

DataSheet

SDS2000 Series Digital Oscilloscope

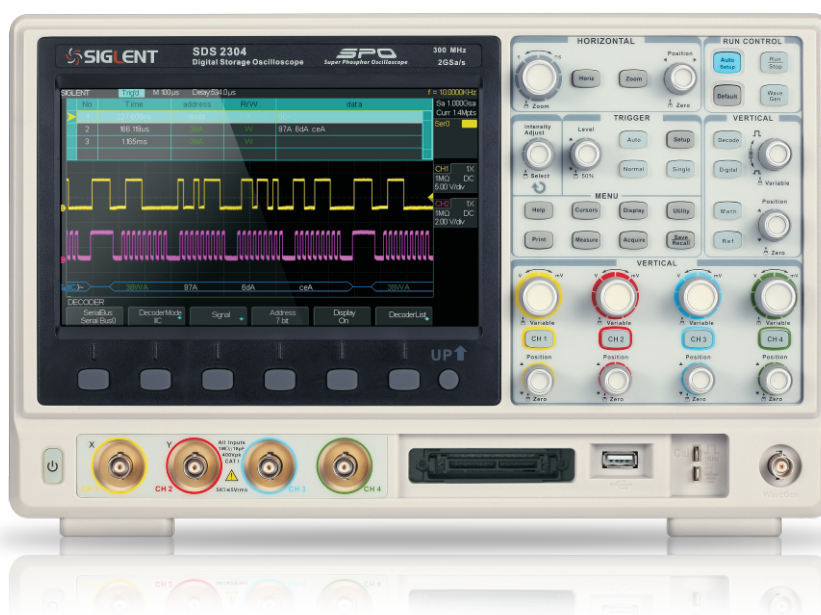


- ✧ Innovative SPO technology
- ✧ Memory Depth up to 28Mpts
- ✧ Waveform capture rate up to 110,000 wfms/s
- ✧ Zoom function based on the hardware technology
- ✧ Advanced math operations (FFT, Differential, Integral, Square root)
- ✧ Built-in 25MHz function/arbitrary waveform generator (optional)
- ✧ Support 256 intensity grading and color temperature waveform display
- ✧ A variety of serial protocol trigger and decode functions (I²C, SPI, UART/RS232, CAN, LIN)
- ✧ A variety of smart trigger functions (Pattern, Window, Interval, DropOut, Runt)

SDS2000 Series Digital Oscilloscope

Overview

SDS2000 Series is an advanced technology and high performance digital oscilloscope to meet customer's applications with its innovative SPO technology, powerful digital trigger function, serial decode function and logic analyzer.



Innovative SPO Technology

- Higher waveform capture rate(Up to 110,000 wfms/s)
- Memory depth up to 28Mpts
- Support 256 intensity grading and color temperature waveform display
- Hardware-based digital trigger system, lower trigger jitter and higher stability

Main Features

- Innovative SPO technology
- Bandwidth 70MHz,100MHz,200MHz,300MHz
- Sampling rate up to 2GSa/s
- Smart Trigger functions: Window,Runt,Interval,DropOut,Pattern
- Serial protocol decode/trigger functions(I²C,SPI,UART/RS232,CAN,LIN)
- Support HDTV video trigger function

- Hardware-based zoom function and high speed PASS/FAIL function technology
- 32 kinds of automatic waveform measurements , support measurements statistics function
- Built-in 25MHz function/arbitrary waveform generator
- Advanced waveform math operations (FFT,Differential,Integral,Square root)
- Complete connectivity:USB Host,USB Device(USBTMC,PictBridge),LAN(VXI-11), EXT TRIG,PASS/FAIL,TRIG OUT
- Support SCPI remote control commands
- Multi-language user interface and built-in online help system.
- 8-inch TFT LCD(800x480)

