20 MHz/10MHz/7MHz/4MHz DDS FUNCTION GENERATOR

SFG-2100 Series (20/10/7/4 MHz)

Based on Direct Digital Synthesized (DDS) technology and unique FPGA design, SFG-2000/2100 Series Function Generators are built with exceptionally high performance far exceeding that of any conventional function generators, at a very competitive price. Stable output frequency, low distortion, and fine frequency resolution are the most remarkable characteristics of this product series.

SFG-2000/2100 Series include three members in each family at 4MHz, 7MHz, 10MHz and 20MHz bandwidth, respectively. SFG-2100 Series has additional functions of Sweep, AM/FM modulation, and External Counter. As a result of the ±20ppm stability level and output waveform accuracy, SFG-2000/2100 Series well fits a wide variety of applications, such as signal generator for experiment labs, reference signal for PLL (Phase Locked Loop), and calibration and adjustment source for electronic devices.

SFG-2000 Series (20/10/7/4 MHz)

FEATURES

* DDS Technology and FPGA Chip Design
* Frequency Range:0.1Hz~4/7/10/20 MHz
* High Frequency Accuracy : ±20ppm
* High Frequency Stability : ±20ppm
* Frequency Resolution :100mHz
* Low Distortion Sine Wave : -55dBc, 0.1Hz ~ 200kHz
* Front Panel Setting Save/Recall with 10 Groups of Setting Memories
* Built-in 9 Digits, 150MHz/High Resolution Counter (SFG-2100 Series Only)
* INT/EXT AM/FM Modulation (SFG-2100 Series Only)
* LIN/LOG Sweep Mode (SFG-2100 Series Only)

SPECIFICATIONS

	SFG-2000 Series				SFG-2100 Series			
MAIN								
	SFG-2004	SFG-2007	SFG-2010	SFG-2020	SFG-2104	SFG-2107	SFG-2110	SFG-2120
Frequency Range(For Sine, Square)	0.1Hz~ 4MHz	0.1Hz~ 7MHz	0.1Hz~ 10MHz	1Hz~ 20MHz	0.1Hz~ 4MHz	0.1Hz~ 7MHz	0.1Hz~ 10MHz	1Hz~ 20MHz
Range(For Triangle)	0.1Hz~1MHz (1Hz ~ 1MHz for SFG-2020/2120)							
Resolution	0.1Hz (1Hz for SFG-2020/2120)							
Stability	±20 ppm							
Accuracy	±20 ppm							
Aging	±5 ppm / year							
Output Function	Sine, Square, Triangle							
Amplitude Range	2mV ~ 10Vpp(into 50Ωload)							
Impedance	50Ω±10%							
Attenuator	-20dB±1dBx2							
DC Offset	＜-5V ~ ＞+5V(into 50Ω load)							
Duty Control	20% to 80% , 2Hz ~1MHz (Square wave only)							
Range Resolution	1%							
Display	9 digits LED display							
SINE WAVE								
Harmonics Distortion	-55dBc,0.1Hz～200kHz; -40dBc,0.2MHz～4MHz; -30dBc,4MHz～10MHz (Specification applied to both TTL/CMOS OFF and from MAX. to 1/10 level)							
Flatness(Relative to 1kHz)	<±0.3dB, 0.1Hz~1MHz; <±0.5dB, 1MHz~4MHz; <±2dB, 4MHz~10MHz							
TRIANGLE WAVE								
Linearity	≥98%,0.1Hz～100kHz;≥95%,100kHz～1MHz							
SQUARE WAVE								
Symmetry	±1% of period + 4ns, 0.1Hz～100kHz							
Rise or Fall Time	≤25ns at maximum output.(into 50Ωload)							
CMOS OUTPUT								
Level	4Vpp±1Vpp～15Vpp±1Vpp adjustable; Rise or FallTime≤120ns							
TTL OUTPUT								
Level	≥3Vpp; Fan Out: 20 TTL load;Rise or FallTime:≤25ns							
SWEEP OPERATION								
Rate	—			100:1 ratio max. and adjustable(*)				
Time				1Sec～30Sec adjustable(**)				
Mode				Lin./Log. switch selector				
AMPLITUDE MODULATION								
Depth & Modulation	—			0～100% ; 400Hz(INT),				
Frequency				DC～1MHz(EXT)				
Carrier BW				100Hz～5MHz(-3dB)				
EXT Modulation Sensitivity				≤10Vpp for 100%modulation				
FREQUENCY MODULATION								
Deviation & Modulation	—			≥0～±50kHz,center at 1MHz,				
Frequency				400Hz fixed(INT),1kHz fixed(EXT)				
EXT Modulation Sensitivity				≤10Vpp for 10% modulation(center at 1MHz)				
FREQUENCY COUNTER								
Range	—			5Hz～150MHz				
Accuracy				Time base accuracy±1count				
Time base				±20ppm(23℃±5℃)after 30 minutes warm up				
Resolution				The maximum resolution is 100nHz for 1Hz and 0.1Hz for 100MHz				
Input Impedance				1MΩ/150pf				
Sensitivity				≤35mVrms (5Hz~100MHz)				
				≤45mVrms (100MHz~150MHz)				

