SSG5000A Series

RF Signal Generator

Datasheet

SIGLENT TECHNOLOGIES CO.,LTD

Specifications

SSG5000A Series:

SSG5083A

SSG5085A

General Description

SSG5083A/SSG5085A microwave signal generator's output frequency range from 9 kHz to 13.6/20 GHz, supports AM & FM & PM modulation, pulse modulation, pulse sequence generator, power meter control and other functions. With standard OCXO reference hardware module inside ensures high-precision and high stability signal output. It is designed for communication, aerospace, national defense and other fields. And it is suitable for various application scenarios such as R&D and production.

Features and Benefits

- Frequency up to 13.6 GHz / 20 GHz
- 0.001 Hz frequency setting resolution
- Level setting range: -130 dBm ~ 25 dBm
- Phase Noise: -120 dBc / Hz @ 1 GHz, 20 kHz offset (typ.)
- Level error $\leqslant$ 0.7 dB (typ.)
- Provides AM, FM, PM analog modulation with internal, external or Int+Ext source
- Single pulse, double pulse and pulse train generator (option)
- The power meter control kit can easily use the power meter to measure power, control power output and correct line loss
- 5 inch TFT capacitive touch screen, mouse and keyboard supported
- Web browser remote control on PC and mobile terminals
- Standard interface includes USB Host, USB Device (USB TMC), LAN (VXI-11, Socket, Telnet). Optional interface: GPIB

〽 Model and Main index

Model	SSG5083A	SSG5085A
Frequency Range	CW MODE 9 kHz-13.6 GHz	CW MODE 9 kHz-20 GHz
Frequency Resolution	0.001 Hz	
Amplitude Resolution	0.01 dB	
Level error	$\leqslant$ 0.7 dB(typ.)	
Phase noise	-120 dBc/Hz @1 GHz, offset 20 kHz (typ.)	
Display	5 inch capacitance touch screen, RGB (800*480)	

〽 SPECIFICATIONS

Specifications are valid under the following conditions: The instrument is within the calibration period, has been stored between 0 and 50℃ for at least 2 hours prior to use, and has been powered on and warmed up for at least 40 minutes. The specifications include the measurement uncertainty, unless otherwise noted.

Specifications: All products are guaranteed to meet published specifications when operating at room temperature (approximately 25℃), unless otherwise noted.

Typical (typ.): Performance deemed typical implies that 80 percent of the measurement results will meet the typical published performance with a 95th percentile confidence level at room temperature (approximately 25℃). Typical performance is not warranted and does not include measurement uncertainty.

Nominal (nom.): This value indicates the expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ohm connector.

Frequency characteristics

Frequency

Frequency range	SSG5083A	CW MODE 9 kHz-13.6 GHz
	SSG5085A	CW MODE 9 kHz-20 GHz
Frequency resolution	0.001 Hz	
Setting time	< 10 ms (typ.), ALC ON < 20 ms (typ.), ALC OFF (S&H)	
Resolution of phase offset setting	0.1°	

Frequency Band [1]

Band	Frequency range	N
1	9 kHz ≤ f ≤ 1 MHz	0.25
2	1 MHz < f ≤ 250 MHz	0.5
3	250 MHz < f ≤ 500 MHz	0.125
4	500 MHz < f < 1000 MHz	0.25
5	1000 MHz ≤ f < 2000 MHz	0.5
6	2000 MHz ≤ f ≤ 4000 MHz	1
7	4000 MHz < f ≤ 8000 MHz	2
8	8000 MHz < f ≤ 16000 MHz	4
9	16000 MHz < f ≤ 20000 MHz	8

[1] N is a factor used to help define certain specifications within the document

Frequency Reference

Reference frequency	10MHz
Initial calibration accuracy	±100 ppb
Temperature stability	±1 ppb, 0℃ ~50℃
Frequency aging rate	50 ppb/1 year

Frequency sweep

Sweep type	Frequency step (linear or logarithmic step) arbitrary list

Sweep range	Full frequency range	
Sweep shape	Triangle, saw-tooth	
Sweep mode	Single, continuous	
Step spacing	Linear, logarithmic	
Number of points	Step sweep	2-65535
	List sweep	1-500
Dwell time range	10 ms-100 s	
Dwell time setting resolution	0.1 ms	
Trigger source	Auto, keyboard, external connector, bus (GPIB, USB, LAN)	
Trigger slope	Positive, negative (when trigger source is external)	

⎍ Level characteristics

ALC modes

The SSG5000A series offer three ALC modes:

ALC STATE AUTO: The best suited ALC mode is set automatically.

