SSG6000A Series Microwave Signal Generator

Data Sheet

EN01D

SIGLENT TECHNOLOGIES CO.,LTD

SSG6083A
SSG6085A
SSG6087A

Product Overview

SSG6083A / SSG6085A / SSG6087A microwave signal generator's output frequency range from 100 kHz to 13.6 / 20 / 40 GHz, supports AM and 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 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/ 40 GHz
- 0.001 Hz frequency setting resolution
- Level setting range: -130 dBm ~ 24 dBm
- Phase Noise: -135 dBc / Hz @ 1 GHz, 10 kHz offset (typ.)
- Level error ≤ 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

Models and Main index

model	SSG6083A	SSG6085A	SSG6087A
Frequency Range	CW MODE 100 kHz-13.6 GHz	CW MODE 100 kHz-20 GHz	CW MODE 100 kHz-40 GHz
Frequency Resolution	0.001 Hz		
Amplitude Resolution	0.01 dB		
Level error	≤ 0.7 dB(typ.)		
Phase noise	-135 dBc/Hz @1 GHz, offset 10 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 at room temperature (approximately 25℃) 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	SSG6083A	CW MODE 100 kHz-13.6 GHz
	SSG6085A	CW MODE 100 kHz-20 GHz
	SSG6087A	CW MODE 100 kHz-40 GHz
Frequency resolution	0.001 Hz[1]	
Setting time	< 10 ms (typ.), ALC ON < 20 ms (typ.), ALC OFF (S&H)	
Frequency band[2]		
Band	Frequency range	N
1	1MHz ≤f≤ 250 MHz	1/8
2	250MHz ≤f≤ 400 MHz	1/32
3	400MHz ≤f≤ 800 MHz	1/16
4	800MHz ≤f≤ 1600 MHz	1/8
5	1600MHz ≤f≤3200 MHz	1/4
6	3200MHz ≤f≤6400 MHz	1/2
7	6400MHz ≤f≤12800 MHz	1

8	12800MHz ≤f≤ 25600 MHz	2
9	25600MHz ≤f≤ 40000 MHz	4
Frequency Reference		
Reference frequency	10.000000 MHz	
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)	

[1]For serial number of the seventh bit >=3, SSG6AA3XXXXXXX.the frequency resolution can satisfy 0.001Hz，FM，PM modulation.

[2] Frequency modulation related parameter factor.

Level Characteristics

ALC modes

The SSG6000A 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.

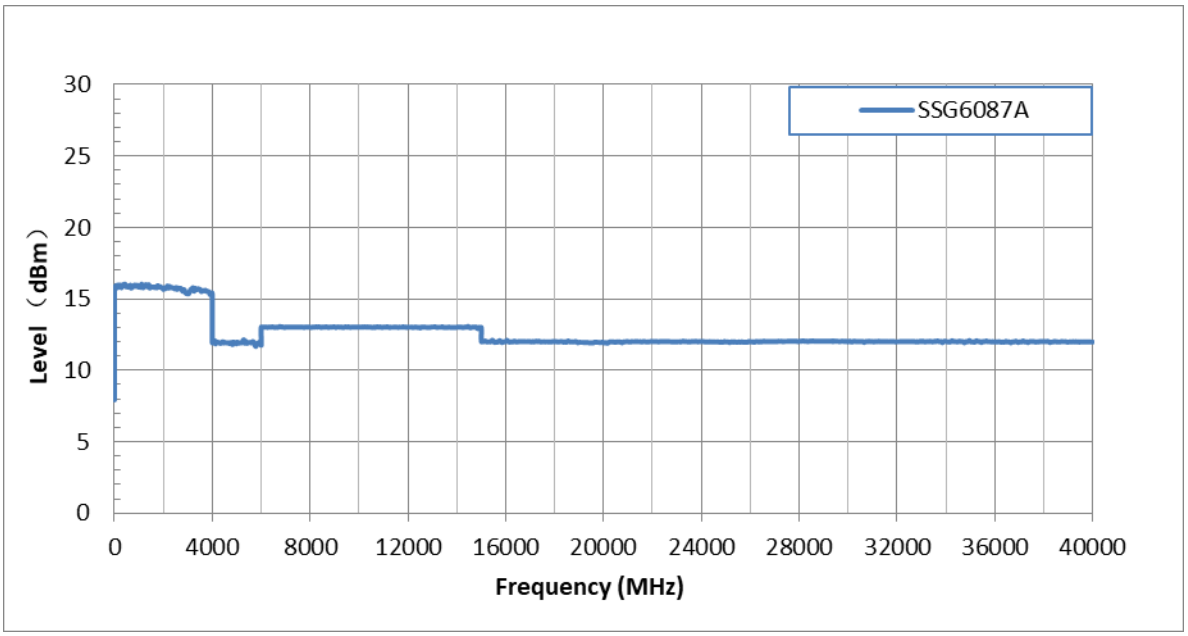
ALC STATE OFF (S&H): At every frequency and level change, the level control loop is closed and the level control voltage is sampled. Then the level control voltage is the clamped. This mode is used internally while in ALC state AUTO for pulse modulation, and AM modulation.

