

SDG2000X Series

Function/Arbitrary
Waveform Generator



DataSheet-2015.7



SDG2122X

SDG2082X

SDG2042X

Overview

SIGLENT's SDG2000X is a series of dual-channel function/arbitrary waveform generators with specifications of up to 120MHz maximum bandwidth, 1.2GSa/s sampling rate and 16-bit vertical resolution. The proprietary TrueArb & EasyPulse techniques help to solve the weaknesses inherent in traditional DDS generators when generating arbitrary, square and pulse waveforms. With advantages above, SDG2000X can provide users with a variety of high fidelity and low jitter signals, which can meet the growing requirements of complex and extensive applications.

Key Features

- ▶ Dual-channel, 120MHz maximum bandwidth, 20Vpp maximum output amplitude, high fidelity output with 80dB dynamic range
- ▶ High-performance sampling system with 1.2GSa/s sampling rate and 16-bit vertical resolution. No detail in your waveforms will be lost
- ▶ Innovative TrueArb technology, based on a point-by-point architecture, supports any 8pts~8Mpts Arb waveform with a sampling rate in range of 1 μ Sa/s~75MSa/s
- ▶ Innovative EasyPulse technology, capable of generating lower jitter Square or Pulse waveforms, brings a wide range and extremely high precision in pulse width and rise/fall times adjustment
- ▶ Plenty of analog and digital modulation types: AM、DSB-AM、FM、PM、FSK、ASK and PWM
- ▶ Sweep and Burst function
- ▶ High precision Frequency Counter
- ▶ Standard interfaces: USB Host, USB Device (USBTMC) , LAN (VXI-11)
 - Optional interface: GPIB
- ▶ 4.3" touch screen display for easier operation