ALC STATE ON: The level control loop is closed. This mode is suitable for CW, FM and PM.

ALC STATE OFF (S&H): At every frequency and level change, the level control loop is closed and the level control voltage is sampled. The level control voltage is the clamped. This mode is used internally while in ALC state AUTO for pulse modulation, and AM modulation.

Level characteristics		
Level setting (standard)		
	9 kHz ≤ f < 100 kHz	-20 dBm to + 7 dBm
	100 kHz ≤ f < 1 MHz	-20 dBm to + 15 dBm
Level setting range	1 MHz ≤ f ≤ 4 GHz	-20 dBm to + 25 dBm
	4 GHz < f ≤ 6 GHz	-20 dBm to + 25 dBm
	6 GHz < f ≤ 20 GHz	-15 dBm to + 20 dBm
Level setting (SSG5080A-LP)		
	9 kHz ≤ f < 100 kHz	-110 dBm to + 7 dBm
	100 kHz ≤ f <1 MHz	-110 dBm to + 15 dBm
Level setting range	1 MHz ≤ f ≤ 4 GHz	-130 dBm to + 25 dBm
	4 GHz < f ≤ 6 GHz	-130 dBm to + 25 dBm
	6 GHz < f ≤ 20 GHz	-125 dBm to + 20 dBm
Resolution of setting	0.01 dB	
Step attenuator	Range from 0 to 110 dB, 10dB step (SSG5080A-LP)	
Maximum output power (Standard without option SSG5080A-LP)		
9 kHz ≤ f <100 kHz		+3 dBm
100 kHz ≤ f< 1 MHz		+15 dBm

1 MHz ≤ f ≤ 4 GHz	+23 dBm
4 GHz < f ≤ 6 GHz	+21 dBm
6 GHz < f ≤ 15 GHz	+20 dBm
15 GHz < f ≤ 20 GHz	+15 dBm

Maximum output power (SSG5080A-LP)

9 kHz ≤ f <100 kHz	+3 dBm
100 kHz ≤ f < 1 MHz	+13 dBm
1 MHz ≤ f ≤ 4 GHz	+22 dBm
4 GHz < f ≤ 6 GHz	+20 dBm
6 GHz < f ≤ 15 GHz	+18 dBm
15 GHz < f ≤ 20 GHz	+13 dBm

Level error (ALC on, temperature is 20 ℃ ~ 30 ℃)

	Max performance power to 13 dBm	13 dBm to -20dBm	-20 dBm to -90 dBm	-90 dBm to -110 dBm	-110 dBm to -120 dBm
9 kHz ≤ f < 100 kHz			≤ 0.7 dB	≤ 1.1 dB(nom.)	
100 kHz ≤ f ≤ 1 MHz		≤ 0.7 dB	≤ 0.7 dB	≤ 1.1 dB	≤ 2 dB
1 MHz < f ≤ 20 GHz	≤ 1 dB	≤ 0.7 dB	≤ 0.7 dB	≤ 1.1 dB	≤ 2 dB
Additional level error	ALC State Off (S&H)	< 0.5 dB			

VSWR

Level ≤ 0 dBm, ALC State ON		
VSWR	1 MHz ≤ f ≤ 6 GHz	≤ 1.6 (nom.)
	6 GHz < f ≤ 20 GHz	≤ 2 (nom.)