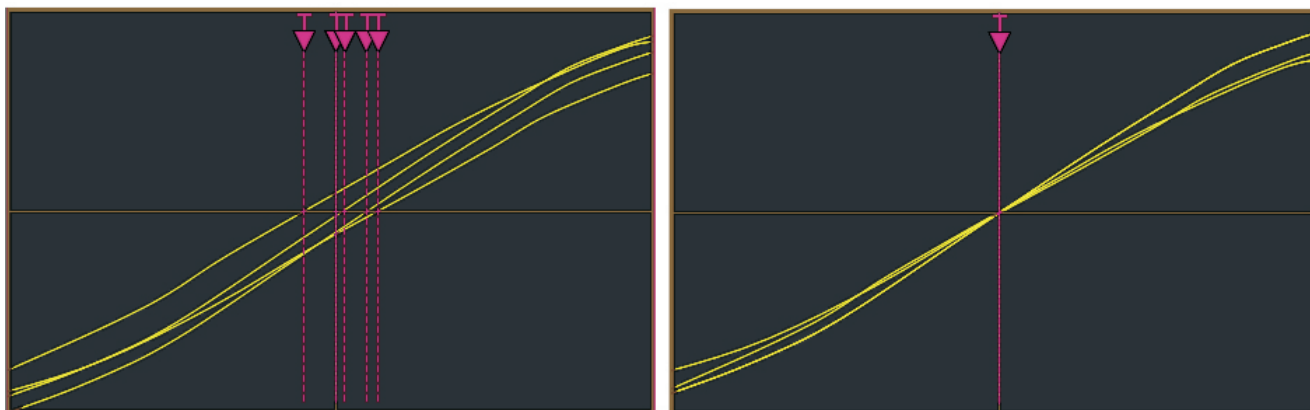
Digital Trigger function

Based on hardware technology, SDS2000 series realizes digital trigger system with its high triggering sensitivity, low trigger jitter, and supports smart trigger function, HDTV video trigger and serial trigger function.

Superiority

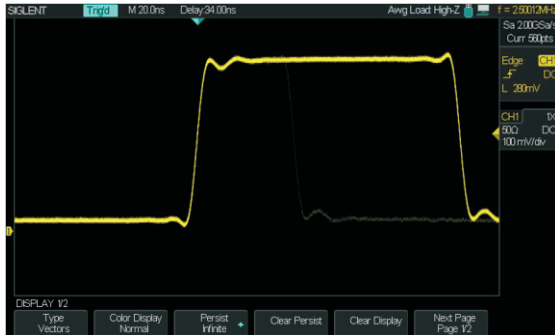
- Precise trigger
- Low trigger jitter
- High trigger sensitivity
- 1ns trigger timing
- Configurable Noise Reject
- High stability, not affected by temperature changes

Jitter comparison between Analog and Digital trigger



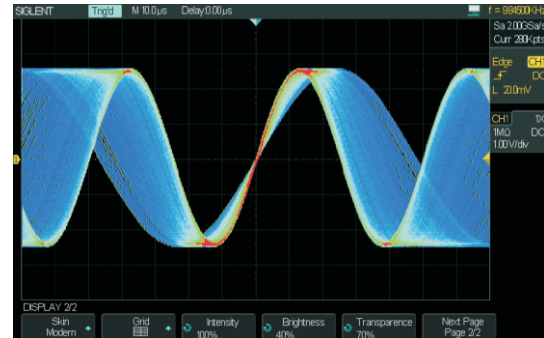
Function & Characteristic

Waveform capture rate up to 110,000 wfms/s



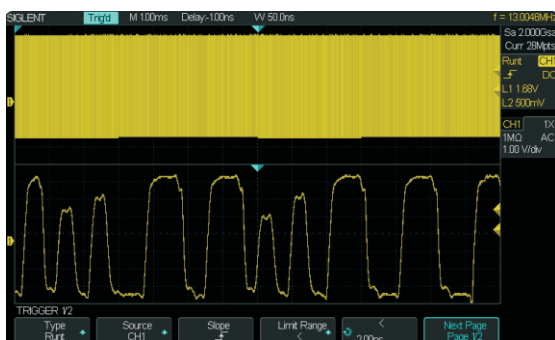
The higher capture rate can improve the ability of capturing abnormal event or low probability event.