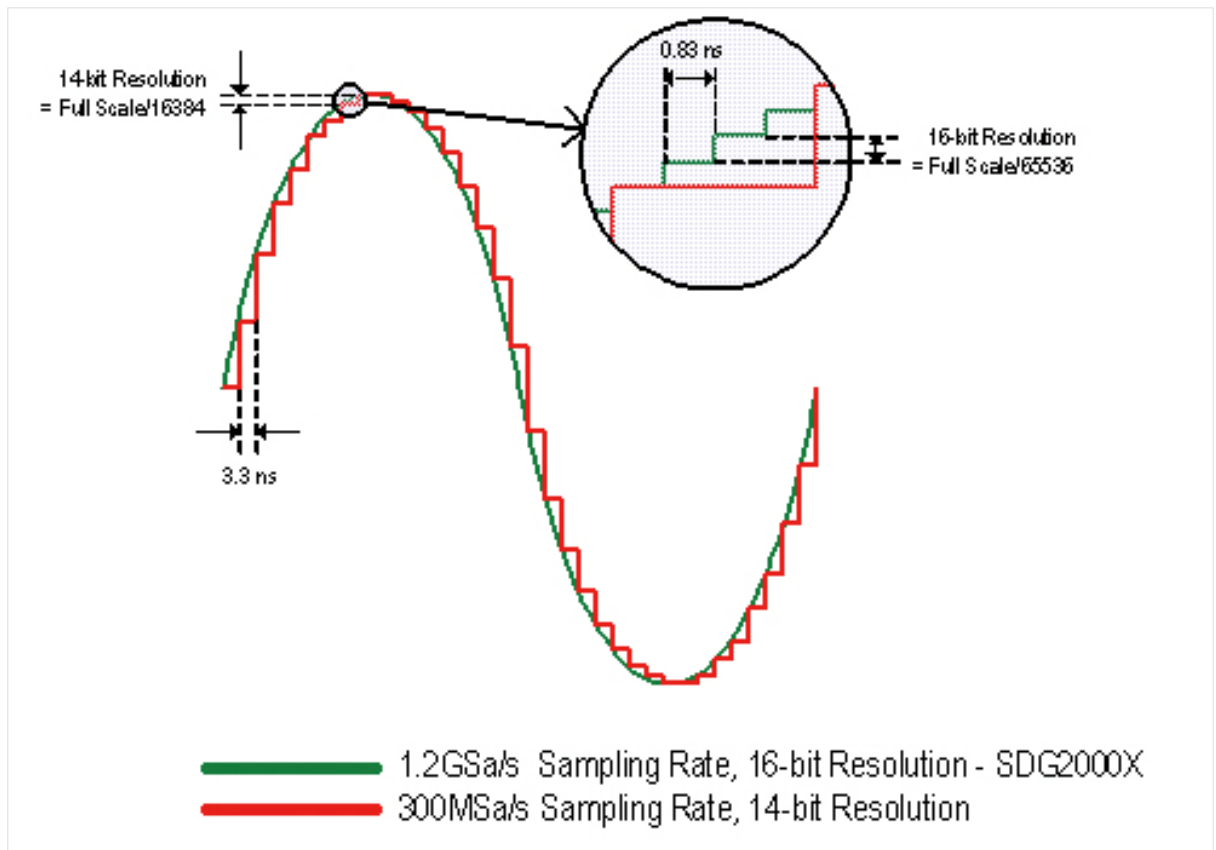
Models and Key Specifications

| Product Model | SDG2042X | SDG2082X | SDG2122X |
|---------------------|--|----------|----------|
| Bandwidth | 40MHz | 80 MHz | 120 MHz |
| Sampling rate | 1.2 GSa/s (4X Interpolation) | | |
| Vertical resolution | 16 bit | | |
| Num. of channels | 2 | | |
| Max. amplitude | ±10V | | |
| Display | 4.3" touch screen display, 480 x 272 x RGB | | |
| Interface | Standard: USB Host, USB Device, LAN Optional: GPIB (USB-GPIB adaptor) | | |

Characteristics

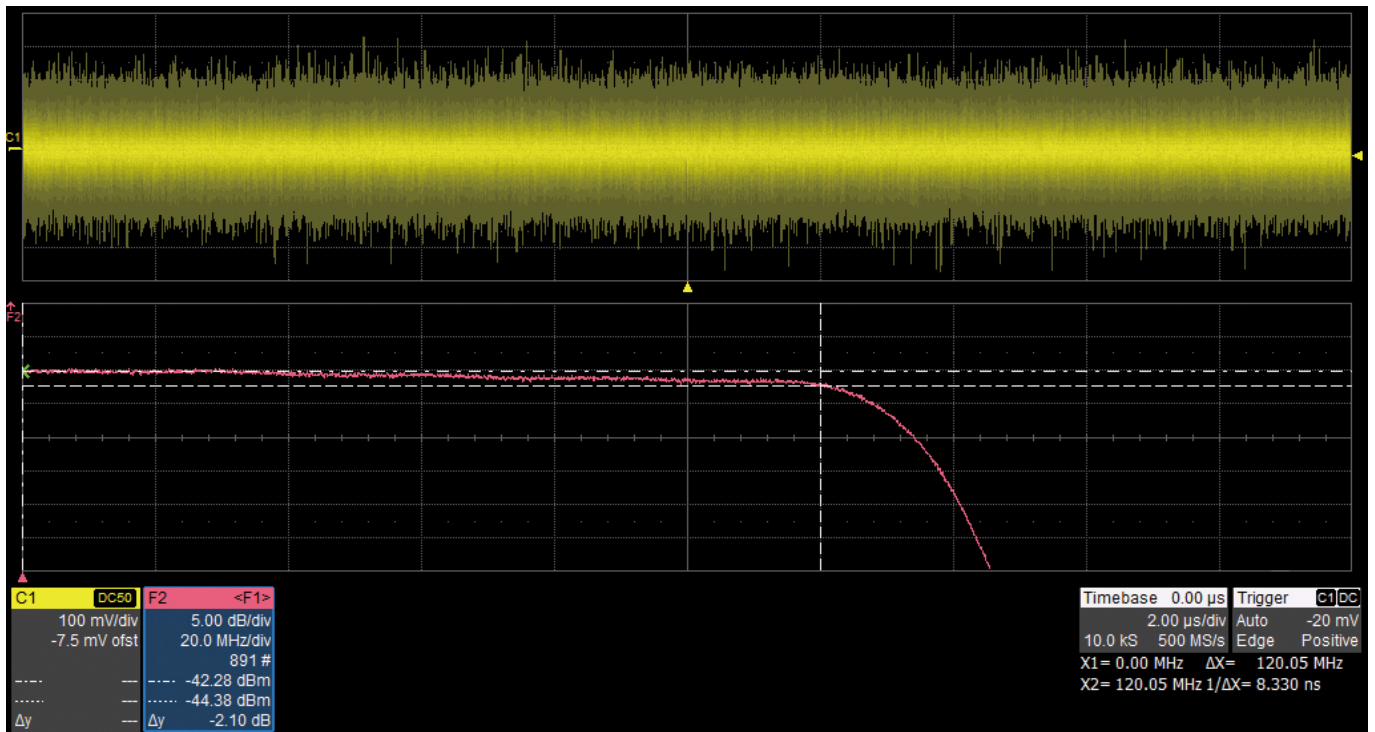
High-performance Sampling System

Benefiting from a 1.2GSa/s and 16-bit sampling system, SDG2000X achieves extremely high accuracy performance in both time domain and amplitude, which results in more accurately reconstructed waveforms and lower distortion.