Level setting

Level setting time	Level deviation < 0.1 dB from final value, with GUI update stopped, temperature range from 20 ℃ - 30 ℃	
	ALC state ON	< 10 ms
	ALC state Off (S&H)	< 20 ms

     SSG5000A RF Signal Generator Datasheet

| Reverse power		
Maximum permissible DC voltage	50 V	
Maximum reverse input power	1 MHz ≤ f ≤ 6 GHz	+30 dBm
	6 GHz ≤ f ≤ 20 GHz	+25 dBm
Level step sweep		
Sweep type	Amplitude step (linear step), arbitrary list	
Sweep shape	Triangle, saw-tooth	
Sweep range	The device output range	
Trigger mode	Free run, single	
Step spacing	Linear	
Sweep points	Step sweep	2-65535
	List sweep	1-500
Dwell time range	10 ms-100 s	
Dwell time setting resolution	0.1 ms	
Trigger source	Auto, keyboard, external connector, bus (GPIB, USB, LAN)	
Trigger Slope	Positive, negative (when trigger source is external)	
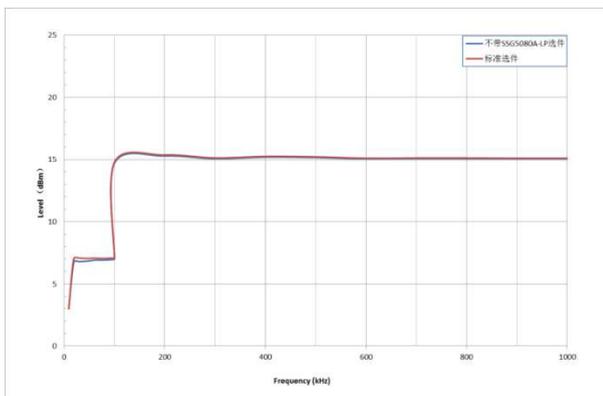
Maximum output power versus frequency, f < 1 MHz
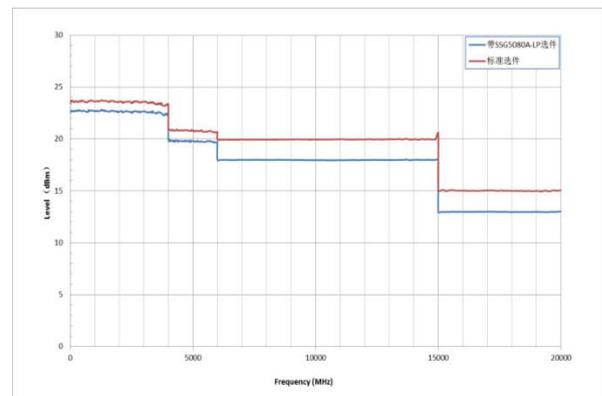
Maximum output power versus frequency, f ≥ 1 MHz
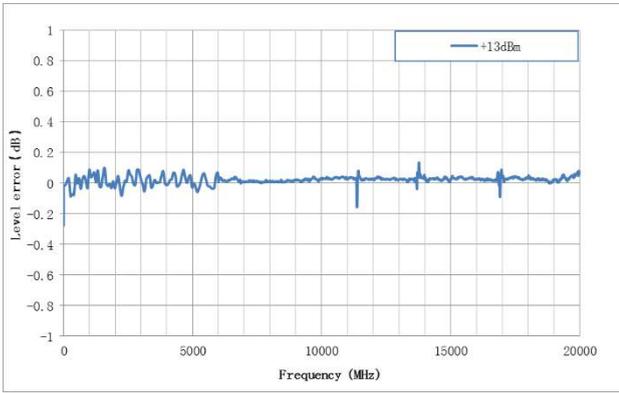
Measured level error versus frequency,
Level = + 13 dBm
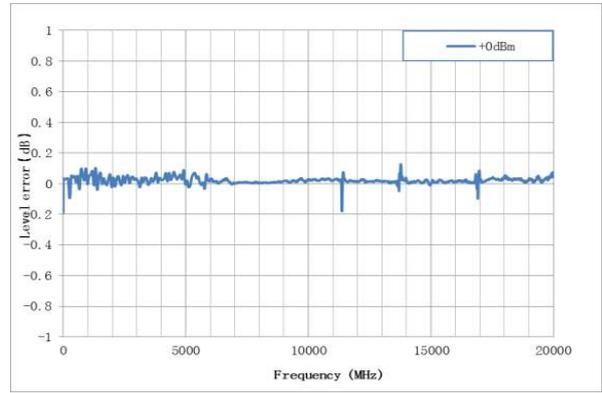
Measured level error versus frequency,
Level = + 0 dBm
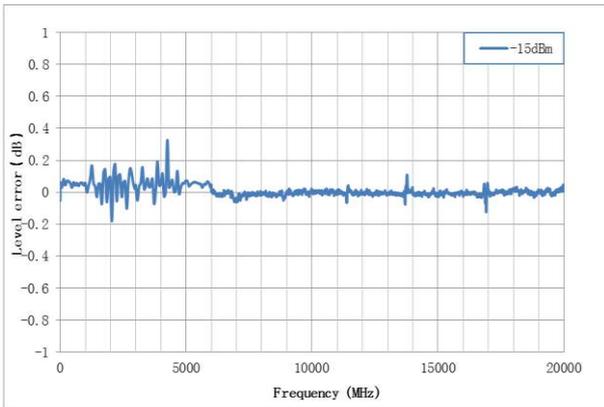
Measured level error versus frequency,
Level = - 15 dBm
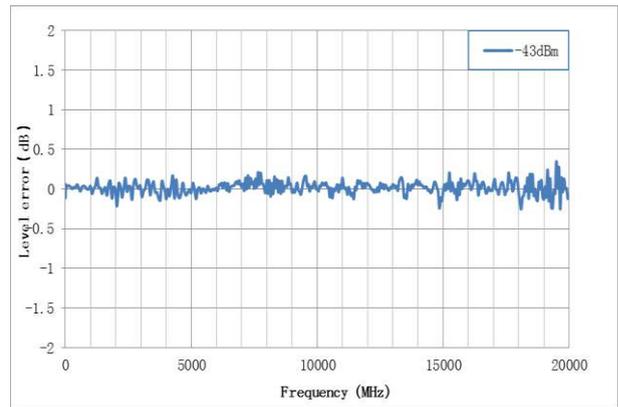