Support 256 intensity grading and color temperature waveform display



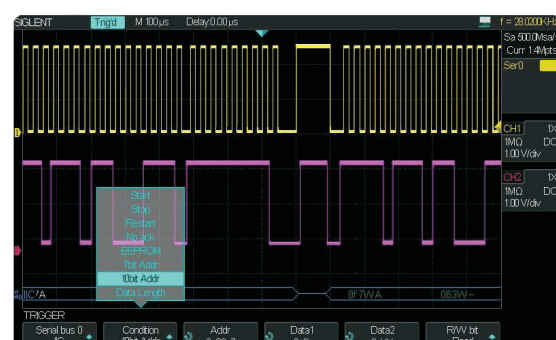
Color temperature display using a color change to reflect the probability of the waveform appears

Memory depth up to 28Mpts



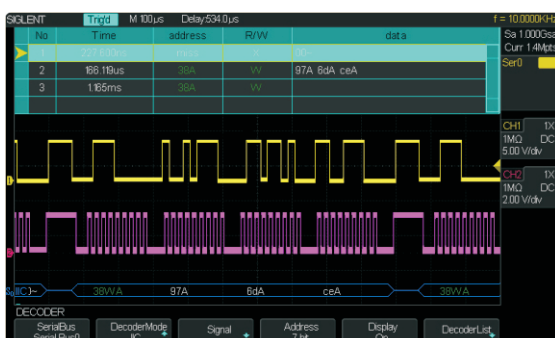
The 2GSa/s, 28Mpts Configuration provides the ability to capture a fast transient or a long acquisition.

Serial Trigger functions



The serial trigger will quickly isolate events on a bus eliminating the need to set manual triggers and hoping to catch the right info.

Serial protocol Decode functions (Optional)



Serial protocol decoding show directly on the waveform with an intuitive,color-coded overlay and presented in binary, hex or ASCII.

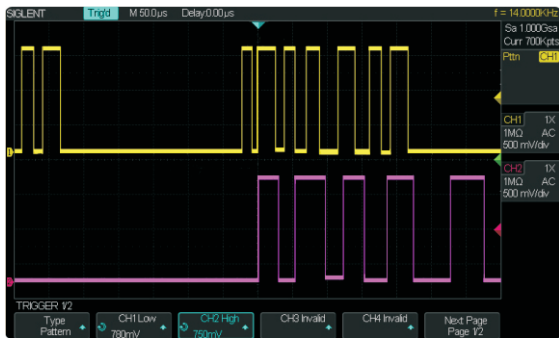
Various Connectivity (USB Host&Device, LAN, EXT TRIG, TRIG OUT, PASS/FAIL)



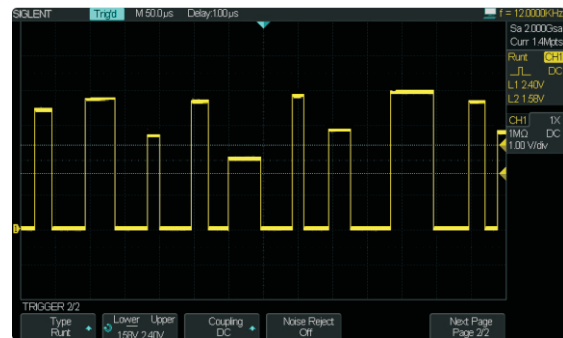
Smart Trigger Functions

SDS2000 series support a variety of smart trigger functions, such as Window, Interval, Runt, DropOut, Pattern.

