

Low Harmonics level

USB Synthesized Signal Generator SSG-4000LH

50Ω -60 dBm to +10 dBm, 250-4000 MHz

The Big Deal

- Low Harmonics (-66dBc typ.)
- 70dB Adjustable output power range
- Internal Pulse Modulation
- Cost effective Signal Generator



Installation CD with
Software included

Case Style: LV1753



Product Overview

Mini-circuits' SSG-4000LH (RoHS compliant) is a wideband Synthesized Signal Generator operating over the frequency range 250 to 4000 MHz. The signal generator is cased in a rugged metal shielded package (size of 11.0" x 8.5" x 2.15") and equipped with a N-type 50Ω connector at the RF output port. The signal generator is controlled through a USB 2.0 interface using unique user friendly GUI software allowing the user to select one of several different output modes including multiple pulsed RF options, frequency sweep and power sweep (up, down or bidirectional).

The SSG-4000LH is supplied along with a CD containing the graphical user interface control program and programming APIs for 32 and 64 bit environments. Also included are a 2.7ft. USB cable, and a power adaptor, see pages 8&10 for details. Longer USB cables and mounting brackets are available as additional options.

Key Features

Feature	Advantages
Wide output power dynamic range	Dynamic range 70 dB, output power from -60dBm to +10dBm in 0.25dB steps
USB HID (Human Interface Device)	Plug-and-Play (no need to install a driver for the device).
Pulse modulation options	The SSG-4000LH can be set to produce RF pulses either triggered, or continuous (1μSec resolution).
Multiple sweep options	The SSG-4000LH can be set to sweep either power or frequency up, down or bidirectionally.
24V _{DC} Operating voltage	The SSG-4000LH is powered using the supplied 24V AC/DC external power adaptor with three wire line cord (Use only grounded power supply)
Software CD with program instructions for various operating systems	A CD containing programing instructions for Linux® and windows® operating systems (32 and 64 bit systems), a friendly Windows® Graphical User Interface (GUI) control program and API objects is included. The SSG-4000LH is compatible with 32/64-bit Windows® or Linux® operating systems, as well as LabVIEW®, Delphi®, C++, C#, Visual Basic®, and .NET software.



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Features

- Low Harmonics level (-66 dBc typ.)
- Adjustable output power, 70 dB dynamic range
- USB HID control interface (Plug and Play)
- Small, light weight
- Can sweep either frequency or power up, down or bidirectionally
- Multiple pulsed RF options (free run, triggered)
- Separate Trigger In and Trigger Out ports
- Compatible with 32/64-bit Windows® or Linux® operating systems
- ActiveX com object and .Net class library for use with other software: C++, C#, CVI®, Delphi®, LabVIEW® 8 or newer, MATLAB® 7 or newer, Python, Agilent VEE®, Visual Basic®, Visual Studio® 6 or newer, AutoIT and more¹
- Friendly Windows® Graphical User Interface
- Mounting bracket (Optional)



Installation CD with
Software included

SSG-4000LH

Model P/N	Description	Price	Qty.
SSG-4000LH	USB Signal Generator	\$2395.00 ea.	(1)
Included Accessories			
AC/DC-24-3W1	AC/DC 24V Adapter (see Ordering Information)		1
CBL-3W1-XX	AC power cord (see Ordering Information)		1
USB-CBL-AB-3+	2.7ft. USB cable		1
SSG-CD	Software CD		1

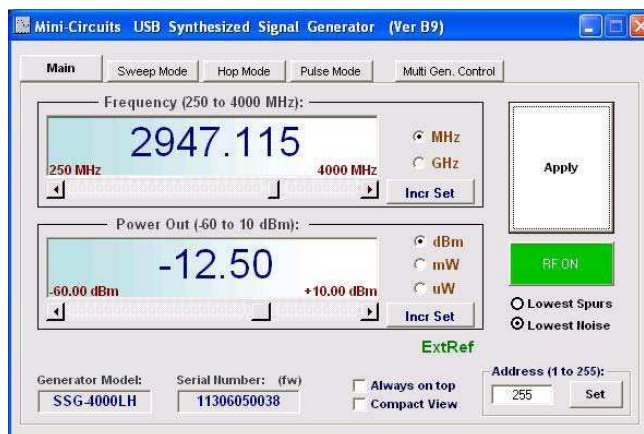
RoHS Compliant

See our web site for RoHS Compliance methodologies and qualifications

Applications

- Lab Test equipment
- Automated Test capability
- Production line testing
- Field testing