Level characteristics		
Level setting (standard)		
Level setting range	100 kHz ≤ f < 3 MHz	-110 dBm to + 15 dBm
	3 MHz ≤ f ≤ 4 GHz	-130 dBm to + 24 dBm
	4 GHz < f ≤ 6 GHz	-130 dBm to + 20 dBm
	6 GHz < f ≤ 20 GHz	-120 dBm to + 20 dBm
	20 GHz < f ≤ 40 GHz	-120 dBm to + 20 dBm
Resolution of setting	0.01 dB	

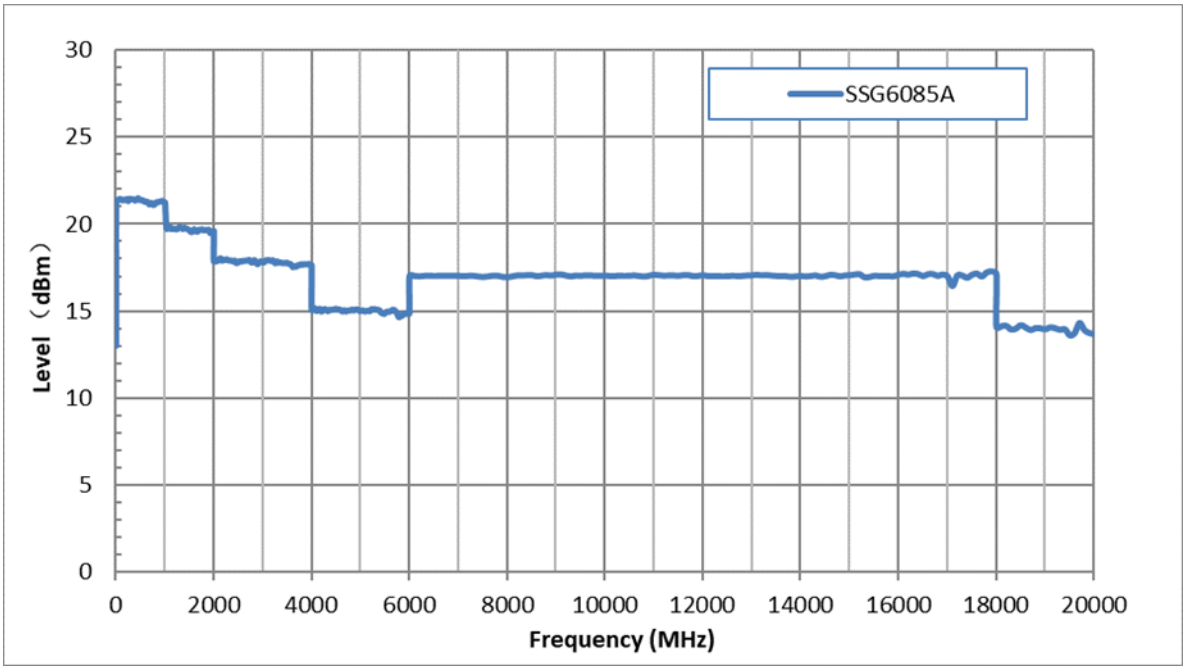
Step attenuator	Range from 0 to 110 dB, 10dB step				
Maximum output power (SSG6083A& SSG6085A)					
100 kHz ≤ f < 3 MHz			13 dBm		
3 MHz ≤ f ≤1 GHz			22 dBm		
1 GHz < f ≤ 2 GHz			20 dBm		
2 GHz < f ≤ 4 GHz			18 dBm		
4 GHz < f ≤ 6 GHz			15 dBm		
6 GHz < f ≤ 18 GHz			17 dBm		
18 GHz < f ≤ 20 GHz			14 dBm		
Maximum output power (SSG6087A)					
100 kHz ≤ f <3 MHz			8 dBm		
3 MHz ≤ f ≤ 4 GHz			16 dBm		
4 GHz < f ≤ 6 GHz			12 dBm		
6 GHz < f ≤ 15 GHz			12 dBm		
15 GHz < f ≤ 20 GHz			12 dBm		
20 GHz < f ≤ 40 GHz			12 dBm		
Level error (ALC on, temperature is 20 ℃ ~ 30 ℃)					
	Max performance power to 10 dBm	10 dBm to -20dBm	-20 dBm to -90 dBm	-90 dBm to -110 dBm	-110 dBm to -120 dBm
100 kHz ≤ f < 1 MHz		≤ 0.7 dB	≤ 0.7 dB	≤ 1.1 dB	
1 MHz < f ≤ 40 GHz	≤ 1 dB	≤ 0.7 dB	≤ 1 dB	≤ 1.5 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 ≤ 40 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			
Reverse power					
Maximum permissible DC voltage	0 V				
Maximum reverse input power	1 MHz ≤ f ≤ 6 GHz	+30 dBm			
	6 GHz < f ≤ 40 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)	