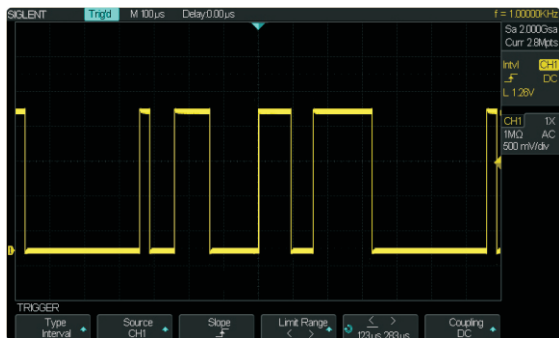
Pattern trigger



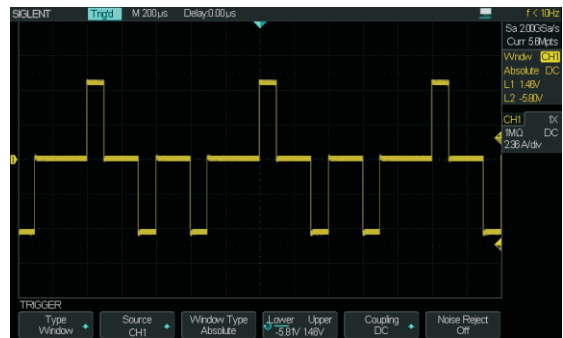
Runt trigger



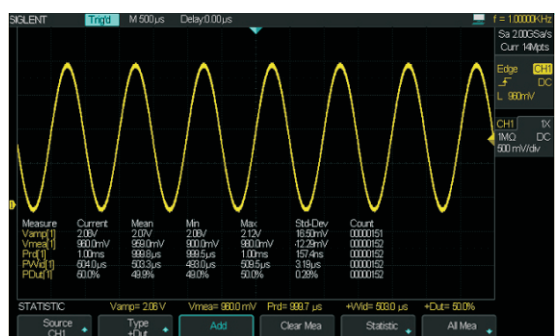
Interval trigger



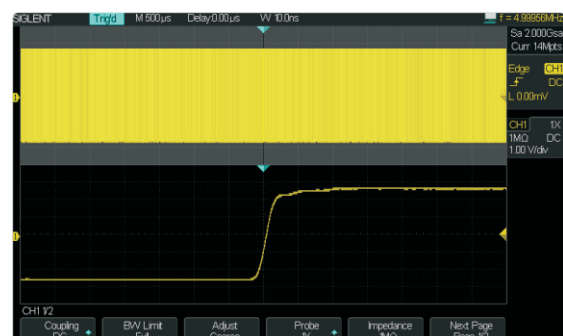
Window trigger



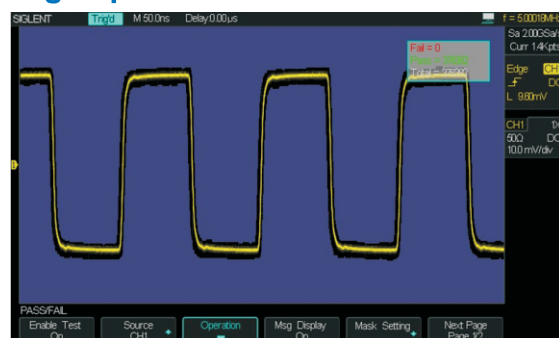
Automatic measurements with statistics



Zoom function based on hardware technology



High speed Pass/Fail Test Function



Built-in Waveform Generator (Optional)



Specifications

Input	
Channels	2/4
Coupling	AC, DC, GND
Impedance	(1MΩ±2%) (23pF ±4pF)
	50Ω: 50Ω±2%
Max.Input voltage	400Vrms, CAT I, 10X, 1MΩ
CH to CH Isolation	>100:1
Probe attenuator	1X, 10X, 50X, 100X, 500X,1000X
Vertical System	
Bandwidth	300MHz (SDS2304/SDS2302)
	200MHz (SDS2204/SDS2202)
	100MHz (SDS2104/SDS2102)
	70MHz (SDS2074/SDS2072)
Vertical Resolution	8 bit
Vertical Scale	2 mV/div ~ 10 V/div
Offset Range	2mV ~ 100mV: ± 1V
	102mV ~ 1V: ± 10V
	1.02V ~ 10V: ± 100V
Hardware Bandwidth Limits	20MHz ±40%
Bandwidth Flatness	DC ~ 10% of BW: ± 1dB
	10% ~ 50% of BW: ± 2dB
	50% ~ 100% of BW: + 2dB/-3dB
Low Frequency Response (AC - 3dB)	≤10Hz
Noise	≤0.6 Div for average of 10 Pk-Pk readings, Fixed gain settings
	≤1.0 Div for average of 10 Pk-Pk readings (152mV/div~198mV/div,1.52V/div ~ 1.98V/div)
	≤0.7 Div for average of 10 Pk-Pk readings, variable gain settings
SFDR including harmonics	≥35dB (≥10mV/div) ; ≥30dB (<10mV/div)