Measured level error versus frequency,
Level = - 43 dBm
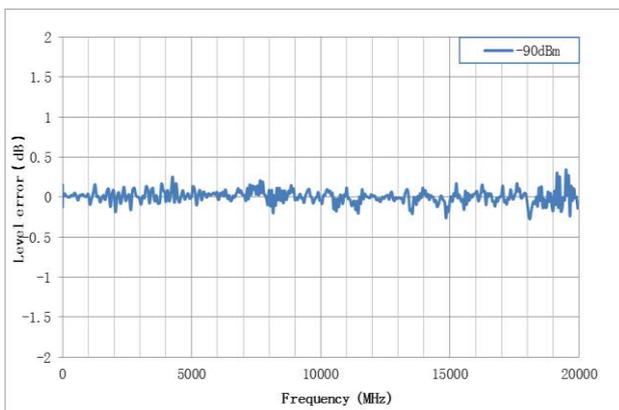
Measured level error versus frequency,
Level = - 90 dBm
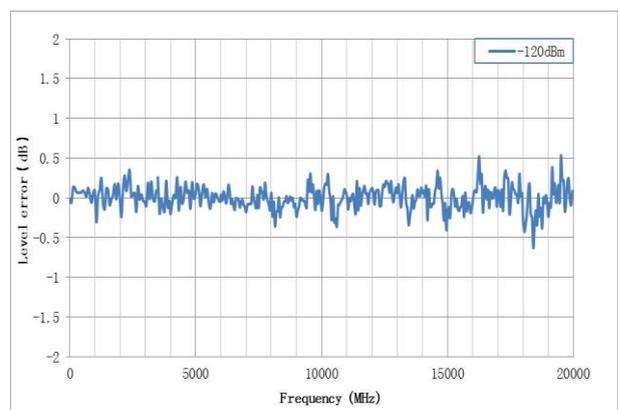
Measured level error versus frequency,
Level = - 120dBm