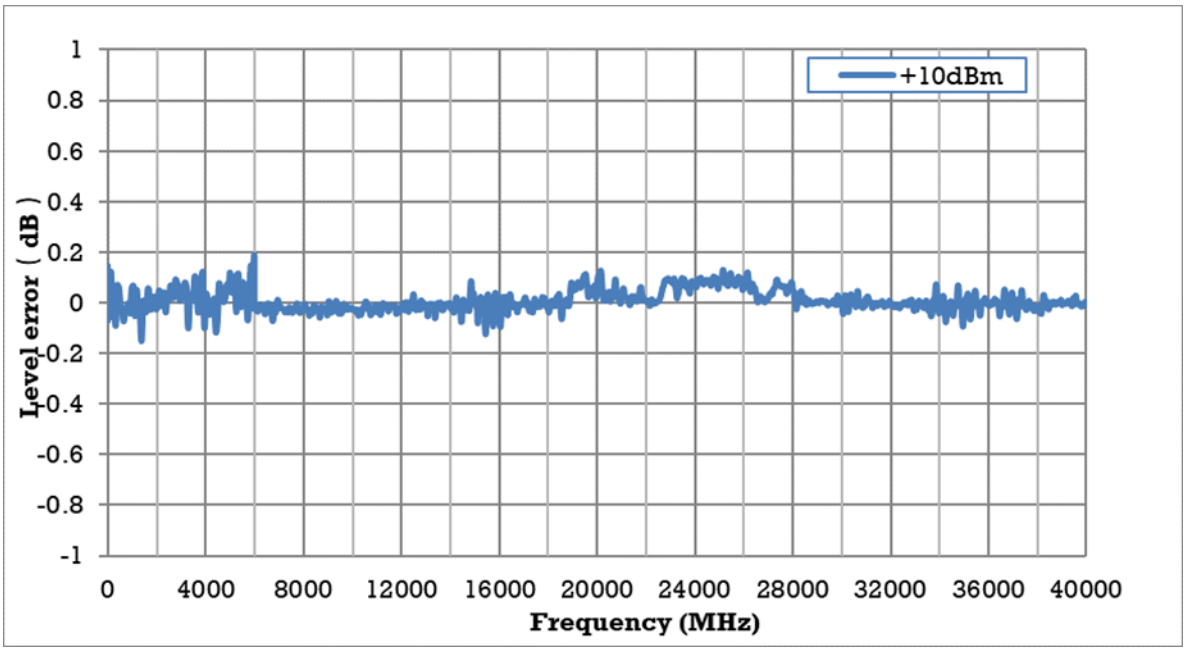
Maxpower, SSG6087A



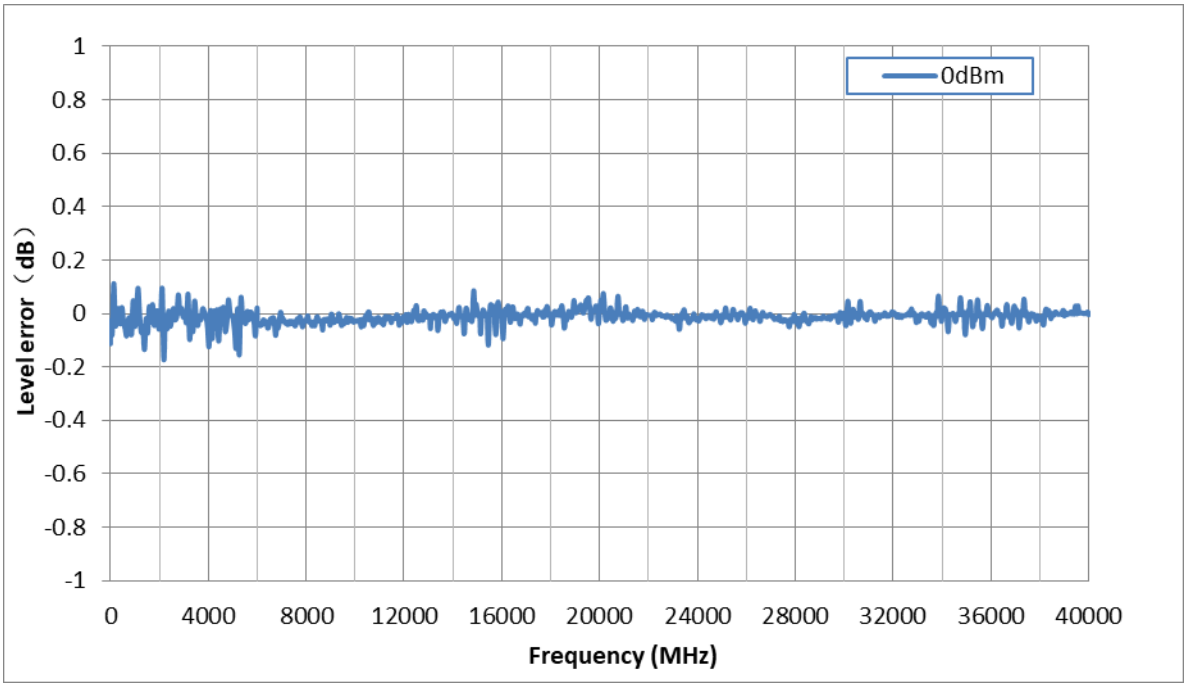