DC Gain Accuracy	$\leq \pm 3.0\%$: 5mV/div ~10V/div
	$\leq \pm 4.0\%$: 2mV/div
DC Measurement Accuracy	$\pm [3\% \times (\text{Reading} + \text{Offset}) + 1\% \times \text{Offset} + 0.2\text{div} + 2\text{mV}]$, $\leq 100\text{mV/div}$
	$\pm [3\% \times (\text{Reading} + \text{Offset}) + 1\% \times \text{Offset} + 0.2\text{div} + 100\text{mV}]$, $> 100\text{mV/div}$
Offset Accuracy	$\pm (1\% \times \text{Offset} + 1\% \times 8 \times \text{div} + 2\text{mV})$
Rise time	$< 1.2\text{ns}$ (SDS2304/SDS2302)
	$< 1.7\text{ns}$ (SDS2204/SDS2202)
	$< 3.5\text{ns}$ (SDS2104/SDS2102)
	$< 5.0\text{ns}$ (SDS2074/SDS2072)
Overshoot	$< 10\%$
Channel Skew	$< 200\text{ps}$

Math Function

Operation	$+$, $-$, $*$, $/$, FFT, d/dt , $\int dt$, $\sqrt{\quad}$
FFT	Window: Rectangular, Blackman, Hanning, Hamming
	Sample points: 1024

Horizontal System

Time base Scale	1.0ns/div ~ 50s/div
Waveform Capture	110,000 wfm/s
intensity grading	256 Levels
Display Format	Y-T, Zoom, Roll, X-Y
Time base Accuracy	$\pm 25\text{ppm}$
Roll mode	100ms/div ~ 50s/div (1-2-5 step)

Trigger System

Trigger Mode	Auto, Normal, Single
Trigger Level	Internal: ± 4.5 div from the center of the screen
Range	EXT: $\pm 1.2\text{V}$; EXT/5: $\pm 6\text{v}$
Holdoff Range	100ns ~ 1.5s
Trigger Coupling	AC, DC, LF Rej, HF Rej
	DC: Passes all components of the signal
	AC: Blocks DC components and attenuates signals below 5.8Hz

Trigger Coupling	LF Rej: Blocks the DC component and attenuates the low-frequency components below 2.08MHz
	HF Rej: Attenuates the high-frequency components above 1.27MHz
Trigger Accuracy	$\pm 0.2\text{div}$
Trigger Sensitivity	Internal: 0.5 div
	EXT: 200mVpp DC ~ 10MHz 300mVpp 10MHz ~ BW
	EXT/5: 1Vpp DC ~ 10MHz 1.5Vpp 10MHz ~ BW
Trigger Jitter	<200ps
Trigger Displacement	Pre-Trigger: 7 divisions
	Delay Trigger: 10s ~ 1,000,000,000s
Edge Trigger	
Slope	Rising, Falling, Rising&Falling
Source	CH1/CH2/CH3/CH4/EXT/(EXT/5)/AC Line
Slope Trigger	
Slope	Rising, Falling
Limit Range	< , > , < > , > <
Source	CH1/CH2/CH3/CH4
Time Range	2ns ~ 4.2s
Resolution	1ns
Pulse Trigger	
Polarity	+wid , -wid
Limit Range	< , > , < > , > <
Source	CH1/CH2/CH3/CH4
Pulse Range	2ns ~ 4.2s
Resolution	1ns
Video Trigger	
Signal Standard	NTSC,PAL/Secam,720p/50,720p/60,1080p/50,1080p/60, 1080i/50, 1080i/60,Custom
Source	CH1/CH2/CH3/CH4
Sync	ANY,Select

Window Trigger

Window Type	Absolute,Relative
Source	CH1/CH2/CH3/CH4

Interval Trigger

Slope	Rising,Falling
Limit Range	< , > , < > , > <
Source	CH1/CH2/CH3/CH4
Time Range	2ns ~ 4.2s