Mini-Circuits Control Program for USB Synthesized Signal Generators



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Electrical Specifications at +25°C

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Output Frequency	–	250	–	4000	MHz
Frequency Resolution	–	5	–	–	kHz
Frequency accuracy	Using Internal Reference	–	±1	–	ppm
Settling time ^{2,4}	–	–	2.5	–	msec
Minimum Dwell Time ^{3,4}	–	–	15	–	
VSWR	250 - 3000 MHz	–	1.5	–	:1
	3000 - 4000 MHz	–	2.3	–	
Output power range	–	-60	–	10	dBm
Power resolution (nom.)	–	–	0.25	–	dB
Dynamic range	–	–	70	–	dB
Output power accuracy	–	–	±0.25	–	dB
RF output level	@RF OFF	–	-95	–	dBm
Harmonics & Sub-Harmonics	PWR _{out} = -50 dBm	–	-58	–	dBc
	PWR _{out} = -30 dBm	–	-78	–	
	PWR _{out} = -10 dBm	–	-78	–	
	PWR _{out} = 0 dBm	–	-74	–	
	PWR _{out} = +10 dBm	–	-47	–	
Non-Harmonic Spurious ⁵	@Frequency step size = 5 kHz	–	-50	–	dBc
	@Frequency step size = 100 kHz	–	-66	–	
	@Frequency step size = 1 MHz	–	-80	–	
	@Frequency step size = 10 MHz	–	-94	–	
SSB Phase Noise ⁵	RF _{out} = 250 MHz @Software mode: Lowest Spur / Lowest Noise	@ 100 Hz offset	–	-95 / -96	dBc/Hz
		@ 1 kHz offset	–	-102 / -111	
		@ 10kHz offset	–	-101 / -107	
		@ 100 kHz offset	–	-121 / -123	
		@ 1MHz offset	–	-147 / -147	
SSB Phase Noise ⁵	RF _{out} = 1060 MHz @Software mode: Lowest Spur / Lowest Noise	@ 100 Hz offset	–	-81 / -83	dBc/Hz
		@ 1 kHz offset	–	-92 / -98	
		@ 10kHz offset	–	-91 / -94	
		@ 100 kHz offset	–	-111 / -112	
		@ 1MHz offset	–	-139 / -139	
SSB Phase Noise ⁵	RF _{out} = 2600 MHz @Software mode: Lowest Spur / Lowest Noise	@ 100 Hz offset	–	-74 / -75	dBc/Hz
		@ 1 kHz offset	–	-82 / -91	
		@ 10kHz offset	–	-82 / -89	
		@ 100 kHz offset	–	-102 / -105	
		@ 1MHz offset	–	-132 / -132	
SSB Phase Noise ⁵	RF _{out} = 4000 MHz @Software mode: Lowest Spur / Lowest Noise	@ 100 Hz offset	–	-70 / -72	dBc/Hz
		@ 1 kHz offset	–	-79 / -85	
		@ 10kHz offset	–	-81 / -88	
		@ 100 kHz offset	–	-101 / -106	
		@ 1MHz offset	–	-131 / -131	

² Settling time - transition between two signals during which generator is in RF OFF state.

³ Dwell time - duration of each signal point in a Sweep or Hop sequence set by user. Default is minimum dwell time.

⁴ Generator response time is Dwell time + Settling Time.

⁵ It is recommended to work in Lowest Spur mode when using frequency step size of up to 50 kHz and Lowest Noise mode for frequency step size greater than 50kHz. Working in Lowest Spur or Lowest Noise mode outside the recommended range may cause excessive Noise (in Lowest Spur mode) or excessive spurs (in Lowest Noise mode)

Electrical Specifications (Pulse modulation modes)⁶ at +25°C

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Pulse Width resolution	Nominal value	1	–	–	μSec
Pulse Period	Measured at the 50% points	2 μSec	–	10 Sec	–
Duty cycle ⁷	Pulse Width divided by Pulse Period	0.01	–	99.99	%
Rise / Fall time	Measured between 10% and 90%	–	30 / 45	–	nSec
Pulse Width Accuracy	Measured at the 50% points	–	±2	–	%
Trigger response delay ^{8,9}	Relevant trigger edge to 50% point of the pulse	–	3.5	–	μSec
Pulse Power ratio	@PWR _{OUT} =+20dBm, FREQ _{OUT} =250 MHz	–	60	–	dB
Pulse Power ratio	@PWR _{OUT} =+17dBm, FREQ _{OUT} =4000 MHz	–	50	–	

⁶ Pulse mode is supported from Firmware Rev. B3. Firmware from Rev. B1 onwards can be upgraded using the latest software CD (available for download from http://www.minicircuits.com/support/software_download.html)

⁷ In Free Run mode.