SFG-2000 Series

Rear Panel

SPECIFICATIONS

	SFG-2000 Series				SFG-2100 Series			
	SFG-2004	SFG-2007	SFG-2010	SFG-2020	SFG-2104	SFG-2107	SFG-2110	SFG-2120
STORE/RECALL FUNCTION								
	10 groups of Setting memories							
POWER SOURCE								
	AC115V±10%, AC230V+10%/-15%, 50/60Hz							
ACCESSORIES								
	User manual x1, Power Cord x1,GTL-101 x1				User manualx1, Power Cord x 1,GTL-101x 2			
DIMENSION & WEIGHT								
	266(W)x107(H)x293(D) mm; Approx. 3.1kg				266(W)x107(H)x293(D) mm; Approx. 3.2kg			

ORDERING INFORMATION

SFG-2004 4MHz DDS Function Generator
SFG-2007 7MHz DDS Function Generator
SFG-2010 10MHz DDS Function Generator
SFG-2020 20MHz DDS Function Generator
SFG-2104 4MHz DDS Function Generator with Counter, Sweep & AM, FM Modulation
SFG-2107 7MHz DDS Function Generator with Counter, Sweep & AM, FM Modulation
SFG-2110 10MHz DDS Function Generator with Counter, Sweep & AM, FM Modulation
SFG-2120 20MHz DDS Function Generator with Counter, Sweep & AM, FM Modulation

Note : 1.(*) In order to get maximum sweep span, the sweep time needs to be tuned on when adjust sweep span.
2.(**) When the sweep time is too long, the stop frequency will reach and stay at the maximum frequency of instrument until the end of the sweep cycle.

SELECTION GUIDE

FREQUENCY RANGE	4MHz		7MHz		10MHz		20MHz	
MODEL	SFG-2004	SFG-2104	SFG-2007	SFG-2107	SFG-2010	SFG-2110	SFG-2020	SFG-2120
DUTY	✓	✓	✓	✓	✓	✓	✓	✓
TTL/CMOS	✓	✓	✓	✓	✓	✓	✓	✓
DC OFFSET	✓	✓	✓	✓	✓	✓	✓	✓
LIN/LOG SWEEP		✓		✓		✓		✓
AM/FM MODULATION		✓		✓		✓		✓
EXT COUNTER		✓		✓		✓		✓

20 MHz/10MHz/7MHz/4MHz DDS FUNCTION GENERATOR

SFG-2100 Series (20/10/7/4 MHz)

Based on Direct Digital Synthesized (DDS) technology and unique FPGA design, SFG-2000/2100 Series Function Generators are built with exceptionally high performance far exceeding that of any conventional function generators, at a very competitive price. Stable output frequency, low distortion, and fine frequency resolution are the most remarkable characteristics of this product series.

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SFG-2000 Series (20/10/7/4 MHz)

FEATURES

* DDS Technology and FPGA Chip Design
* Frequency Range:0.1Hz~4/7/10/20 MHz
* High Frequency Accuracy : ±20ppm
* High Frequency Stability : ±20ppm
* Frequency Resolution :100mHz
* Low Distortion Sine Wave : -55dBc, 0.1Hz ~ 200kHz
* Front Panel Setting Save/Recall with 10 Groups of Setting Memories
* Built-in 9 Digits, 150MHz/High Resolution Counter (SFG-2100 Series Only)
* INT/EXT AM/FM Modulation (SFG-2100 Series Only)
* LIN/LOG Sweep Mode (SFG-2100 Series Only)

