RF Signal Generator
SG7000 Series

Features

- Frequency up to 4 GHz / 6 Ghz
- 0.001 Hz frequency setting resolution
- Maximum output power up to + 26 dBm (typ.)
- Phase Noise: -120 dBc / Hz @ 1 GHz, 20 kHz offset (typ.)
- User programmable flatness correction
- Provides AM, FM, PM analog modulation with internal, external or Int + Ext source
- Single pulse, double pulse and pulse train generator (option)
- Internal IQ modulation with 150 MHz modulation bandwidth with perfect in-factory calibration
- Built-in digital communication standard waveform files such as 5G-NR,LTE, WCDMA, WLAN, Blue-Tooth, CDMA
- Internal Custom mode generate common IQ signals such as QAM, FSK, ASK, MSK
- Analog differential I/Q outputs
- External analog I/Q input
- USB-power meter measurement
- 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

Technical Specifications

Model	SG7040X	SG7060X	SG7040X-V	SG7060X-V
Frequency Characteristics				
Frequency Range				
CW Mode	9 kHz to 4 GHz	9 kHz to 6 GHz	9 kHz to 4 GHz	9 kHz to 6 GHz
IQ Mode	-	-	10 MHz to 4 GHz	10 MHz to 6 GHz
Frequency Resolution	0.001 Hz			
Setting time	< 5 ms (typ.) ALC ON			
	< 10 ms (typ.) ALC OFF (S&H)			
Resolution of phase offset setting	0.1˚			

Model	SG7040X	SG7060X	SG7040X-V	SG7060X-V
Frequency Band (1)	**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 ≤ 6000 MHz		2	
(1) N is a factor used to help define certain specifications within the document.				
Frequency Reference				
Reference frequency	10.000000 MHz		Option 10M_OCXO_L	
Initial Calibration Accuracy	< 0.2 ppm		± 100 ppb	
Temperature Stability	< 1 ppm / year, 0˚C to 50˚C		± 1 ppb, 0˚C to 50˚C	
Frequency aging rate	< 0.5 ppm / first year, 3.0 ppm / 20 years		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 to 65535			
	List Sweep : 2 to 500			
Dwell Time Range	10 ms to 100 s			
Dwell time setting resolution	0.1 ms			
Trigger Source	Auto, Keyboard, External connector, Bus			
Trig slope	Positive, Negative when Trigger source is external			
Level Characteristics				
Level Setting				
Level Setting Range	9 kHz ≤ f < 100 kHz	-110 dBm to + 7 dBm		
	100 kHz ≤ f < 1 MHz	-110 dBm to + 15 dBm		
	1 MHz ≤ f ≤ 4 GHz	-140 dBm to + 26 dBm		
	4 GHz < f ≤ 6 GHz	-130 dBm to + 24 dBm		
Resolution of setting	0.01 dB			
Level of Performance Range	9 kHz ≤ f < 100 kHz	-110 dBm to + 4 dBm		
	100 kHz ≤ f < 1 MHz	-110 dBm to + 13 dBm		
	1 MHz ≤ f ≤ 4 GHz	-130 dBm to + 20 dBm		
	4 GHz < f ≤ 6 GHz	-120 dBm to + 20 dBm		
Level error (ALC on, temperature is 20˚C to 30˚C	Max performance power to -40 dBm	- 40 dBm to - 90 dBm	- 90 dBm to - 110 dBm	- 110 dBm to - 130 dBm
9 kHz ≤ f < 100 kHz	≤ 0.9 dB	≤ 0.9 dB	≤ 1.1 dB	
	≤ 0.7 dB (typ.)	≤ 0.7 dB (typ.)		
100 kHz ≤ f ≤ 4 GHz	≤ 0.7 dB	≤ 0.7 dB	≤ 1.1 dB	≤ 1.1 dB (typ.)
	≤ 0.5 dB (typ.)	≤ 0.5 dB (typ.)	≤ 0.7 dB (typ.)	
4 GHz < f ≤ 6 GHz	≤ 0.7 dB	≤ 0.7 dB	≤ 1.1 dB	≤ 1.2 dB (typ.)
	≤ 0.5 dB (typ.)	≤ 0.5 dB (typ.)	≤ 0.7 dB (typ.)	
Additional level error	ALC State off (S&H) < 0.2 dB			
VSWR				
(Level ≤ 0 dBm, ALC State ON)	1 MHz ≤ f ≤ 6 GHz	≤ 1.8 (nom.)		
Level Setting				
Level Setting Time	Level deviation < 0.1 dB from final value, with GUI update stopped, temperature range from 20˚C to -30˚C	< 5 ms		
	ALC State On	< 5 ms		
	ALC State S & H	< 10 ms		