⁸ Max trigger frequency is 200 kHz

⁹ In Triggered mode the SSG-4000LH can be triggered by either rising edge or falling edge as selected by the customer using the supplied software.

Electrical Specifications at +25°C (Reference, Trigger & DC power)

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Aging	Using Internal Reference	–	1	–	ppm/yr
Reference In	Frequency	–	10	–	MHz
	Power	–3.5	–	+7.5	dBm
Reference Out	Frequency	–	10	–	MHz
	Freq. Accuracy	Using Internal Reference	±1	–	ppm
	Power	–	+7	–	dBm
	Aging	Using Internal Reference	1	–	ppm/yr
Trigger Out, Low	–	0	–	0.4	V
Trigger Out, High	–	2.4	–	3.3	
Trigger In, Low	–	0	–	0.8	
Trigger In, High	–	2.4	–	3.3	
Supply Voltage ¹⁰	–	22.8	24	25.2	V _{DC}
Supply Current ¹⁰	–	–	400	500	mA
USB current ¹⁰	–	–	Note 11	–	mA

¹⁰ Power On Sequence: Connect the 24V power, followed by the USB control before turning on the Generator

¹¹ SSG-4000LH does not draw power from the USB bus, only from DC power adapter

Minimum System Requirements

Interface	USB HID
Host operating system	32 Bit operating system: Windows 98®, Windows XP®, Windows Vista®, Windows 7®, Windows 8® 64 Bit operating system: Windows Vista®, Windows 7®, Windows 8® Linux® support: 32/64 Bit operating system
Hardware	Pentium® II or better

Absolute Maximum Ratings

Operating Temperature	0°C to +50°C
Storage Temperature	-20°C to +60°C
Power in @ Reference In	+10 dBm
Reverse Power(DC) @ Reference Out	25V _{DC}
Reverse Power(DC) @ RF Out	10V _{DC}
Voltage @ Trigger out	-0.3V _{DC} to +3.5V _{DC}
Voltage @ Trigger in	-0.3V _{DC} to +3.5V _{DC}