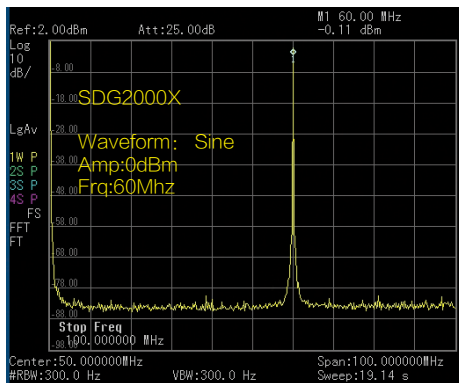


Characteristics

Excellent Analog Channel Performance

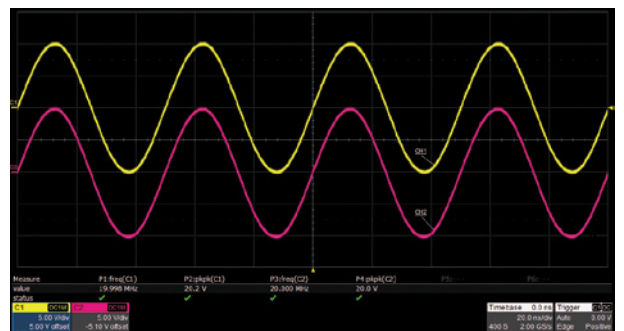


▲ The bandwidth of analog channels proves to be greater than 120MHz, via doing a frequency response test with white noise.

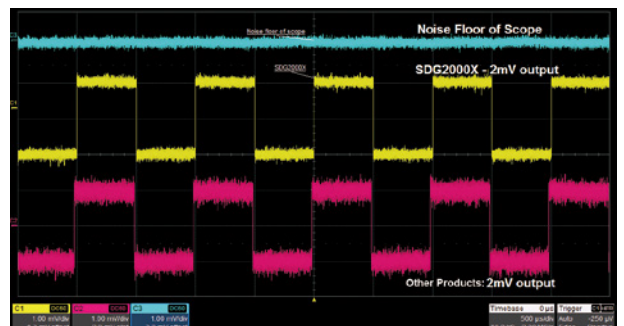


◀ High fidelity sine output. Almost no spurious observed @60MHz, 0dBm.

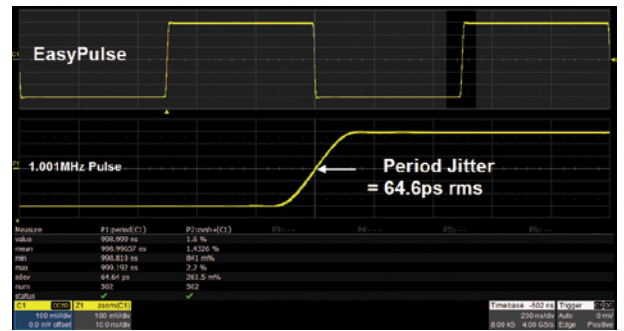
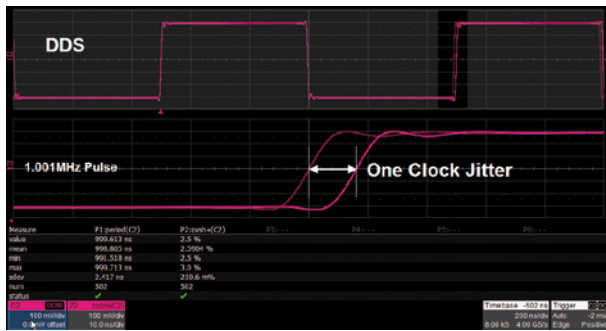
▶ Capacity of outputting large signal at high frequency. Dual-channel, 20 Vpp amplitude can be guaranteed even @20 MHz.



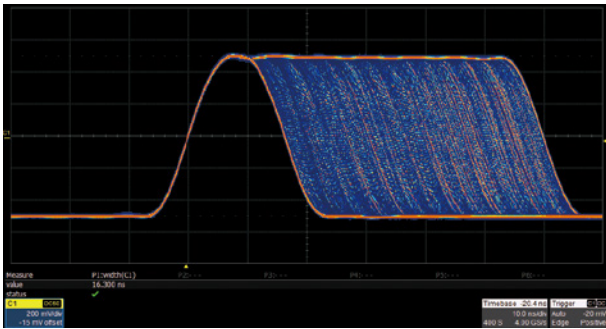
▶ Low noise floor, improves signal-noise ratio.