Maxpower, SSG6085A



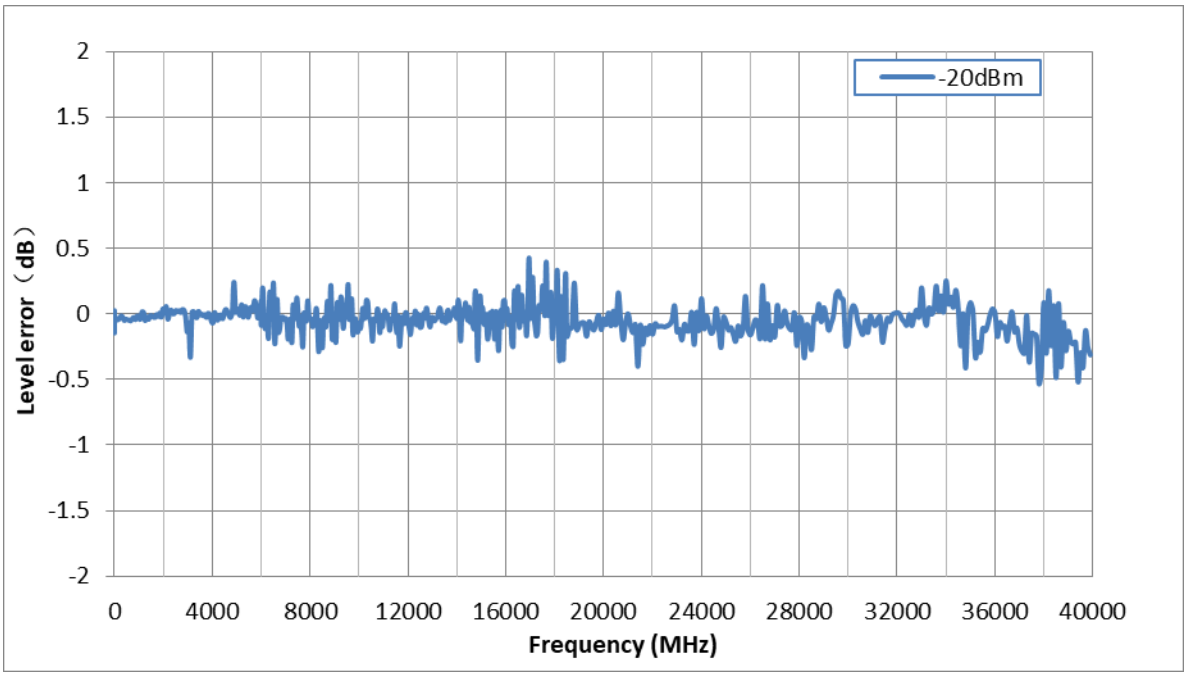
Measured level error versus frequency, Level = 10 dBm