Spectral purity		
Harmonics	CW mod, 1 MHz < f ≤ 20 GHz, Level ≤ 10 dBm	< -30 dBc
Sub harmonics	CW mod, 1 MHz < f ⩽ 6 GHz, Level ≤ 10 dBm	< -50 dBc
	CW mod, 6 GHz < f ⩽ 20 GHz, Level ≤ 10 dBm	< -70 dBc
Non-harmonics	CW mod, offset > 10 kHz, 1 MHz < f ≤ 4 GHz	< -65 dBc
	CW mod, offset > 10 kHz, 4 GHz < f ≤ 20 GHz	< -50 dBc
SSB Phase noise	CW mod, offset=20 kHz, 1 Hz measure bandwidth	
	f=100 MHz	< -122 dBc/Hz (typ.)
	f=1 GHz	< -120 dBc/Hz (typ.)
	f=4 GHz	< -106 dBc/Hz (typ.)
	f=6 GHz	< -105 dBc/Hz (typ.)
	f=10 GHz	< -99 dBc/Hz (typ.)
	f=20 GHz	< -93 dBc/Hz (typ.)
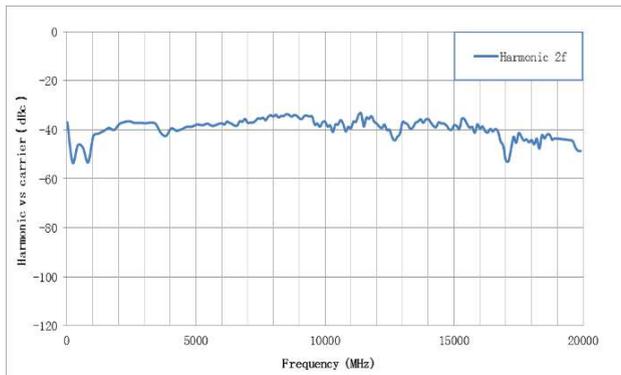
Second harmonic versus carrier frequency at
level ≤ + 10 dBm
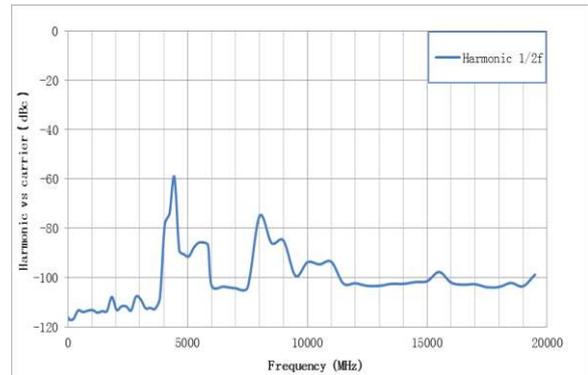
Sub harmonic versus carrier frequency at
level ≤ + 10 dBm

SSB phase noise

Internal modulation generator (LF)		
Waveforms	Sine wave, square wave, saw-tooth, triangle, DC	
Frequency range	Sine wave	0.01 Hz-1 MHz [2]
	Square wave, triangle, saw-tooth	0.01 Hz-20 kHz
Resolution of frequency setting	0.01 Hz	
Frequency error	Similar with RF source	
Frequency response	Sine wave < 0.3 dB	
Level Offset	Setting range	$\min(2.5V - \frac{1}{2}LEVEL, 2V)$
	Offset resolution	0.01 V
Output voltage range [3]	Vp at connector	1 mVpp - 3 Vpp
	Resolution of amplitude setting	1 mVpp

DC voltage error	1% of setting $\pm$ 3 mV
Output impedance	50 Ω (nom.)

[2] When use modulation and LF simultaneously, the LF frequency range and wave type will be restricted.

[3] The connector's load is 50 Ω.

LF frequency sweep	
Operating mode	Digital sweep in discrete steps
Step spacing	Linear, logarithmic
Sweep shape	Saw-tooth, triangle
Sweep direction	Up, down
Sweep range	0.01 Hz-1 MHz
Trigger mode	Auto, keyboard, external connector, bus
Trigger slope	Positive, negative
Sweep time setting range	1 ms- 500 s
Sweep time setting resolution	0.1 ms

Analog modulation				
	Simultaneous modulation			
	Amplitude modulation	Frequency modulation	Phase modulation	Pulse modulation
Amplitude modulation		●	●	(●)
Frequency modulation	●		×	●
Phase modulation	●	×		●
Pulse modulation	(●)	●	●	

●=compatible, ×=incompatible, (●) =compatible limitations; NO specification Applies to AM distortion.