Model	SG7040X	SG7060X	SG7040X-V	SG7060X-V
Reverse Power				
Maximum permissible DC Voltage	50 V			
Maximum reverse input power	1 MHz ≤ f ≤ 6 GHz : + 30 dBm			
Level Step Sweep				
Sweep Type	Amplitude step (linear or logarithmic step), Arbitrary list Full specified level range			
Sweep Shape	Triangle, Saw-tooth			
Sweep Range	The device output range			
Trigger Mode	Free run, Single			
Step spacing	Linear			
Sweep points	Step sweep : 2 to 65535			
	List Sweep : 1 to 500			
Dwell time setting range	10 ms to 100 s			
Dwell time setting resolution	0.1 ms			
Trigger Source	Auto, Keyboard, External connector, Bus			
Trigger slope	Positive, Negative			
Spectral Purity				
Harmonics	CW mode, 1 MHz < f ≤ 6 GHz, Level < +13 dBm < - 30 dBc			
Sub Harmonics	CW mode, 1 MHz < f ≤ 6 GHz, offset > 10 kHz < - 48 dBc Level ≤ + 13 dBm			
Non-Harmonics	CW mode, offset > 10 kHz, Level ≤ + 13 dBm < - 65 dBc 1 MHz < f ≤ 4 GHz			
	CW mode, offset > 10 kHz, Level ≤ + 13 dBm < - 56 dBc (typ.) 4 GHz < f ≤ 6 GHz			
	CW mode, offset = 20 kHz, 1 Hz measure bandwidth			
SSB Phase noise	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.)			
Internal Modulation Generator (LF)				
Waveforms	Sine, Square, Saw tooth, Triangle, DC			
Frequency Range	Sine 0.1 Hz to 1 MHz (*)			
	Square, Triangle, Saw Tooth 0.1 Hz to 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 (2.5 V -½ Level, 2 V)			
	Offset resolution 0.01 V			
Output Voltage Range (**)	Vp at connector 1 mVpp to 3 Vpp			
	Resolution of amplitude setting 1 mV			
Output Impedance	50 Ω (nom.)			
(*) When use modulation and LF simultaneously the LF frequency range and wave type will be restricted.				
(**) 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 to 1 MHz			
Trigger Mode	Auto, Keyboard, External connector, Bus			
Trigger slope	Positive, Negative			
Dwell time setting range	1 ms to 500 s			
Dwell time setting resolution	0.1 ms			

Model	SG7040X	SG7060X	SG7040X-V	SG7060X-V
Analog Modulation				
Simultaneous Modulation				

	Amplitude Modulation	Frequency Modulation	Phase Modulation	Pulse Modulation	IQ Modulation
Amplitude Modulation		●	●	(●)	●
Frequency Modulation	●		✕	●	●
Phase Modulation	●	✕		●	●
Pulse Modulation	(●)	●	●		(●)
IQ Modulation	●	●	●	(●)	

● = compatible, ✕ = incompatible, (●) = compatible limitations, No specification Applies to AM distortion in IQ mode, if open the RF Blank function in the marker utility, you cannot use the pulse modulation.