Dropout Trigger

Timeout Type	Edge, State
Source	CH1/CH2/CH3/CH4
Slope	Rising,Falling
Time Range	2ns ~ 4.2s
Resolution	1ns

Runt Trigger

Slope	+wid , -wid
Limit Range	< , > , < > , > <
Source	CH1/CH2/CH3/CH4
Time Range	2ns ~ 4.2s
Resolution	1ns

Pattern Trigger

Pattern Setting	Invalid, Low, High
Logic	AND, OR, NAND, NOR
Source	CH1/CH2/CH3/CH4
Limit Range	< , > , < > , > <
Time Range	2ns ~ 4.2s
Resolution	1ns

Serial Protocol Trigger I²C Trigger

Condition	Start, Stop, Restart, No Ack, EEPROM, 7bits Address& Data, 10bits Address&Data, Data Length
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SPI Trigger

Trigger Source	MOSI, MISO
Data Length	4 ~ 96bits
Value	0, 1, X
Bit Order	LSB, MSB

UART/ RS232 Trigger

Trigger Setting	Trigger Source RX, TX
	Condition Start, Stop, Data, Check Error
Bus Configure	Baud 600/1200/2400/4800/9600/19200/38400/ 57600/115200/Custom
	Data Length 5bits, 6bits, 7bits, 8bits
	Parity Check No, odd, even
	Stop Bit 1, 1.5, 2
	Idle Level Low, High

CAN Trigger

Trigger Setting	Condition Start, Remote Frame, Data Frame, ID&DATA
Bus Configure	Baud 5kb/s, 10kb/s, 20kb/s, 50kb/s, 100kb/s, 125kb/s, 250kb/s, 500kb/s, 800kb/s, 1Mb/s, Custom

LIN Trigger

Trigger Setting	Condition Start, ID, ID&DATA, Error
Bus Configure	Baud 600/1200/2400/4800/9600/19200/Custom

Serial Decode I²C

Signal	SCL, SDA
Address	7bits, 10bits
List	1 ~ 7 lines

SPI

Signal	CLK, MISO, MOSI, CS
Edge Select	Rising, Falling
Idle Level	Low, High
Bit Order	MSB, LSB
Data Length	4 ~ 96 bits
List	1 ~ 7 lines

UART/RS232

Signal	RX, TX
Configure	Baud 600/1200/2400/4800/9600/19200/38400/ 57600/115200/Custom
	Parity Check No, odd, even
	Stop Bit 1, 1.5, 2
	Idle Level Low, High
	Data Length 5bits, 6bits, 7bits, 8bits
List	1 ~ 7 lines

CAN

Signal	CAN_H, CAN_L
Configure	Baud 5kb/s, 10kb/s, 20kb/s, 50kb/s, 100kb/s, 125kb/s, 250kb/s, 500kb/s, 800kb/s, 1Mb/s, Custom
Decode Source	CAN_H, CAN_L, CAN_H – CAN_L
List	1 ~ 7 lines

LIN

Configure	Baud 600/1200/2400/4800/9600/19200/Custom
List	1 ~ 7 lines

Measure System

Auto Measurement (32 Types)	Vpp, Vmax, Vmin, Vamp, Vtop, Vbase, Vavg, Mean, Crms Vrms, ROV, FOV, RPRE, FPRE, Rise time, Fall time, Freq Period, + Wid, - Wid, + Dut, - Dut, BWid, Phase, FRR FRF, FFR, FFF, LRR, LRF, LFR, LFF
Cursor	Time (X1, X2), (X1X2)
	Voltage (Y1, Y2), (Y1Y2)
Statistics	Current, Mean, Min, Max, Std-Dev, Count

Sample System

Sample Mode	Real Time sample
Sample Rate	2GSa/s
Memory Depth	Max.28Mpts, available
Acquisition	Sample, Peak Detect, Average, High Res
Averages	4, 16, 32, 64, 128, 256, 512, 1024

Waveform Generator

Channels	1
Max. Frequency	25MHz
Sample Rate	125 MSa/s
Arb waveform length	16 kpts
Frequency Resolution	1 μ Hz
Vertical Resolution	14 bits
Amplitude Range	2 mVpp ~ 3 Vpp (50 Ω)
	4 mVpp ~ 6 Vpp (High-z)