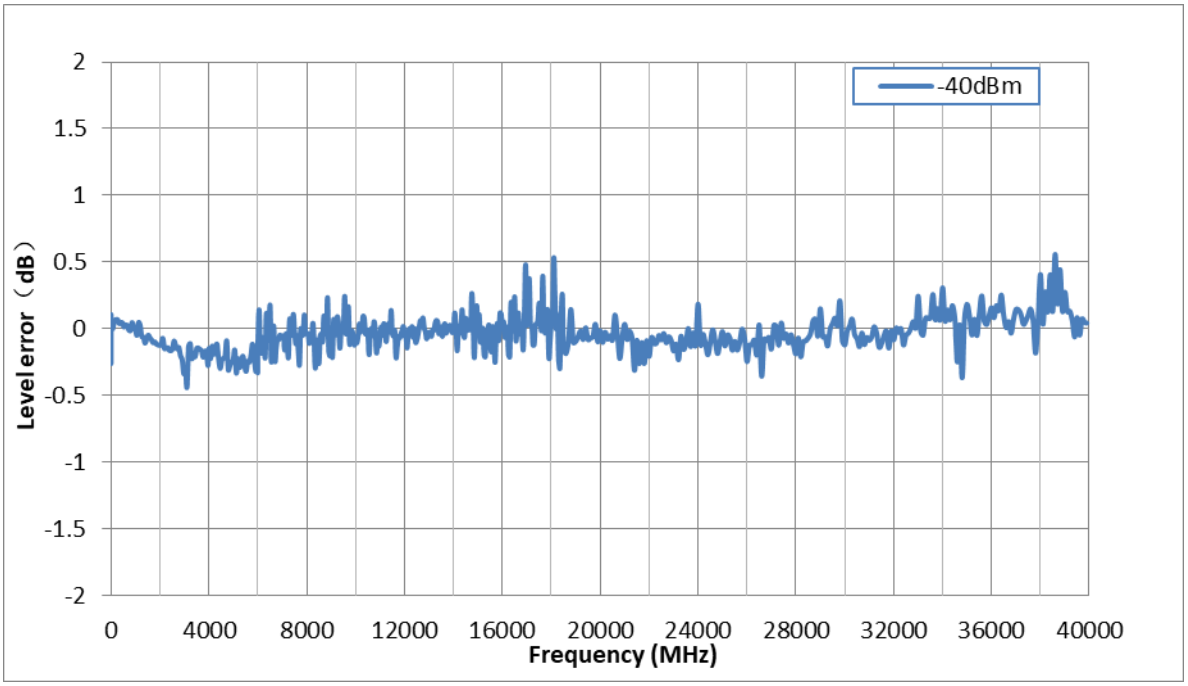
Measured level error versus frequency, Level = 0 dBm



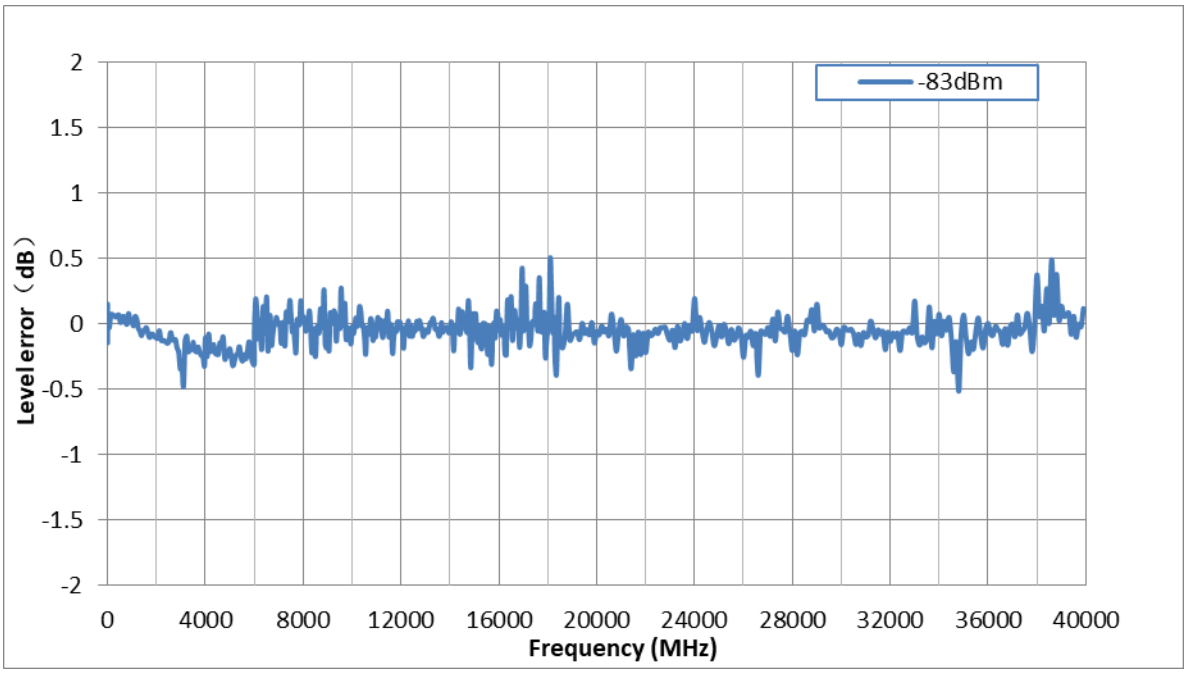
Measured level error versus frequency, Level = - 20 dBm