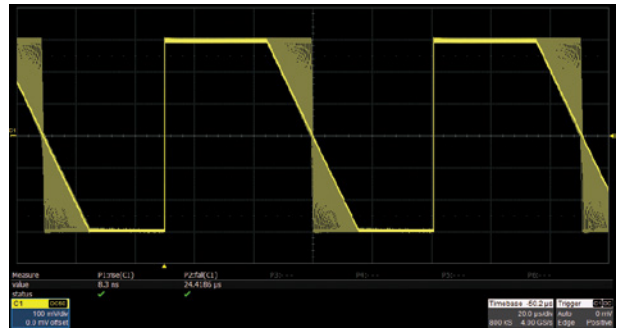
Innovative EasyPulse Technology



When a Square/Pulse waveform is generated by DDS, there will be a one-clock-jitter if the sampling rate is not an integer-related multiple of the output frequency. SDG2000X EasyPulse technology successfully overcomes this weakness in DDS designs and helps to produce low jitter Square/Pulse waveforms.



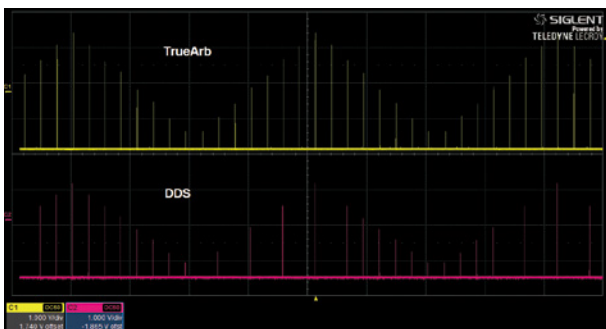
The Pulse width can be fine-tuned to the minimum of 16.3ns with the adjustment step as small as 100ps.



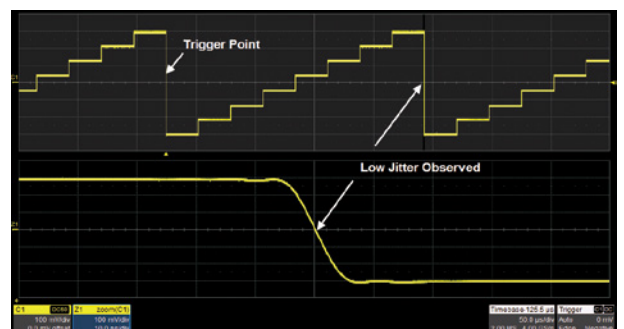
The rise/fall times can be set independently to the minimum of 8.4ns at any frequency and to the maximum of 22.4s. The adjustment step is as small as 100 ps.

Innovative TrueArb Technology

For arbitrary waveforms, TrueArb not only has all the advantages of traditional DDS, but also eliminates the probability that DDS may cause serious jitter and distortion.



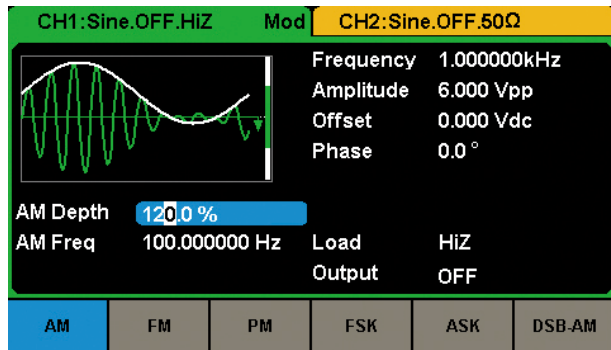
TrueArb generates arbitrary waveforms point by point, never skips any point so that it can reconstruct all the details of the waveform as defined.



As with EasyPulse, TrueArb effectively overcomes the defect that DDS may cause the one-clock-jitter in arbitrary waveforms.

