



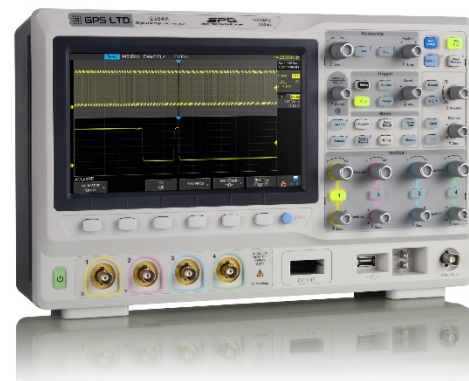
Super Phosphor Oscilloscope Introducing the GPS-2000X series



What is SPO technology?

In a traditional DSO, to start the acquisition of the next frame, there will be a section of time between every two frames to wait for the CPU to complete the processing of the previous frame. The time between two acquired frames is called *oscilloscope acquisition dead time*. The dead time of a traditional digital storage oscilloscopes can be very long and an issue. Occasional glitches are difficult to capture by traditional oscilloscopes as they can easily fall into the dead time.

With the newly innovated SPO technology - waveform acquisition and the image processing engine, using FPGA group to complete the processing and display of waveforms, greatly reduces the dead time between two frames in the SPO oscilloscope



Key Features

- Real-time sampling rate up to 2GSa/s
- Record length of 140Mpts
- Built-in 25MHz function/arbitrary waveform generator
- Waveform capture rate up to 140,000 wfs/s (normal mode), 500,000 wfs/s (sequence mode)
- History Waveforms (History) mode and segmented acquisition (Sequence) mode
- Supports 256-level intensity grading and colour temperature display
- Abundant trigger functions
- Comprehensive statistical functions
- Advanced Math functions
- Optional MSO and serial bus decoding available

Acquire System	
Sampling Rate	2 GSa/s (Single-Channel), 1 GSa/s (Dual-Channel)
Memory Depth	Max 140 Mpts/Ch (Single-Channel), 70 Mpts/Ch (Dual- Channel)
Peak Detect	1 ns
Average	Averages: 4,16,32,64,128,256,512,1024
Eres	Enhance bits: 0.5, 1, 1.5, 2, 2.5, 3 Selectable
Waveform interpolation	Sinx/x, Linear

Input	
Channels	2/4 + EXT
Coupling	DC, AC, GND
Impedance	DC: (1 M Ω ±2%) (18 pF ±3 pF) 50 Ω : 50 Ω ±2%
Max Input voltage	1 M Ω ≤400 Vpk (DC + Peak AC ≤10 kHz), 50 Ω ≤5 Vrms
CH to CH Isolation	DC~Max BW >35 dB
Probe attenuator	0.1X, 0.2X, 0.5X, 1X, 2X, 5X, 10X, 20X, 50X, 100X, 200X, 500X, 1000X, 2000X, 5000X, 10000X

Vertical System	
Bandwidth (-3 dB)	300MHz (GPS-2304X/GPS-2302X) 200MHz (GPS-2204X/GPS-2202X) 100MHz (GPS-2104X/GPS-2102X) 70 MHz (GPS-2074X/GPS-2072X)
Vertical Resolution	8-bit
Vertical Range	8 divisions
Vertical Scale (Probe 1X)	1 mV/div - 10 V/div (1-2-5)
Offset Range (Probe 1X)	1 mV ~ 100 mV: ± 1 V 102 mV ~ 1 V: ± 10 V 1.02 V ~ 10 V: ± 100 V
Bandwidth Limit	20 MHz ±40%
Bandwidth Flatness	DC ~ 10%(BW): ± 1 dB 10% ~ 50%(BW): ± 2 dB 50% ~ 100%(BW): + 2 dB/-3 dB
Low Frequency Response (AC-3 dB)	≤10 Hz (at input BNC)
Noise	ST-DEV ≤0.2 division (<2 mV/div) ST-DEV ≤0.5 division (≥2 mV/div)
SFDR including harmonics	≥35 dB
DC Gain Accuracy	5mV/div ~10V/div: ≤3.0% ≤2mV/div: ≤4.0%
Offset Accuracy	≥2mV/div: ± (1%*offset+1.5%*8*div+2mV) <2mV/div: ± (1%* offset +1.5%*8*div+1mV)
Rise time	Typ. <1.2ns (GPS-2304X/GPS-2302X) Typ. <1.7ns (GPS-2204X/GPS-2202X) Typ. <3.5ns (GPS-2104X/GPS-2102X) Typ. <5.0ns (GPS-2074X/GPS-2072X)
Overshoot (500 ps Pulse)	<10%