Amplitude Modulation		
Modulation Source	Internal, External, Internal + External	
AM Depth Setting Range	0% to 100%	
Resolution of Setting	0.1%	
AM Depth Error	f-mode = 1 kHz, m < 80%, Level < =13 dBm	< 4% of setting + 1%
AM Distortion	f-mode = 1 kHz, m < 30% Level < 0 dBm	< 3% (typ.)
Modulation Frequence Response	m < 80%, 10 Hz to 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	f-mode = 1 kHz, Internal	< (2% of setting + 20 Hz)
FM distortion	f-mode = 1 kHz, Deviation = N*1 MHz	< 0.5% (nom.)
Modulation Frequency response	10 Hz to 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 to 100 kHz	< 3 dB (nom.)
Pulse Modulation		
Modulation Source	Internal, External	
On/off ratio	1 MHz < f < 4 GHz 4 GHz < f ≤ 6 GHz	> 70 dBc > 65 dBc (typ.)
Rais/Fall time (10% / 90%)	10% to 90% of RF amplitude	< 50 ns
Pulse repetition time	Setting Range	40 ns to 300 s
Pulse Generator		
Pulse Modes	Single pulse, Double pulse	
Pulse Source	Internal, External	
Pulse Polarity	Normal, Inverse	
Pulse Period	Setting Range	40 ns to 300 s
	Resolution of setting	10 ns
Pulse Width	Setting Range	20 ns to 300 s
	Resolution of setting	10 ns
Double Pulse Delay	Setting Range	20 ns to 300 s
	Resolution of setting	10 ns
# 2 Width	Setting Range	20 ns to 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)	

Model	SG7040X	SG7060X	SG7040X-V	SG7060X-V
External Trigger delay	140 ns to 300 s			
External Trigger delay resolution of setting	10 ns			
Pulse Train Generator (Option)				
Number of pulses	1 to 2047			
Number of repetitions per pulse	1 to 65535			
Pulse on time and off time setting range	20 ns to 300 s			
Pulse on time and off time setting resolution	10 ns			
Vector Modulation Specification				
IQ modulation external inputs				
Bandwidth	Base Band I or Q < 100 MHz, nominal RF (I+Q) < 200 MHz, nominal			
Full scale input drive (I + Q)	$\sqrt{I^2 + Q^2}$ = 0.5 Vrms 50 Ω			
Internal I/Q baseband generator adjustment				
I/Q offset	± 50%			
I/Q gain	± 4 dB			
Quadrature angle adjustment	± 10˚			
I/Q Output				
Impedance	50 Ω nominal per output			
	100 Ω differenece output			
Maximum voltage per output	0.5 V peak to peak with sine wave			
Bandwidth (I, Q)	Baseband (I or Q) 37.5 MHz, nominal			
	Baseband (I or Q) 75 MHz, nominal (option SG7000XV-B150)			
Amplitude flatness	± 0.3 dB, measured with channel corrections optimized for I/Q output			
Differential mode I or Q offset	± 3 V into 50 Ω			
Common mode I/Q offset	± 1.5 V into 50 Ω			
Internal Baseband Generator				
Sample Rate	100 Hz to 120 MHz 100 Hz to 240 MHz (Option SG7000XV_B150)			
RF Bandwidth (I + Q)	75 MHz, nominal 150 MHz, nominal (Option SG7000XV_B150)			
Frequency offset range	± 60 MHz			
Arbitrary waveform memory	Max playback capacity 200 Msa Max storage capacity included markers 4 G Bytes			
Waveform Segments	Segment length 200 Sa - 200 MSa			
Waveform Sequences	Max. number of segments/ sequences 1024			
	Max. number of repetitions 65535			
Triggers	Types Continuous, single, gated, segment advance			
	Source Trigger key, external, bus (GPIB, LAN, USB)			
Trigger Modes	Continuous Free run, Trigger and run, Reset and run			
	Single No retrigger, buffered trigger, restart on trigger			
	Gated Negative polarity or positive polarity			
	Segment advanced Single or continous			
Trigger Latency	83 ns + 8 sample clock period, nominal 83 ns + 0.8 µs + 8 sample clock period, nominal			
Trigger Accuracy	10 ns			
Markers	Marker Polarity Negative, Positive			
	Number of Markers 4			
	RF blanking / Burst on/Off ratio > 70 dBc (typ.)			
AWGN (Additive White Gaussian Noise)				
Type	Real Time			
Mode of Operation	Standalone, or digitally added to signal played by arbitrary waveform			
Bandwidth	1 Hz to 75 MHz 1 Hz to 150 MHz (Option SG7000XV-B150)			