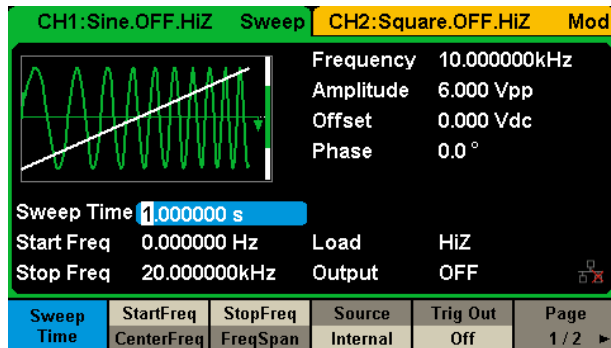
Characteristics

Modulation



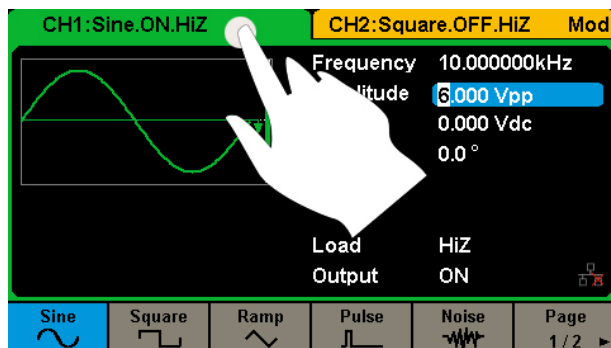
SDG2000X supports plenty of modulation types, such as AM、FM、PM、FSK、ASK、DSB-AM, and so on. The modulation source can be configured as "Internal" or "External".

Sweep



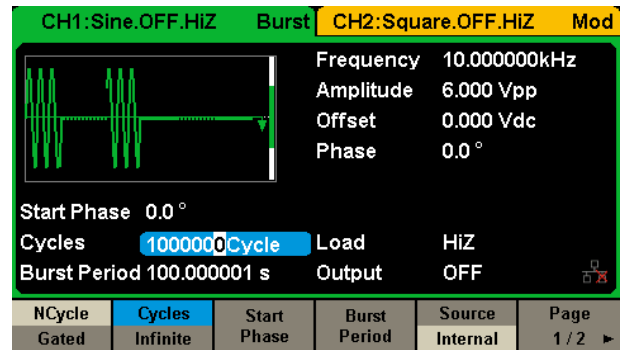
SDG2000X supports two Sweep modes, "Linear" and "Log". Two Sweep directions, "Up" and "Down" and three Sweep sources, "Internal", "External" and "Manual".

4.3" Touch Screen Display



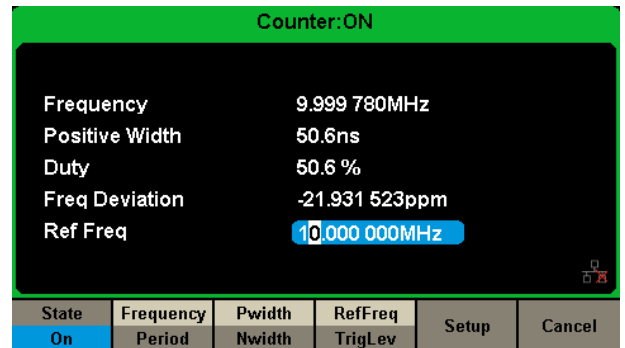
4.3" touch screen display, makes operation much more convenient.

Burst



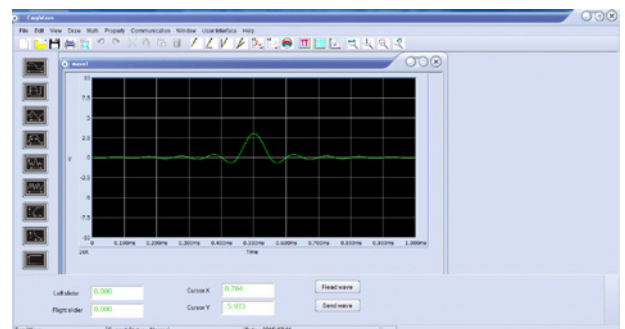
SDG2000X supports two Burst modes, "N cycle" and "Gated". The Burst source can be configured as "Internal", "External" or "Manual".

Frequency Counter



High precision Frequency Counter with an input frequency range of 0.1Hz~200MHz.

Arbitrary Waveform Software EasyWave



EasyWave is a powerful arbitrary waveform editing software that supports several ways to generate arbitrary waveform such as manual drawing, line-drawing, equation-drawing, coordinate-drawing, etc. It is quite convenient for users to edit their own arbitrary waveforms through EasyWave.

Specifications

All specifications apply to both channels. Unless otherwise stated, all specifications are not guaranteed unless the following conditions are met:

- The generator is within calibration period of validity
- The generator has been working continuously for at least 30 minutes at a specified temperature (18°C ~ 28°C).