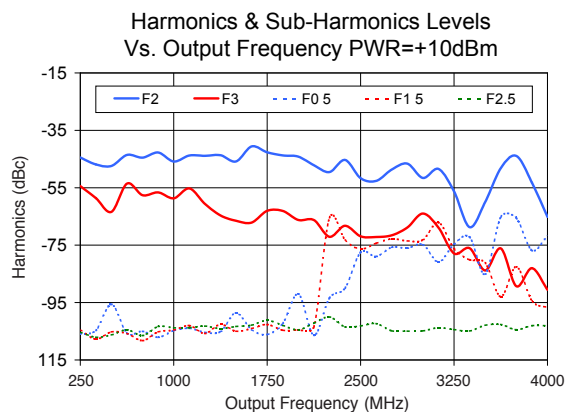
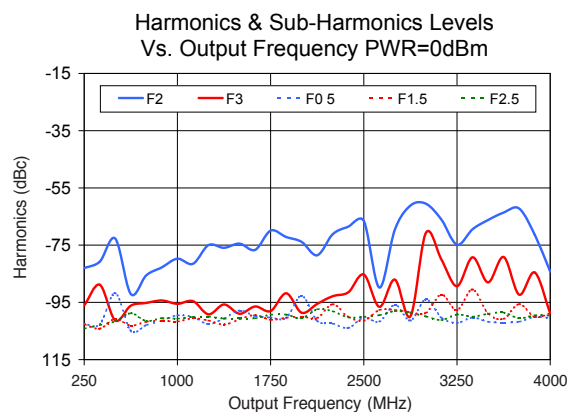
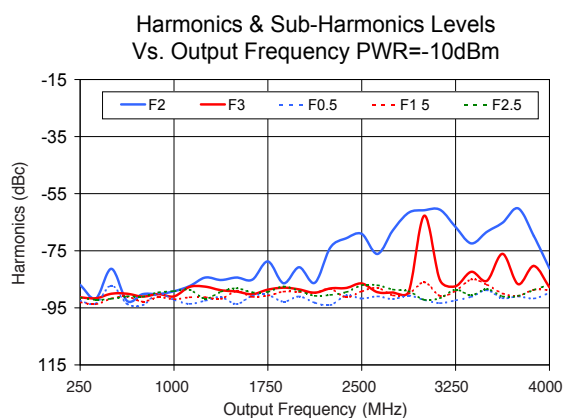
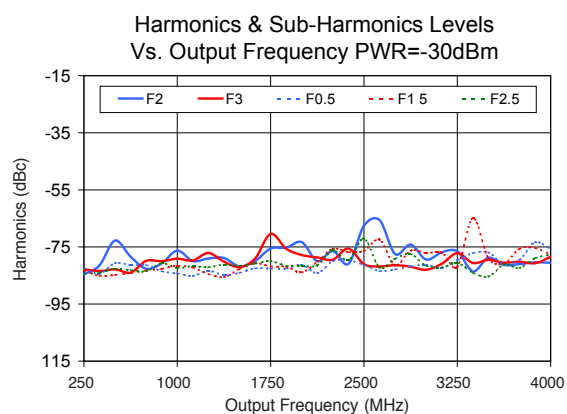
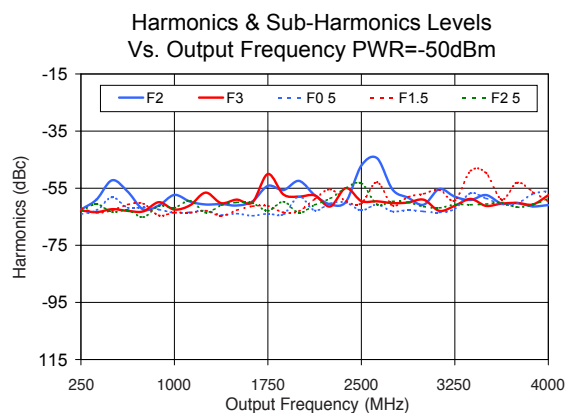
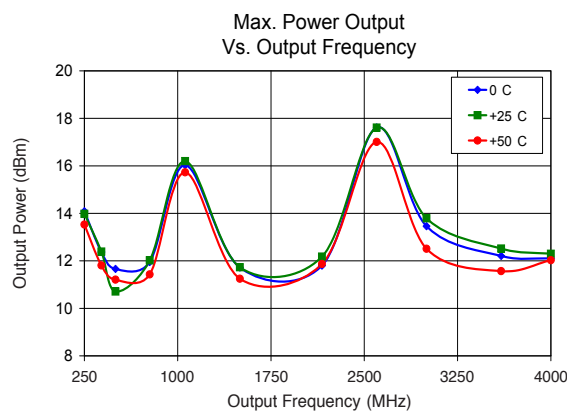
Permanent damage may occur if any of these limits are exceeded.

Connections

RF Output	(N Type-Female)
Ref. In	(BNC-Female)
Ref. Out	(BNC-Female)
Trigger In	(BNC-Female)
Trigger Out	(BNC-Female)
Power In	(2.1 mm DC socket)
USB Port	(USB B female)