SPECIFICATIONS

	SFG-2000 Series				SFG-2100 Series			
MAIN								
	SFG-2004	SFG-2007	SFG-2010	SFG-2020	SFG-2104	SFG-2107	SFG-2110	SFG-2120
Frequency Range(For Sine, Square)	0.1Hz~ 4MHz	0.1Hz~ 7MHz	0.1Hz~ 10MHz	1Hz~ 20MHz	0.1Hz~ 4MHz	0.1Hz~ 7MHz	0.1Hz~ 10MHz	1Hz~ 20MHz
Range(For Triangle)	0.1Hz~1MHz (1Hz ~ 1MHz for SFG-2020/2120)							
Resolution	0.1Hz (1Hz for SFG-2020/2120)							
Stability	±20 ppm							
Accuracy	±20 ppm							
Aging	±5 ppm / year							
Output Function	Sine, Square, Triangle							
Amplitude Range	2mV ~ 10Vpp(into 50Ωload)							
Impedance	50Ω±10%							
Attenuator	-20dB±1dBx2							
DC Offset	＜-5V ~ ＞+5V(into 50Ω load)							
Duty Control	20% to 80% , 2Hz ~1MHz (Square wave only)							
Range Resolution	1%							
Display	9 digits LED display							
SINE WAVE								
Harmonics Distortion	-55dBc,0.1Hz～200kHz; -40dBc,0.2MHz～4MHz; -30dBc,4MHz～10MHz (Specification applied to both TTL/CMOS OFF and from MAX. to 1/10 level)							
Flatness(Relative to 1kHz)	<±0.3dB, 0.1Hz~1MHz; <±0.5dB, 1MHz~4MHz; <±2dB, 4MHz~10MHz							
TRIANGLE WAVE								
Linearity	≥98%,0.1Hz～100kHz;≥95%,100kHz～1MHz							
SQUARE WAVE								
Symmetry	±1% of period + 4ns, 0.1Hz～100kHz							
Rise or Fall Time	≤25ns at maximum output.(into 50Ωload)							
CMOS OUTPUT								
Level	4Vpp±1Vpp～15Vpp±1Vpp adjustable; Rise or FallTime≤120ns							
TTL OUTPUT								
Level	≥3Vpp; Fan Out: 20 TTL load;Rise or FallTime:≤25ns							
SWEEP OPERATION								
Rate	—			100:1 ratio max. and adjustable(*)				
Time				1Sec～30Sec adjustable(**)				
Mode				Lin./Log. switch selector				
AMPLITUDE MODULATION								
Depth & Modulation	—			0～100% ; 400Hz(INT),				
Frequency				DC～1MHz(EXT)				
Carrier BW				100Hz～5MHz(-3dB)				
EXT Modulation Sensitivity				≤10Vpp for 100%modulation				
FREQUENCY MODULATION								
Deviation & Modulation	—			≥0～±50kHz,center at 1MHz,				
Frequency				400Hz fixed(INT),1kHz fixed(EXT)				
EXT Modulation Sensitivity				≤10Vpp for 10% modulation(center at 1MHz)				
FREQUENCY COUNTER								
Range	—			5Hz～150MHz				
Accuracy				Time base accuracy±1count				
Time base				±20ppm(23℃±5℃)after 30 minutes warm up				
Resolution				The maximum resolution is 100nHz for 1Hz and 0.1Hz for 100MHz				
Input Impedance				1MΩ/150pf				
Sensitivity				≤35mVrms (5Hz~100MHz)				
				≤45mVrms (100MHz~150MHz)				

SFG-2000 Series

Rear Panel

SPECIFICATIONS

	SFG-2000 Series				SFG-2100 Series			
	SFG-2004	SFG-2007	SFG-2010	SFG-2020	SFG-2104	SFG-2107	SFG-2110	SFG-2120
STORE/RECALL FUNCTION								
	10 groups of Setting memories							
POWER SOURCE								
	AC115V±10%, AC230V+10%/-15%, 50/60Hz							
ACCESSORIES								
	User manual x1, Power Cord x1,GTL-101 x1				User manualx1, Power Cord x 1,GTL-101x 2			
DIMENSION & WEIGHT								
	266(W)x107(H)x293(D) mm; Approx. 3.1kg				266(W)x107(H)x293(D) mm; Approx. 3.2kg			