Model	SG7040X	SG7060X	SG7040X-V	SG7060X-V
Carrier to noise ratio	± 100 dB			
Carrier-to-noise formats	C/N, Eb/No			
Custom Digital Modulation Mode				
Modulation Type	PSK BPSK, QPSK, 8PSK, DBPSK, DQPSK, 8PSK, OQPSK, PI/4-DQPSK, PI/8-D8PSK			
	QAM 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM			
	MFSK 2FSK, 4FSK, 8FSK, 16FSK, MSK			
	ASK 2ASK, 4ASK, 8ASK, 16ASK			
User				
Symbol Rate	60 Msps 120 Msps (option SG7000XV-B150)			
Multi-tone				
Number of tones	1 to 40, with selectable on/off state per tone			
Freqeuncy Spacing	100 Hz to 120 MHz			
Phase (per tone)	Fixed			
3GPP WCDMA distortion performance				
Power level ≤ 4 dBm				
Offset	Configuration	Frequency	Spec	
Adjacent (5 MHz)	1 DPCH, 1 Carrier	1800 to 2200 MHz	-60 dBc	
Adjacent (10 MHz)			-62 dBc	
Adjacent (5 MHz)	Test mode, 1 with 64 DPCH, 1 Carrier	1800 to 2200 MHz	-60 dBc	
Adjacent (10 MHz)			-62 dBc	
3GPP LTE-FDD Distortion Performance				
Offset	Configuration	Frequency	Level ≤ 4 dBm	
Adjacent (10 MHz)	10 MHZ E-TM1.1 QPSK	1800 to 2200 MHz	-56 dBc (typ.)	
Adjacent (20 MHz)			-60 dBc (typ.)	
GSM/EDGE output RF spectrum				
Offset	Configuration	Frequency	GSM	EDGE
			Power level ≤ 4 dBm	
200 kHz	1 normal time slot burst	800 to 900 MHz 1800 to 1900 MHz	-35 dBc (typ.)	-35 dBc (typ.)
400 kHz			-40 dBc (typ.)	-40 dBc (typ.)
600 kHz			-68 dBc (typ.)	-68 dBc (typ.)
800 kHz			-78 dBc (typ.)	-78 dBc (typ.)
1200 kHz			-80 dBc (typ.)	-80 dBc (typ.)
3GPP2 CDMA2000 Distortion Performance				
Offset	Configuration	Frequency	Power Level ≤ 4 dBm	
885 kHz to 1.98 MHz	9 Channel forward link	800 to 900 MHz	-64 dBc (typ.)	
> 1.98 to 4.0 MHz			-82 dBc (typ.)	
> 4.0 to 10 MHz			-82 dBc (typ.)	

EVM Performance					
Format	W-CDMA	LTE-FDD	GSM	EDGE	CDM2000
Modulation Type	QPSK	64 QAM	GMSK (burst)	3 pi / 8PSK (burst)	QPSK
Modulation Rate	3.84 Mcps	10 MHz BW	270.833 Ksps	70.833 Ksps	1.2288 Mcps
Channel Configuration	1 DPCH	E-TM 3.1	1 Timeslot	1 Timeslot	Pilot channel
Frequency	1800 to 2200 MHz	1800 to 2200 MHz	800 to 900 MHz 1800 to 1900 MHz	800 to 900 MHz 1800 to 1900 MHz	800 to 900 MHz 1800 to 1900 MHz
EVM Power level	≤ 4 dBm				
EVM	< 1.2%	< 0.5%	< 1.3%	< 1.3%	< 1%

EVM performance		
	QPSK	16 QAM
Modulation Type	QPSK	16 QAM
Modulation Rate	4 Msps (Root - Nyquist filter α = 0.25)	
Frequency	≤ 6 GHz	≤ 6 GHz
Power Level	≤ 4 dBm	
EVM	< 1%	< 1%