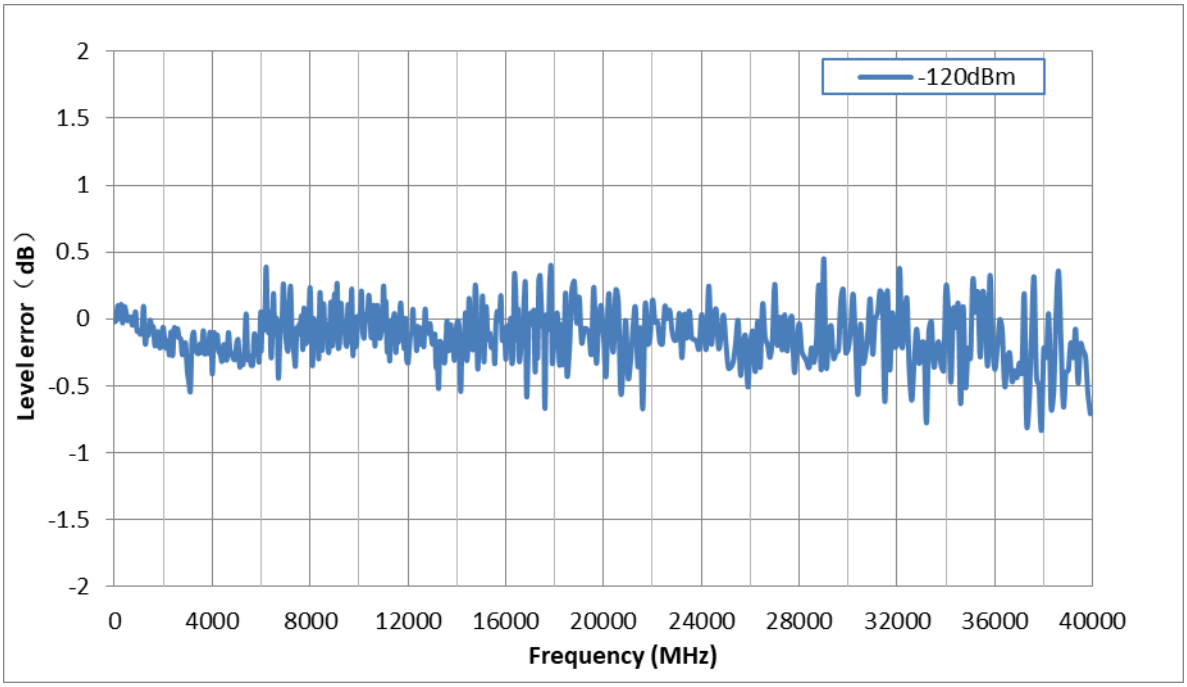
Measured level error versus frequency, Level = - 40 dBm