Frequency Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-----------------------------|------|------|------|------|-----------|
| Resolution | | | 1μ | Hz | |
| Initial accuracy | -1 | | +1 | ppm | 25°C |
| | -2 | | +2 | ppm | 0~40°C |
| 1 st -year aging | -1 | | +1 | ppm | 25°C |
| 10-year aging | -3.5 | | +3.5 | ppm | 25°C |

Sine Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|---------------------------|------|------|-------|------|-------------------------------|
| Frequency | 1μ | | 120M | Hz | |
| Harmonic distortion | | | -65 | dBc | 0 dBm, 0~10 MHz (Included) |
| | | | -60 | dBc | 0 dBm, 10~20 MHz (Included) |
| | | | -55 | dBc | 0 dBm, 20~40 MHz (Included) |
| | | | -50 | dBc | 0 dBm, 40~60 MHz (Included) |
| | | | -45 | dBc | 0 dBm, 60~80 MHz (Included) |
| | | | -40 | dBc | 0 dBm, 80~100 MHz (Included) |
| | | | -38 | dBc | 0 dBm, 100~120 MHz (Included) |
| Total Harmonic Distortion | | | 0.075 | % | 0 dBm, 10 Hz ~ 20 kHz |
| Non-harmonic spurious | | | -70 | dBc | ≤50 MHz |
| | | | -65 | dBc | >50 MHz |

Square Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|------------------------------|-------|------|--------|------|------------------------------|
| Frequency | 1μ | | 25M | Hz | |
| Rise/fall times | | | 9 | ns | 10% ~ 90%, 1 Vpp, 50ΩLoad |
| Overshoot | | | 3 | % | 100 kHz, 1 Vpp, 50ΩLoad |
| Duty cycle | 0.001 | | 99.999 | % | Limited by frequency setting |
| Jitter (rms), Cycle to cycle | | | 150 | ps | 1 Vpp, 50Ω Load |

Pulse Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-----------------------------|-------|------|----------------|------|---|
| Frequency | 1μ | | 25M | Hz | |
| Pulse width | 16.3 | | | ns | |
| Pulse width accuracy | | | ±(0.01%+0.3ns) | | |
| Rise/fall times | 8.4n | | 22.4 | s | 10% ~ 90%, 1 Vpp, 50Ω Load, Subject to pulse width limits |
| Overshoot | | | 3 | % | 100 kHz, 1 Vpp |
| Duty cycle | 0.001 | | 99.999 | % | Limited by frequency setting |
| Duty cycle resolution | 0.001 | | | % | |
| Jitter (rms) cycle to cycle | | | 150 | ps | 1 Vpp, 50Ω Load |

Noise Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|----------------|------|------|------|------|-----------|
| -3dB bandwidth | 120 | | | MHz | |

Specifications

Ramp Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-----------|---------|------|------|------|---|
| Frequency | 1 μ | | 1M | Hz | |
| Symmetry | 0 | | 100 | % | |
| Linearity | | | 1 | % | Percentage of peak-peak output, 1kHz, 1Vpp, 100% symmetry |

Arbitrary Wave characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-------------------|---------|------|------|-------|---------------------------------------|
| Frequency | 1 μ | | 20M | Hz | |
| Waveform length | 8 | | 8M | pts | |
| Sampling rate | 1 μ | | 75M | Sa/s | TrueArb mode |
| | 300 | | | MSa/s | DDS mode |
| Vertical solution | 16 | | | bit | |
| jitter (rms) | | | 150 | ps | 1 Vpp, 50 Ω Load, TrueArb mode |

DC Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-----------|----------------|------|------|------|------------------|
| Range | -10 | | 10 | V | HiZ load |
| | -5 | | 5 | V | 50 Ω load |
| Accuracy | $\pm(1\%+2mV)$ | | | | HiZ load |

Output Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|--------------------|------------------|------|------|----------|---|
| Range (Note 1) | 2m | | 20 | Vpp | ≤ 20 MHz, HiZ load |
| | 2m | | 10 | Vpp | > 20 MHz, HiZ load |
| Accuracy | $\pm(1\%+1mVpp)$ | | | | 10 kHz sine, 0 V offset |
| Amplitude flatness | -0.3 | | +0.3 | dB | 0~100 MHz (Included), 50 Ω load, 2.5Vpp, compare to 10kHz Sine |
| | -0.4 | | +0.4 | dB | 100~120 MHz (Included), 50 Ω load, 2.5Vpp, compare to 10kHz Sine |
| Output impedance | 49.5 | 50 | 50.5 | Ω | 10kHz sine |
| Output current | -200 | | 200 | mA | |
| Crosstalk | | | -60 | dBc | CH1 - CH2/CH2 - CH1 |

Note 1: The specification will be divided by 2 while applied to a 50 Ω load.