ORDERING INFORMATION

SFG-2004 4MHz DDS Function Generator
SFG-2007 7MHz DDS Function Generator
SFG-2010 10MHz DDS Function Generator
SFG-2020 20MHz DDS Function Generator
SFG-2104 4MHz DDS Function Generator with Counter, Sweep & AM, FM Modulation
SFG-2107 7MHz DDS Function Generator with Counter, Sweep & AM, FM Modulation
SFG-2110 10MHz DDS Function Generator with Counter, Sweep & AM, FM Modulation
SFG-2120 20MHz DDS Function Generator with Counter, Sweep & AM, FM Modulation

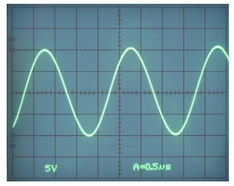
Note : 1.(*) In order to get maximum sweep span, the sweep time needs to be tuned on when adjust sweep span.
2.(**) When the sweep time is too long, the stop frequency will reach and stay at the maximum frequency of instrument until the end of the sweep cycle.

SELECTION GUIDE

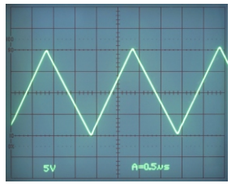
FREQUENCY RANGE	4MHz		7MHz		10MHz		20MHz	
MODEL	SFG-2004	SFG-2104	SFG-2007	SFG-2107	SFG-2010	SFG-2110	SFG-2020	SFG-2120
DUTY	✓	✓	✓	✓	✓	✓	✓	✓
TTL/CMOS	✓	✓	✓	✓	✓	✓	✓	✓
DC OFFSET	✓	✓	✓	✓	✓	✓	✓	✓
LIN/LOG SWEEP		✓		✓		✓		✓
AM/FM MODULATION		✓		✓		✓		✓
EXT COUNTER		✓		✓		✓		✓

20MHz/10MHz/7MHz/4MHz DDS FUNCTION GENERATOR

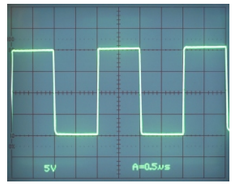
A. OUTPUT WAVEFORM



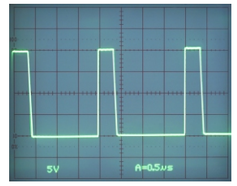
Sine Waveform



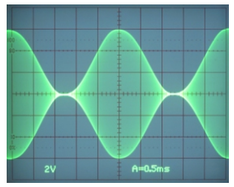
Triangle Waveform



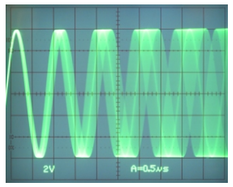
Square Waveform



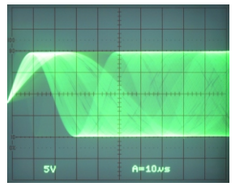
Pulse Waveform



AM Modulated Waveform



FM Modulated Waveform

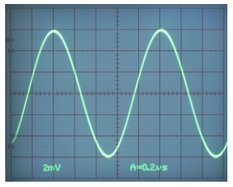


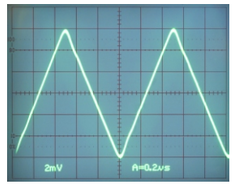
Sweep Waveform

SFG-2000/2100 Series provides Sine, Triangle and Square waveforms with DC offset and variable duty cycle at±20ppm frequency stability and accuracy. The low drift rate and -55dBc low distortion of the sine wave output significantly extend the application range of the product to various market sectors.

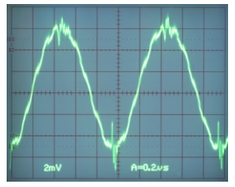
The TTL/CMOS output is also available to fulfill various application requirements in the market. Besides the basic functions, SFG-2100 Series further provides additional functions of AM/FM modulation, sweep mode, and Built-In Frequency Counter.

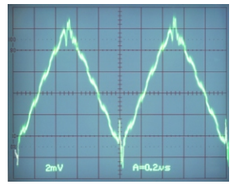
B. DDS FG VS. CONVENTIONAL FG





GW Instek SFG DDS Sine Wave & Triangle Wave





Conventional Function Generator Sine Wave & Triangle Wave

The signal of SFG-2000/2100 is generated by continuously delivering a series of sampling values from a sine waveform table (stored in RAM) to DAC (Digital to Analog Converter) for waveform construction. With low pass filter circuit to filter out the harmonics of DAC output and smooth the signal, the SFG-2000/2100 is able to provide a stable output with very low waveform distortion. This is very different from the way a conventional FG generates a signal. As a conventional FG needs to obtain its signal by switching current sources to go positive and negative directions alternately all the time, the "Ringing" distortion occurs at the peak of the signal waveform when the switching is activated. This distortion is comparatively serious when the output amplitude is low. For SFG-2000/2100 DDS FG, however, the waveform distortion remains low even when the output amplitude is at only 2mVpp.