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

Trigger System	
Trigger Mode	Auto, Normal, Single
Trigger Level	Internal: ± 4.5 div from the centre of the screen EXT: ± 0.6 V EXT/5: ± 3 V
Hold-off Range	100 ns ~ 1.5 s
Trigger Coupling	AC, DC, LFRJ, HFRJ, Noise RJ (CH1~CH2)
Coupling Frequency Response (CH1~CH4)	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 900 kHz HFRJ: Attenuates the high-frequency components above 500 kHz
Coupling Frequency Response (EXT)	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 400 kHz HFRJ: Attenuates the high-frequency components above 1 MHz
Trigger Accuracy (Typical)	Internal: ± 0.2 div EXT: ± 0.4 div
Trigger Sensitivity	CH1~CH4: DC~ Max BW 0.6 div EXT: 200 mVpp DC ~ 10 MHz 300 mVpp 10 MHz ~ BW frequency EXT/5: 1 Vpp DC ~ 10 MHz 1.5 Vpp 10 MHz ~ BW frequency
Trigger Jitter	<100 ps (CH1~CH4)
Trigger Displacement	Pre-Trigger: 0~100% Memory Delay Trigger: 0 to 2,000 div

Slope Trigger	
Slope	Rising, Falling
Limit Range	<, >, <>, ><
Source	CH1~CH4
Time Range	2 ns ~ 4.2 s
Resolution	1 ns
Edge Trigger	
Slope	Rising, Falling, Rising & Falling
Source	CH1~CH4 /EXT/(EXT/5)/AC Line
Pulse Trigger	
Polarity	+wid, -wid
Limit Range	<, >, <>, ><
Source	CH1~CH4
Pulse Range	2 ns ~ 4.2 s
Resolution	1 ns
Video Trigger	
Signal Standard	NTSC, PAL, 720p/50, 720p/60, 1080p/50, 1080p/60, 1080i/50, 1080i/60, Custom
Source	CH1~CH4
Sync	Any, Select
Trigger condition	Line, Field

Interval Trigger	
Slope	Rising, Falling
Limit Range	<, >, <>, ><
Source	CH1~CH4
Time Range	2 ns ~ 4.2 s
Resolution	1 ns
Dropout Trigger	
Time out Type	Edge, State
Source	CH1~CH4
Slope	Rising, Falling
Time Range	2 ns ~ 4.2 s
Runt Trigger	
Polarity	+wid, -wid
Limit Range	<, >, <>, ><
Source	CH1~CH4
Time Range	2 ns ~ 4.2 s
Resolution	1 ns
Pattern Trigger	
Pattern Setting	Invalid, Low, High
Logic	AND, OR, NAND, NOR
Source	CH1~CH4
Limit Range	<, >, <>, ><
Time Range	2 ns ~ 4.2 s
Resolution	1 ns
Window Trigger	
Window Type	Absolute, Relative
Source	CH1~CH4

Serial Trigger

I ² C Trigger	
Condition	Start, Stop, Restart, No Ack, EEPROM, Address & Data, Data Length
Source (SDA/SCL)	CH1~CH4
Data format	Hex
Limit Range	EEPROM: =, >, <
Data Length	EEPROM: 1 byte Address & Data: 1~2-byte Data Length: 1~12 byte
R/W bit	Address & Data: Read, Write, DNC
SPI Trigger	
Condition	Data
Source (CS/CL/Data)	CH1~CH4
Data format	Binary
Data Length	4 ~ 96 bit
Bit Value	0, 1, X
Bit Order	LSB, MSB

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

Serial Decoder (optional)

No. of Decoders: 2

I²C Decoder

Signal	SCL, SDA
Address	7-bit, 10-bit
Threshold	-4.5~4.5 div
List	1~7 lines

SPI Decoder

Signal	CLK, MISO, MOSI, CS
Edge Select	Rising, Falling
Idle	Low, High
Bit Order	MSB, LSB
Threshold	-4.5~4.5 div
List	1~7 lines

UART/RS232 Decoder

Signal	RX, TX
Data Width	5-bit, 6-bit, 7-bit, 8-bit
Parity Check	None, Odd, Even
Stop Bit	1-bit, 1.5-bit, 2-bit
Idle Level	Low, High
Threshold	-4.5~4.5 div
List	1~7 lines

CAN Decoder

Signal	CAN_H, CAN_L
Source	CAN_H, CAN_L, CAN_H-CAN_L
Threshold	-4.5~4.5 div
List	1 ~ 7 lines

LIN Decoder

LIN Specification Package Revision	Ver1.3, Ver2.0
Threshold	-4.5 ~ 4.5 div
List	1 ~ 7 lines