Modulation Characteristics

AM

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|----------------------|--------------------------------|------|------|------|---------------------------------------|
| Carrier | Sine, Square, Ramp, Arb | | | | |
| Modulation Source | Internal/External | | | | |
| Modulating wave | Sine, Square, Ramp, Noise, Arb | | | | |
| Modulation depth | 0 | | 120 | % | |
| Modulation frequency | 1m | | 1M | Hz | While modulation source is "Internal" |

FM

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|----------------------|--------------------------------|------|--------|------|--|
| Carrier | Sine, Square, Ramp, Arb | | | | |
| Modulation Source | Internal/External | | | | |
| Modulating wave | Sine, Square, Ramp, Noise, Arb | | | | |
| Frequency deviation | 0 | | 0.5*BW | | BW is the max. output frequency Limited by frequency setting |
| Modulation frequency | 1m | | 1M | Hz | While modulation source is "Internal" |

Specifications

Modulation Characteristics

PM

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|----------------------|--------------------------------|------|------|------|---------------------------------------|
| Carrier | Sine, Square, Ramp, Arb | | | | |
| Modulation Source | Internal/External | | | | |
| Modulating wave | Sine, Square, Ramp, Noise, Arb | | | | |
| Phase deviation | 0 | | 360 | ° | |
| Modulation frequency | 1m | | 1M | Hz | While modulation source is "Internal" |

ASK

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-------------------|----------------------------|------|------|------|--|
| Carrier | Sine, Square, Ramp, Arb | | | | |
| Modulation Source | Internal/External | | | | |
| Modulating wave | Square with 50% duty cycle | | | | |
| Keying frequency | 1m | | 1M | Hz | Limited by frequency setting while modulation source is "Internal" |

FSK

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|----------------------|----------------------------|------|------|------|---------------------------------------|
| Carrier | Sine, Square, Ramp, Arb | | | | |
| Modulation Source | Internal/External | | | | |
| Modulating wave | Square with 50% duty cycle | | | | |
| Modulation frequency | 1m | | 1M | Hz | While modulation source is "Internal" |

PWM

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|----------------------------------|--------------------------------|------|------|------|---------------------------------------|
| Carrier | Pulse | | | | |
| Modulation Source | Internal/External | | | | |
| Modulating wave | Sine, Square, Ramp, Noise, Arb | | | | |
| Modulation frequency | 1m | | 1M | Hz | While modulation source is "Internal" |
| Pulse width deviation resolution | 6.67 | | | ns | |

Burst Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-------------------|---|------|------|------|---------------------------------|
| Carrier | Sine, Square, Ramp, Pulse, Noise, Arb | | | | |
| Type | Count(1-1000000cycles), Infinite, Gated | | | | |
| Carrier frequency | 2m | | BW | Hz | BW is the max. output frequency |
| Start/Stop phase | 0 | | 360 | ° | |
| Internal period | 1μ | | 1000 | s | |
| Trigger source | Internal, External, Manual | | | | |
| Gated source | Internal/External | | | | |
| Trigger delay | | | 100 | s | |

Sweep Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-------------------|----------------------------|------|------|------|---------------------------------|
| Carrier | Sine, Square, Ramp, Arb | | | | |
| Type | Linear, Log | | | | |
| Direction | Up, Down | | | | |
| Carrier frequency | 1μ | | BW | Hz | BW is the max. output frequency |
| Sweep time | 1m | | 500 | s | |
| Trigger source | Internal, External, Manual | | | | |

Specifications

Frequency Counter Characteristics

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-----------------|--|------|-------|------|-------------------------------|
| Function | Frequency, Period, Positive/Negative pulse width, Duty cycle | | | | |
| Coupling mode | AC, DC, HF REJ | | | | |
| Frequency range | 100m | | 200M | Hz | DC coupling |
| | 10 | | 200M | Hz | AC coupling |
| Input amplitude | 100mVrms | | ±2.5V | | DC coupling, < 100 MHz |
| | 200mVrms | | ±2.5V | | DC coupling, 100 MHz ~ 200MHz |
| | 100mVrms | | 5 Vpp | | AC coupling, < 100 MHz |
| | 200mVrms | | 5 Vpp | | AC coupling, 100 MHz ~ 200MHz |
| Input impedance | | 1M | | Ω | |

Reference Clock Input/Output

Reference Clock Input

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-----------------|------|------|------|------|-------------|
| Frequency | | 10M | | Hz | |
| Amplitude | 1.4 | | | Vpp | |
| Input impedance | 5 | | | kΩ | AC coupling |