Amplitude modulation

Modulation source	Internal, external, internal + external	
AM depth setting range	0%~100%	
Resolution of setting	0.1%	
AM depth error	f-mod=1 kHz, m < 80%, Level ≤ 0 dBm	< 4% of setting + 1%
AM distortion	f-mod=1 kHz, m < 30%, level < 0 dBm	< 3% (typ.)
Modulation frequency response	M < 80%, 10 Hz-100 kHz	< 3 dB (nom.)

Frequency modulation

Modulation source	Internal, external, internal +external	
Maximum deviation	N*1 MHz (typ.)	
Resolution	0.1% of set deviation or 1 Hz, whichever is larger	
FM deviation error	Fmod =1 kHz, internal	< (2% of setting + 20 Hz) (nom.)
FM distortion	Fmod=1kHz, deviation=N*1 MHz	< 0.5% (nom.)
Modulation frequency response	10 Hz-100 kHz	< 3 dB (nom.)

Phase modulation

Modulation source	Internal, external, internal + external	
Maximum deviation	N*5 rad	
Resolution	0.1% of set deviation or 0.01 rad, whichever is larger	
ΦM deviation error	Fmod=1 kHz, internal, Deviation ≤ N*5 rad	< (2 % of setting + 0.05 rad)
ΦM distortion	Fmod=1 kHz, deviation ≤ N*5 rad	< 0.5 % (nom.)
Modulation frequency response	10 Hz-100 kHz	< 3 dB (nom.)

Pulse modulation (SSG5080A-PU)

Modulation source	Internal, external	

On/off ration	1 MHz < f ≤ 6 GHz	> 70 dBc（typ.）
	6 GHz < f ≤ 13.6 GHz	> 80 dBc（typ.）
	13.6 GHz < f ≤ 20 GHz	> 75 dBc（typ.）
Rise/fall time (10% / 90%)	10 % to 90 % of RF amplitude	< 15 ns（typ.）
Pulse repetition time	Setting range	40 ns - 300 s

Pulse generator		
Pulse modes	Single pulse, double pulse	
Pulse source	Internal, external	
Pulse polarity	Normal, inverse	
Pulse period	Setting range	40 ns - 300 s
	Resolution of setting	10 ns
Pulse width	Retting range	20 ns - 300 s
	Resolution of setting	10 ns
Double pulse Delay	Setting range	20 ns - 300 s
	Resolution of setting	10 ns
#2 Width	Setting range	20 ns - 300 s
	Resolution of setting	10 ns
Trigger modes	Auto, keyboard, external trigger, external gate trigger, bus	
Trig polarity	Normal, inverse (used in external gate trigger mode)	
Trigger Slope	Positive, negative (used in external trigger mode)	
External trigger delay	140 ns - 300 s	
External trigger delay resolution of setting	10 ns	

Pulse train generator (SSG5080A-PT)	
Number of pulses	1 - 2047
Number of repetitions per pulse	1 - 65535
Pulse on time and off time setting range	20 ns - 300 s
Pulse on time and off time setting resolution	10 ns

Connectors

Front panel connectors		
RF output	Impedance	50 Ω
	Connector	2.92mm male
Modulation generator output (LF)	Impedance	50 Ω
	Connector	BNC-female
Rear panel connectors		
TRIG IN / OUT	Impedance	100 kΩ
	Connector	BNC-female
	Active trigger voltage	5 V TTL
EXT MOD INPUT	Impedance	High impedance
	Connector	BNC-female
PULSE IN / OUT	Impedance	Input: High impedance Output: 50 Ω
	Connector	BNC-female
	Input / output voltage	CMOS 3.3 V
10 MHz IN	Impedance	50 Ω
	Connector	BNC-female
	Input power range	-5 dBm ~ +10 dBm
10 MHz OUT	Impedance	50 Ω
	Connector	BNC-female
	Output power range	> 0 dBm
SIGNAL VALID	Impedance	50 Ω
	Connector	BNC-female
	Output voltage range	CMOS 3.3 V
Communication Interface		
USB host	USB-A 2.0	
USB device	USB-B 2.0	
LAN	LAN (VXI - 11, 10/100Base, RJ - 45)	