Measure System		
Source	CH1~CH4, Math, Ref, History	
Number of Measurements	Display 5 measurements at the same time	
Measurement Range	Screen region, Gate region	
Measurement Parameters (37 Types)		
Vertical (Voltage)	Max	Highest value in input waveform
	Min	Lowest value in input waveform
	Pk-Pk	Difference between maximum and minimum data values
	Ampl	Difference between top and base in a bimodal signal, or between max and min in a 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
	Stddev	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	Period for every cycle in waveform at the 50% level, and positive slope
	Freq	Frequency for every cycle in waveform at the 50% level, and positive slope
	+Wid	Width measured at 50% level and positive slope
	-Wid	Width measured at 50% level and negative slope
	Rise Time	Duration of rising edge from 10-90%
	Fall Time	Duration of falling edge from 90-10%
	Bwid	Time from the first rising edge to the last falling edge, or the first falling edge to the last rising edge at the 50% crossing
	+Dut	Ratio of positive width to period
	-Dut	Ratio of negative width to period
	Delay	Time from the trigger to the first transition at the 50% crossing
Delay	Phase	Calculate the phase difference between two edges
	FRR	Time between the first rising edges of the two channels
	FRF	Time from the first rising edge of channel A to the first falling edge of channel B
	FFR	Time from the first falling edge of channel A to the first rising edge of channel B
	FFF	Time from the first falling edge of channel A to the first falling edge of channel B
	LRR	Time from the first rising edge of channel A, to the last rising edge of channel B
	LRF	Time from the first rising edge of channel A to the last falling edge of channel B
	LFF	Time from the first falling edge of channel A to the last rising edge of channel B
Cursors	Manual: Time X1, X2, (X1-X2), (1/ΔT) Voltage Y1, Y2, (Y1-Y2) Track: Time X1, X2, (X1-X2)	
Statistics	Current, Mean, Min, Max, Std-Dev, Count	
Counter	± 1Hz counter error	

Built-in Function Generator (optional)	
Channel	1
Max. Output Frequency	25 MHz
Sampling Rate	125 MSa/s
Frequency Resolution	1 μ Hz
Frequency Accuracy	\pm 50 ppm
Vertical Resolution	14 bits
Amplitude Range	-1.5 ~ +1.5 V (50 Ω) -3 ~ +3 V (High-Z)
Waveform Type	Sine, Square, Ramp, Pulse, DC, Noise, Cardiac, Gaus Pulse, Exp Rise, Exp Fall, Arb
Output impedance	50 Ω \pm 2%
Protection	Short-Circuit Protection
Sine	
Frequency	1 μ Hz ~ 25 MHz
Offset Accuracy (100 KHz)	\pm (0.3 dB*Offset Setting Value +1 mVpp)
Amplitude flatness (100 kHz, 5Vpp)	\pm 0.3 dB
SFDR	DC ~ 1 MHz -55 dBc 1 MHz ~ 5 MHz -55 dBc 5 MHz ~ 25 MHz -50 dBc
HD	DC-5 MHz -45 dBc 5 MHz - 25 MHz -45 dBc
Square/Pulse	
Frequency	1 μ Hz ~ 10 MHz
Duty Cycle	20% ~ 80%
Rise/Fall time	< 24 ns (10% ~ 90%)
Overshoot (1 kHz, 1Vpp, Typical)	< 3%
Pulse Width	> 50 ns
Jitter	< 500 ps + 10 ppm
Ramp	
Frequency	1 μ Hz ~ 300 kHz
Linearity (typical)	< 0.1% of Pk-Pk (typical, 1 kHz, 1 Vpp, 100% symmetry)
Symmetry	0% ~ 100% (adjustable)
DC	
Offset range	\pm 1.5 V (50 Ω) \pm 3 V (High-Z)
Accuracy	\pm (offset *1%+3 mV)

Arbitrary Wave	
Frequency	1 μ Hz ~ 5 MHz
Wave Length	16 KPts
Sampling Rate	125 MSa/s
Lead in	EasyWave and U-Disk

Digital Channels (optional)	
No. of Channels	16
Max. Sampling Rate	500 MSa/s
Memory Depth	14 Mpts/CH
Min. Detectable Pulse Width	4 ns
Level Group	D0~D7, D8~D15
Level Range	-3 V~3 V
Logic Type	TTL, CMOS, LVCMOS 3.3, LVCMOS 2.5, custom
Skew	D0~D15: \pm 1 sampling interval Digital to Analog: \pm (1 sampling interval +1 ns)

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

I/O

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

Screen Display

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

Waveform Display

Display Mode	Dot, Vector
Persist Time	Off, 1 Sec, 5 Sec, 10 Sec, 30 Sec, Infinite
Colour Display	Normal, Colour
Screen Saver	1 min, 5 min, 10 min, 30 min, 1 hour, Off
Language	English, French, Japanese, Korean, German, Russian, Italian, Portuguese

Environmental & Safety

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: ≤3000 m Non-operating: ≤15,266 m
Electromagnetic Compatibility	2004/108/EC Execution Standard EN 61326-1:2006 EN 61000-3-2:2006 + A2:2009, EN 61000-3-3:2008
Safety	2006/95/EC Execution Standard EN 61010-1:2010/EN 61010-2-030:2010

Mechanical Data

Dimensions	Length 352 mm Width 128 mm Height 224 mm
Weight	N.W: 3.5 Kg C.W: 5.1 Kg

Power Supply

Input Voltage	100 ~ 240 VAC, CAT II, Auto selection
Frequency	50/ 60/ 400 Hz
Power	60 W Max