Reference Clock Output

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|------------------|------|------|------|------|--|
| Frequency | | 10M | | Hz | Synchronized to internal reference clock |
| Amplitude | 2 | 3.3 | | Vpp | HiZ load |
| Output impedance | | 50 | | Ω | |

Auxiliary In/Out Characteristics

Trigger Input

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|-----------------|------|------|------|------|-----------|
| V _{IH} | 2 | | 5.5 | V | |
| V _{IL} | -0.5 | | 0.8 | V | |
| Input impedance | 100 | | | kΩ | |
| Pulse width | 100 | | | ns | |
| Response time | | | 100 | ns | Sweep |
| | | | 600 | ns | Burst |

Trigger Output

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|------------------|------|------|------|------|-------------------------|
| V _{OH} | 3.8 | | | V | I _{OH} = -8 mA |
| V _{OL} | | | 0.44 | V | I _{OL} = 8 mA |
| Output impedance | | 100 | | Ω | |
| Frequency | | | 1 | MHz | |

Sync Output

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|------------------|------|------|------|------|-------------------------|
| V _{OH} | 3.8 | | | V | I _{OH} = -8 mA |
| V _{OL} | | | 0.44 | V | I _{OL} = 8 mA |
| Output impedance | | 100 | | Ω | |
| Pulse width | | 500 | | ns | |
| Frequency | | | 1 | MHz | |

Modulation Input

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|----------------------------------|------|------|------|------|-----------|
| Frequency | 0 | | 50 | kHz | |
| Input impedance | 10 | | | kΩ | |
| Amplitude@ 100% Modulation depth | 11 | 12 | 13 | Vpp | |

Specifications

| General Characteristics | | | | | |
|-------------------------|--|-------|-------|-------------------|--|
| Power | | | | | |
| Parameter | Min. | Typ. | Max. | Unit | Condition |
| Voltage | 100 - 240 Vrms (± 10%), 50 / 60 Hz 100 - 120 Vrms (± 10%), 400 Hz | | | | |
| Power consumption | | 25.5 | 50 | W | Dual channels, Sine, 1kHz, 10Vpp, 50Ω load |
| Display | | | | | |
| Parameter | Min. | Typ. | Max. | Unit | Condition |
| Color depth | | 24 | | bit | |
| Contrast ratio | | 350:1 | | | |
| Luminance | | 300 | | cd/m ² | |
| Touch panel type | Resistive | | | | |
| Environment | | | | | |
| Parameter | Min. | Typ. | Max. | Unit | Condition |
| Operating temperature | 0 | | 40 | °C | |
| Storage temperature | -20 | | 60 | °C | |
| Operating humidity | 5 | | 90 | % | ≤ 30 °C |
| | 5 | | 50 | % | 40 °C |
| Non-operating humidity | 5 | | 95 | % | |
| Operating altitude | | | 3048 | m | ≤ 30 °C |
| Non-operating altitude | | | 15000 | m | |
| Calibration | | | | | |
| Parameter | Min. | Typ. | Max. | Unit | Condition |
| Calibration interval | | 1 | | year | |
| Mechanical | | | | | |
| Parameter | Min. | Typ. | Max. | Unit | Condition |
| Dimensions | W×H×D = 260.3mm×107.2mm×295.7mm | | | | |
| Net weight | | 3.43 | | kg | |
| Gross weight | | 4.42 | | kg | |
| Compliance | | | | | |
| LVD | IEC 61010-1:2010 | | | | |
| EMC | EN61326-1:2013 | | | | |

Ordering Information

| Product Description | SDG2000X Series Function/Arbitrary Waveform Generator |
|-------------------------|--|
| Product code | SDG2122X 120MHz |
| | SDG2082X 80MHz |
| | SDG2042X 40MHz |
| Standard configurations | A Quick Start、A Product Certification、A Power Cord、A USB Cable、A CD (Including Quick Start, data sheet, and Application Software Package)、A Calibration Certificate, A BNC Coaxial Cable |
| Optional configurations | USB-GPIB adapter |

SDG2000X Series Function/Arbitrary Waveform Generator



About SIGLENT

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

SIGLENT began to research and develop the Digital Oscilloscope independently in 2002. After a decade of development products have included digital oscilloscopes, isolated handheld oscilloscopes, function/arbitrary waveform generators, digital multimeters, DC power supplies, spectrum analyzers, and other general purpose test instrumentation. Since SIGLENT's first oscilloscope, the ADS 7000 series produced in 2005, SIGLENT has maintained the highest annual growth rate and has been the fastest developing DSO manufacturer over the past 10 years. Nowadays, SIGLENT Technologies is the leading manufacturer of oscilloscopes by shipments in China.

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