Measured level error versus frequency, Level = - 83 dBm



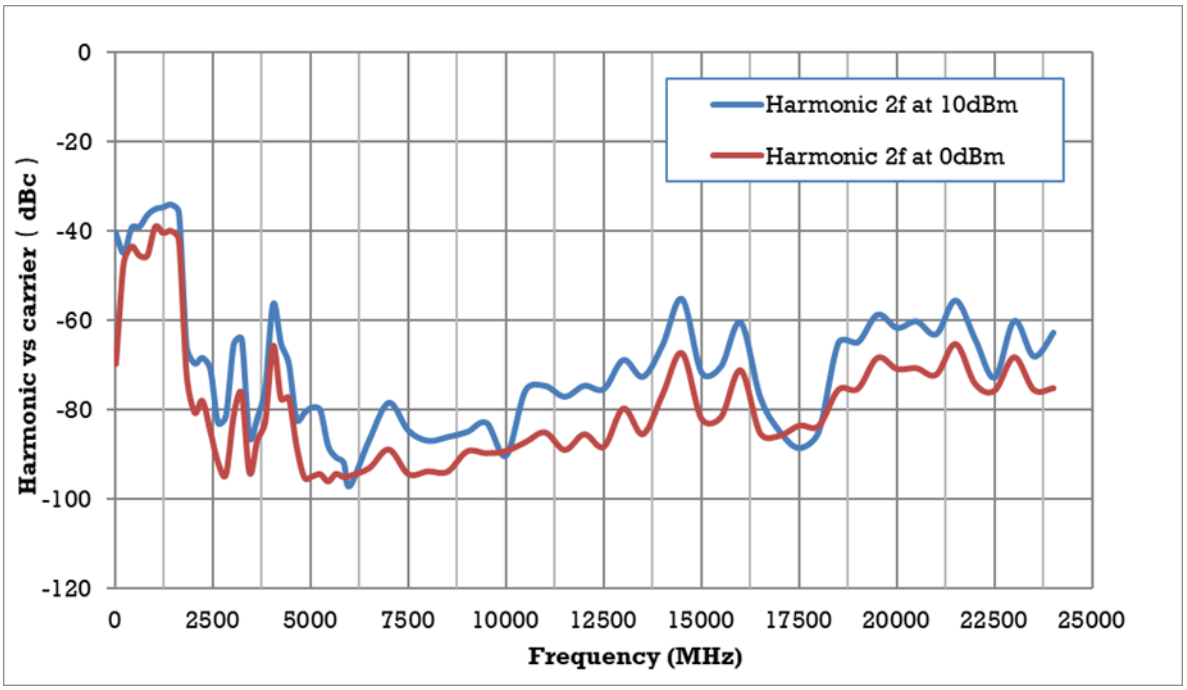
Measured level error versus frequency, Level = - 120 dBm



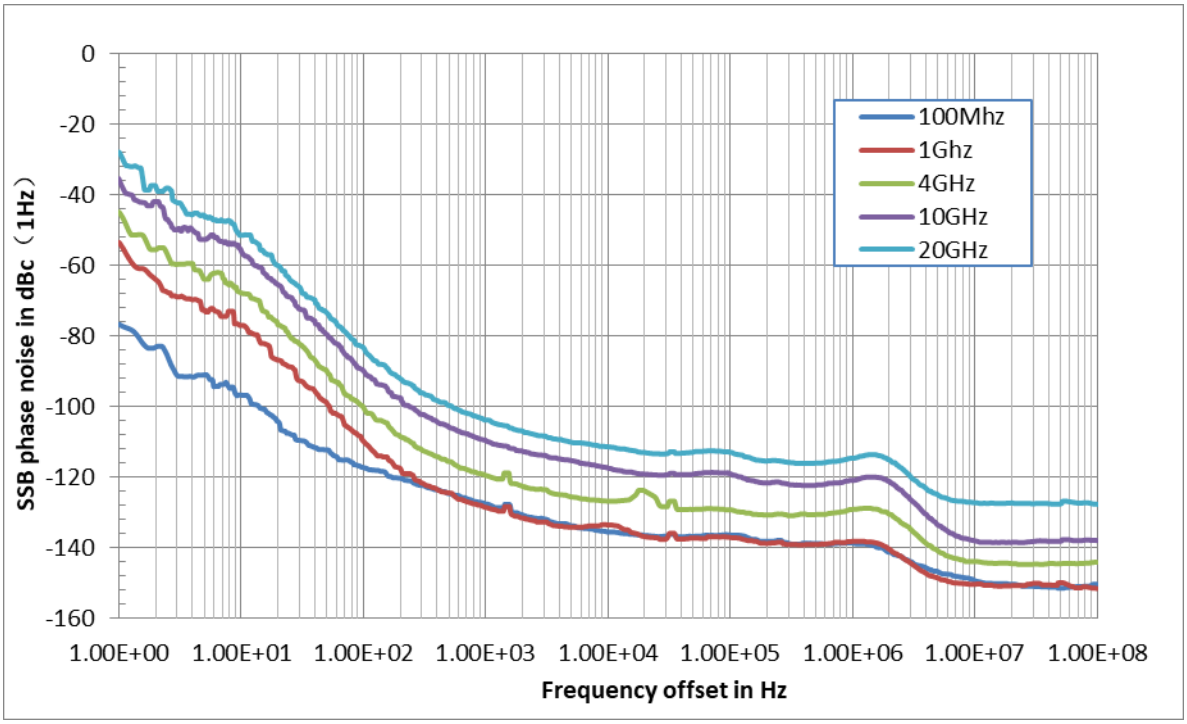
Spectral purity		
Harmonics	CW mod, 1 MHz < f ≤ 2 GHz, Level ≤ 10 dBm	< -30 dBc
	CW mod, 2 GHz < f ≤ 4 GHz, Level ≤ 10 dBm	< -50 dBc
	CW mod, 4 GHz < f ≤ 20 GHz, Level ≤ 10 dBm	< -50 dBc
	CW mod, 20 GHz < f ≤ 40 GHz, Level ≤ 10 dBm	< -46 dBc
Sub harmonics	CW mod, 1 MHz < f ≤ 40 GHz, Level ≤ 10 dBm	< -80 dBc
Non-harmonics	CW mod, offset > 10 kHz, 1 MHz < f ≤ 4 GHz	< -60 dBc
	CW mod, offset > 10 kHz, 4 GHz < f ≤ 40 GHz	< -50 dBc
SSB Phase noise	CW mod, offset=10 kHz, 1 Hz measure bandwidth	
	f=100 MHz	< -130 dBc/Hz (typ.)
	f=1 GHz	< -135 dBc/Hz (typ.)
	f=4 GHz	< -123 dBc/Hz (typ.)
	f=6 GHz	< -119 dBc/Hz (typ.)
	f=10 GHz	< -116 dBc/Hz (typ.)
	f=20 GHz	< -109 dBc/Hz (typ.)
	f=40 GHz	< -102 dBc/Hz (typ.)
SSB Phase noise	CW mod, offset=100 Hz, 1 Hz measure bandwidth	