General Specification

Display	TFT LCD, RGB (800*480), 5inch capacitive touch screen
Storage	Internal (Flash) 4G Byte, external (USB storage device)
Source	100 V to 240 V(±10%), 50/60 Hz Power consumption 70 W with all function working
Temperature	Working temperature 0 ℃ to 50 ℃, Storage temperature - 20 ℃ to 70 ℃
Humidity	0 ℃ to 30 ℃, ≤ 95 % relative humidity; 30 ℃ to 50 ℃, ≤ 75 % relative humidity
Dimensions	W×H×D=338×113×369 mm
Altitude	Operating: less than 3 km
Weight without package	6.05kg with SSG5080A-LP

Electromagnetic Compatibility and Safety

EN 61326-1:2013/	Class A
EN 61000-3-2:2014	
EN 61000-3-3:2013	Plt: 0.65 Pst: 1.00, dmax: 4.00 % dc: 3.00 %, dtLim: 3.30 % dt > Lim: 500 ms
IEC 61000-4-2:2008	AD ± 8.0 kV，CD ± 4.0kV
IEC 61000-4-3:2006 + A1: 2007 + A2:2010	80 MHz to 1000 MHz: 10 V/m; 1.4 GHz to 2.0 GHz: 3 V/m; 2.0 GHz to 2.7 GHz:1 V/m
IEC 61000-4-4:2004 + A1: 2010	AC Line: ± 2100 kV
IEC 61000-4-5:2005	Line to Line: 1.0 kV， Line to Earth: 2.0 kV
IEC 61000-4-6:2008	0.15 - 80 MHz: 3V 1 kHz 80% AM
IEC 61000-4-8:2009	30 A/m， 50/60 Hz
IEC 61000-4-11:2004	Voltage Dips: 0%/0.5P; 40%/10P; 70%/25P; Short Interruptions Test Level%UT: 0%/250P

Safety

IEC 61010-1: 2010 / EN 61010-1: 2010

Canada: CAN/CSA-C22.2 No.61010-1: 2012

RoHS

2011/65/EU

⎁ Ordering Information

Product Description	SSG5000A Signal Generator	Order Number
Product code	Analog Signal Generator 9 kHz~13.6 GHz	SSG5083A
	Analog Signal Generator 9 kHz~20 GHz	SSG5085A
Standard configurations	Quick start, an USB cable, calibration certificate, power cord，2.92mm female to female adapter	
Option	Pulse modulation	SSG5080A-PU
	Pulse train generator	SSG5080A-PT
	110dB Attenuator module[1]	SSG5080A-LP
	Rack mount kit	SSG-RMK
	USB-GPIB adapter	USB-GPIB
	Upgrade 13.6 GHz to 20 GHz	SSG5080A-F85

[1] Assembled and calibrated in factory only

SSIGLENT®

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.

Headquarters:

SIGLENT Technologies Co., Ltd

Add: Bldg No.4 & No.5, Antongda Industrial Zone, 3rd Liuxian Road, Bao'an District, Shenzhen, 518101, China

Tel: + 86 755 3688 7876

Fax: + 86 755 3359 1582

Email: sales@siglent.com

Website: int.siglent.com

North America:

SIGLENT Technologies America, Inc

6557 Cochran Rd Solon, Ohio 44139

Tel: 440-398-5800

Toll Free: 877-515-5551

Fax: 440-399-1211

Email: info@siglentna.com

Website: www.siglentna.com

Europe:

SIGLENT Technologies Germany GmbH

Add: Staetzlinger Str. 70

86165 Augsburg, Germany

Tel: +49(0)-821-666 0 111 0

Fax: +49(0)-821-666 0 111 22

Email: info-eu@siglent.com

Website: www.siglenteu.com

Follow us on
Facebook: SiglentTech