Model	SG7040X	SG7060X	SG7040X-V	SG7060X-V
Connectors				
Front Panel Connectors				
RF Output	Impedance	50 Ω		
	Connector	N female		
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		
	Input/Output Voltage	CMOS 3.3 V		
10 MHz IN	Impedance	50 Ω		
	Connector	BNC female		
	Input Power Range	-5 dBm to + 10 dBm		
10 MHz OUT	Impedance	50 Ω		
	Connector	BNC female		
	Input Power Range	> 0 dBm		
Signal Valid	Impedance	50 Ω		
	Connector	BNC female		
	Output Voltage Range	CMOS 3.3 V		
I INPUT	Impedance	20 kΩ		
	Connector	BNC female		
Q INPUT	Impedance	20 Ω		
	Connector	BNC female		
I + INPUT	Impedance	50 Ω		
	Connector	BNC female		
I - OUTPUT	Impedance	50 Ω		
	Connector	BNC female		
Q + INPUT	Impedance	50 Ω		
	Connector	BNC female		
Q - INPUT	Impedance	50 Ω		
	Connector	BNC female		
PATTERN_TRIG	Impedance	High impedance		
	Connector	BNC female		
	Input Voltage Range	CMOS 3.3 V		
IQ_EVENT	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, 10/100 Base RJ-45)			
Electromagnetic Compatibility and Safety				
EN61326-1:2013	Class A			
EN61000-3-2: 2014				
EN 61000-3-3:2013	Pit : 0.65 Pst: 1.00			
	dmax : 4.00% dc : 3.00%			
	dtLim : 3.30% dt> Lim : 500 ms			
EN 61000-4-2 : 2008	AD ± 8.0 kV, CD ± 4.0 kV			

Model	SG7040X	SG7060X	SG7040X-V	SG7060X-V
EN 61000-4-3 : 2006 + A1: 2007+ A2: 2010	80 MHz to 1000 MHz : 10V/m : 1.4 GHz to 2.0 GHz, 3V/m : 2.0 GHz to 2.7 GHz : 1V/m			
IEC61000-4-4: 2004+ A1 : 2010	AC Line : ± 2100 kV			
IEC61000-4-5 : 2005	Line to Line : 1.0 kV, Line to Earth : 2.0 kV			
IEC61000-4-6 : 2008	0.15-80 MHz : 3 V, 1 kHz 80% AM			
IEC61000-4-8 : 2009	30 A/m, 50/60 Hz			
IEC61000-4-11 : 2004	Voltage Dips : 0% / 0.5P; 40% / 10P; 70% / 25P; Short Interruptions Test Level 1% 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				
General Specification				
Display	TFT LCD, RGB (800 X 480), 5 inch capacitive touch screen			
Storage	Internal (Flash) 4 G Byte, external (USB storage device)			
Source	Input voltage range (AC) 100V - 240V (± 10%), AC frequency supply 100 V to 240 V, 50 / 60 Hz, Supply 100 V to 120 V, 400 Hz			
	Power consumption 75 W with all function working			
Temperature	Working temperature 0˚C to 50˚C, Storage temperature -20˚C to 70˚C			
Humidity	0˚C to 30˚C, ≤ 95% relative humidity;			
	30˚C to 50˚C, ≤ 75% relative humidity;			
Altitude	Operating : less than 3 km			
Dimensions	W :338 x H :113 x D : 369 mm			
Weight	5.3 kg.			
Ordering Information				
Product Code	**SG7000X Signal Generator**		**Order Number**	
	Analog Signal Generator 9 kHz to 4 GHz		SG7040X	
	Analog Signal Generator 9 kHz to 6 GHz		SG7060X	
	Vector Signal Generator 10 MHz to 4 GHz		SG7040X-V	
	Vector Signal Generator 10 MHz to 6 GHz		SG7060X-V	
Standard Configurations	CD, USB Cable, Power Cord			
Option	Pulse Train Generator		SG7000X-PT	
	Rack Mount Kit		SG-RMK	
	USB-GPIB adapter		USB-GPIB	
	Upgrade 4 GHz to 6 GHz		SG7000X_F60	
	Upgrade IQ bandwidth from 75 MHz to 150 MHz		SG7000XV_B150	
	Precision Frequency Reference		10M_OCXO_L	

Subject to change

scientific

Scientific Mes-Technik Pvt. Ltd.

B-14, Pologround, Industrial Estate, Indore 452 015, India

0731-2422330/31/32/33 **0731-2422334** **sales@scientificindia.com** **www.scientificindia.com**

Bengaluru	080-23452635	bangalore@scientificindia.com	
Chennai	044-42054180	chennai@scientificindia.com	
Gujarat	+917567463752	gujarat@scientificindia.com	
Hyderabad	+917095228811	hyderabad@scientificindia.com	
Kolkata	+917095228811	kolkata@scientificindia.com	
Mumbai	+919850901735	mumbai@scientificindia.com	
New Delhi	+918889912554	ndelhi@scientificindia.com	
Pune	+919850901735	pune@scientificindia.com	