	f=100 MHz	< -114 dBc/Hz (typ.)
	f=1 GHz	< -108 dBc/Hz (typ.)
	f=4 GHz	< -94 dBc/Hz (typ.)
	f=6 GHz	< -92 dBc/Hz (typ.)
	f=10 GHz	< -89 dBc/Hz (typ.)
	f=20 GHz	< -83 dBc/Hz (typ.)
	f=40 GHz	< -77 dBc/Hz (typ.)

Second harmonic versus carrier frequency at level 0 dBm&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 [1]
	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	0.001 V
Output voltage range [2]	Vp at connector	1 mVpp - 3 Vpp
	Resolution of amplitude setting	1 mV
DC voltage error	1% of setting ± 3 mV	
Output impedance	50 Ω (nom.)	

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

[2] 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	●		X	●
Phase modulation	●	X		●

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.)
FM modulation [3]				
Modulation source	Internal, external, internal+external			
Maximum deviation	N*5 MHz（typ）			
Resolution	0.1% of set deviation or 1Hz,whichever is larger			
FM deviation error	Fmod=1 kHz ， internal			＜（2% of setting +20 Hz）(nom)
FM distortion	Fmod=1 kHz, deviation=N*2 MHz			＜0.5%（nom.）
Modulation frequency response	10Hz-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			
∅M deviation error	Fmod =1 kHz, internal, Deviation≤N*5 rad			<(2% of setting + 0.05 rad)
∅M distortion	Fmod =1 kHz, deviation, deviation≤N*5 rad			<0.5 %（nom.）
Modulation frequency response	10Hz-100 kHz			<3 dB (nom.)

【3】 For serial number of the seventh bit >=3, SSG6AA3XXXXXXX. support FM，PM modulation.

Pulse modulation (SSG6080A-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 ≤ 40 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
Level accuracy / alc off	± 0.5 dB typ	

Width compression	10 ns	
Video feed-through	< 20 mv	
Video delay	45 ns	
RF delay	45 ns	
Pulse overshoot	< 8%	
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	Setting 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 (SSG6080A-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, Socket, Telnet)	

General Specification	
Display	TFT LCD, RGB (800*480), 5-inch capacitive touch screen
Storage	Internal (Flash) 4G Byte, external (USB storage device)
Source	100 V to 240 V(±10%), 50/60 Hz Power consumption 90 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=482×104×540 mm
Altitude	Operating: less than 3 km
Weight without package	10.4kg
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 Leve I% 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	SSG6000A Signal Generator	Order Number
Product code	Analog Signal Generator 100 kHz~13.6 GHz	SSG6083A
	Analog Signal Generator 100 kHz~20 GHz	SSG6085A
	Analog Signal Generator 100 kHz~40 GHz	SSG6087A
Standard configurations	Quick start, an USB cable, calibration certificate, power cord, 2.92mm female to female adapter	
Option	Pulse modulation	SSG6080A-PU
	Pulse train generator	SSG6080A-PT
	Rack mount kit	SSG6000A-RMK
	USB-GPIB adapter	USB-GPIB
	Upgrade 13.6 GHz to 20 GHz	SSG6080A_F85

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.

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