Sine Wave

Frequency	1 μ Hz ~ 25MHz
Offset Accuracy (100 kHz)	$\pm$ (0.3dB of Setting Value + 1mVpp)
Amplitude flatness (100 kHz, 5Vpp)	$\pm$ 0.3 dB
SFDR	DC ~ 1 MHz -60dBc
	1 MHz ~ 5 MHz -53dBc
	5 MHz ~ 25 MHz -35dBc

Square/Pulse Wave

Frequency	1 μ Hz ~ 10MHz
Duty Cycle	20% ~ 80%
Rise/Fall time	< 24 ns (10% ~ 90%)
Overshoot	< 5%(1kHz, 1Vpp, Typeical)
Pulse Width	48ns~1ms
Jitter	8ns

Ramp Wave

Frequency	1 μ Hz ~ 300kHz
Linearity	< 0.1% of Pk-Pk value
Symmetry	0% ~ 100%

DC Offset

Range	$\pm$ 1.5 V (50 Ω)
	$\pm$ 3.0 V (High)
Offset Accuracy	$\pm$ (setting value *1%+3 mV)

Noise	
Bandwidth	>20MHz (-3dB)
Cardiac	
Frequency	1μHz ~ 5MHz
Gaus Pulse	
Frequency	1μHz ~ 5MHz
Exp Rise	
Frequency	1μHz ~ 5MHz
Exp Fall	
Frequency	1μHz ~ 5MHz
I/O	
Standard Ports	USB Host, USB Device, LAN, Pass/Fail, Trigger Out
Pass/Fail	3.3V TTL Output

General Specifications

Display	
Display Type	8.0 inch color TFT-LCD
Resolution	800 (Horizontal) × 480 (Vertical) pixel
Color	24 bit
Contrast	500:1
Backlight	300nit
Range	8 x 14 div
Display Mode	Dot, Vector
Persist	Off, 1 sec, 5 sec, 10 sec, 30 sec, Infinite
Color Display	Normal, Color
Screen Saver	1min, 5min, 10min, 30min, 1h, Offset
Language	Chinese, English
Environments	
Temperature	Operating: 10°C ~ +40°C
	Non-operating: -20°C ~ +60°C
Humidity	Operating: 85%RH, 40°C, 24 Hours
	Non-Operating: 85%RH, 65°C, 24 Hours
Height	Operating: ≤3000m
	Non-Operating: ≤15,266m
Power Supply	
Input Voltage	100 ~ 240 VAC, CAT II, Auto selection
Frequency	45Hz ~ 400Hz
Power	50VA Max
Mechanical	
Dimensions	Length 352mm
	Width 112mm
	Height 224mm
Weight	Net 2CH : 3.4kg, 4CH : 3.5kg
	Shipping 2CH : 4.9kg, 4CH : 5.1kg

Ordering information

Description		
Model	SDS2072(70MHz, 2 Channels)	
	SDS2102(100MHz, 2 Channels)	
	SDS2202(200MHz, 2 Channels)	
	SDS2302(300MHz, 2 Channels)	
	SDS2074(70MHz, 4 Channels)	
	SDS2104(100MHz, 4 Channels)	
	SDS2204(200MHz, 4 Channels)	
	SDS2304(300MHz, 4 Channels)	
Standard Accessories	A Quick Start	
	1:1/10:1 probe (2/4 PCS based on channels)	
	A Certification	
	An CD(including EasyScopeX computer software system)	
	A Power Cord that fits the standard of destination country	
	A USB Cable	
Optional Accessories	25MHz function/Arb Generator option	SDS-2000-FG
	I ² C、SPI、UART/RS232、CAN、LIN decoding option	SDS-2000-DC
	Power analysis option	SDS-2000-PA
	USB-GPIB communication module	USB-GPIB
	Isolated Front End	ISFE
	High Voltage Probe	HPB4015
	Current Probe	CP4060/CP4200/CP5050/CP5300
	Differential Probe	DPB4050/DPB3050