3 MHz DDS FUNCTION GENERATOR

SFG-1003/1013 (3MHz)

SFG-1000 Series, an economic function generator with high accuracy and high stability output, is designed based on the DDS (Direct Digital Synthesized) technology embedded in a large scale FPGA. The frequency range of 3MHz and the output waveform selection of Sine, Square, Triangle and TTL of SFG-1000 Series adequately provide the fundamental features to ensure high confidence for the test results. The DDS technology at an affordable price gives a high value solution to the users who need a signal source for accurate but unsophisticated measurement applications.

FEATURES

* **DDS Technology and FPGA Design**
* **Frequency Range : 0. 1Hz ~ 3MHz**
* **High Frequency Accuracy : ±20ppm**
* **High Frequency Stability : ±20ppm**
* **Max. Frequency Resolution : 100 mHz**
* **Low Distrortion Sine Wave : -55dBc, 0. 1Hz~200 kHz**
* **Voltage Display (Only SFG-1013)**

SELECTION GUIDE

MAIN FUNCTION \ MODEL	SFG-1003	SFG-1013
Frequency	3 MHz	3 MHz
Offset	✓	✓
TTL Output	✓	✓
-40dB Attenuation	✓	✓
Voltage display	—	✓

SPECIFICATIONS

MAIN	
Output Function	Sine, Square, Triangle, TTL
Frequency Range(For Sine, Square)	0.1Hz ~ 3MHz
Frequency Range(For Triangle)	0.1Hz ~ 1MHz
Resolution	0.1Hz maximum
Stability	±20ppm
Accuracy	±20ppm
Aging	±5ppm/year
Amplitude Range	10Vp-p (into 50Ωload)
Amplitude Accuracy	±20% at maximum position (only SFG-1013)
Impedance	50Ω±10%
Attenuator	-40dB±1dBx1
DC Offset	＜-5V ~ ＞5V (into 50Ωload)
Duty Control Range	25% ~ 75% below 1MHz (for square wave only)
Display	6-digit LED display
Output Control	ON/OFF selector
SINE WAVE	
Harmonics Distortion	From Amplitude control at maximum position without any attenuation to its 1/10 of any combination setting, TTL OFF ≧-55dBc, 0.1Hz ~ 200kHz ≧-40dBc, 0.2MHz ~ 2MHz ≧-35dBc, 2MHz ~ 3MHz
Flatness (at maximum amplitude relative to 1kHz)	＜±0.3dB, 0.1Hz ~ 1MHz ＜±0.5dB, 1MHz ~ 2MHz ＜± 1dB, 2MHz ~ 3MHz
TRIANGLE WAVE	
Linear	≧98%, 0.1Hz ~ 100kHz ; ≧95%, 100kHz ~ 1MHz
SQUARE WAVE	
Symmetry	5% of period+4ns, 0.1Hz ~ 100kHz
Rise or Fall Time	≦ 100ns at maximum output. (into 50Ωload)
TTL OUTPUT	
Level	≧ 3Vp-p
Fan Out	20 TTL load
Rise or Fall Time	≦25ns
GENERAL	
Operation Environment	Indoor use, altitude up ~ 2000m Ambient Temperature 0℃ ~ 40℃ Relative Humidity: Up to 80% at 0℃ ~ 40℃ Up to 70% at 35℃ ~ 40℃ Installation category II Pollution Degree 2
POWER SOURCE	
	AC 240V/220V/110V± 10%, 50/60Hz
STORAGE CONDITION	
Temperature	-10℃ ~ 70℃
Humidity	70% (Maximum).
ACCESSORIES	
User manualx1, Power cord, GTL-101x1	
DIMENSION & WEIGHT	
251(W) x 91(H) x 291(D) mm, Approx. 2.1kg	

ORDERING INFORMATION

SFG-1003 3 MHz DDS Function Generator
SFG-1013 3 MHz DDS Function Generator with Voltage Display