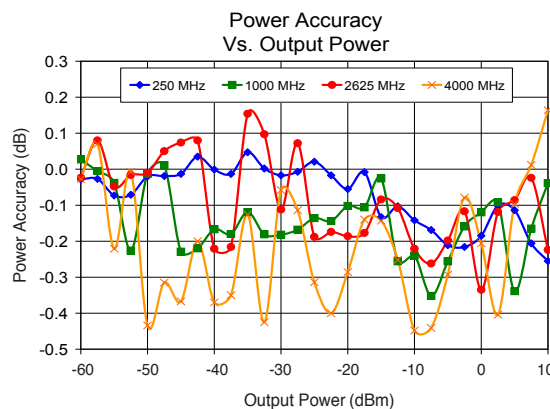
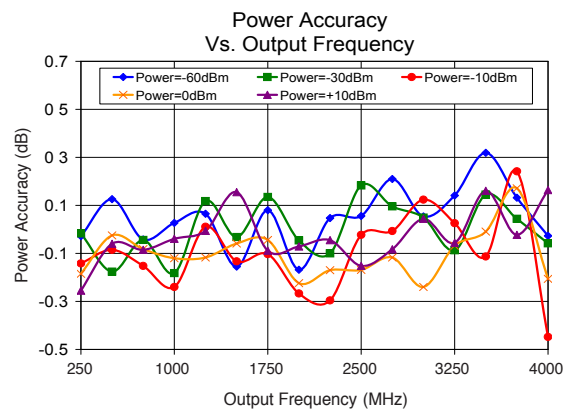
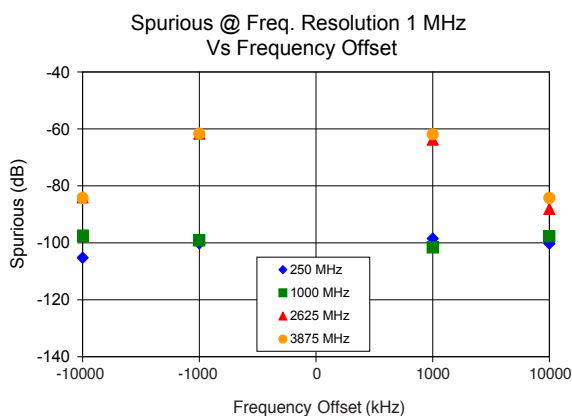
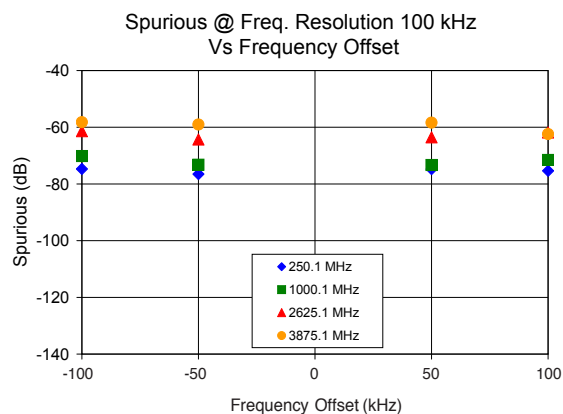
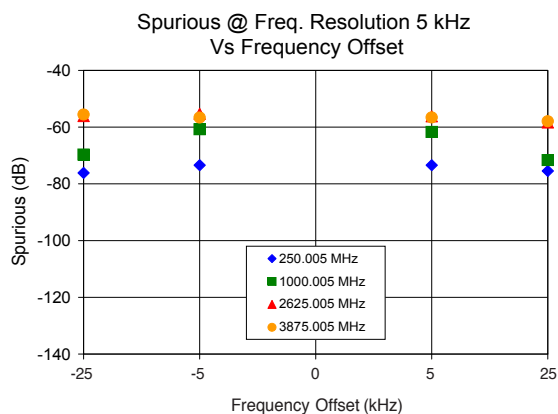
Typical Performance Curves*

*at +25°C unless mentioned otherwise



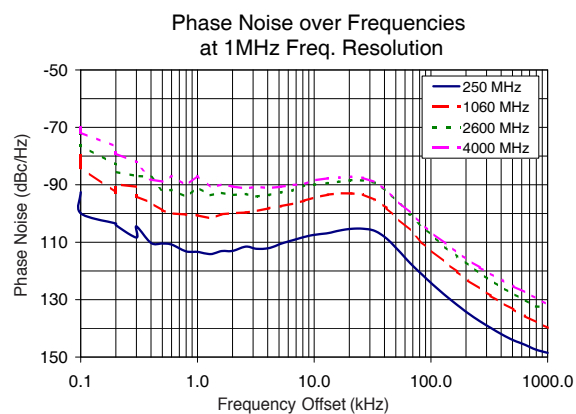
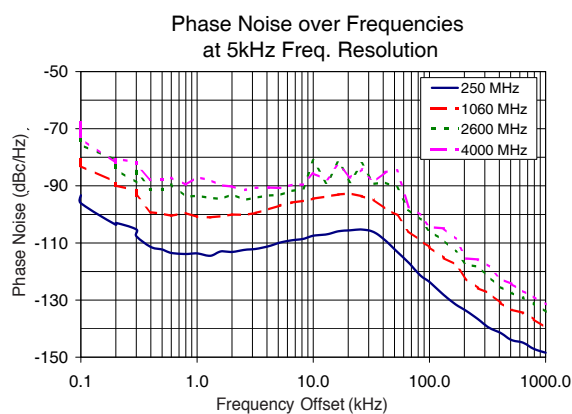
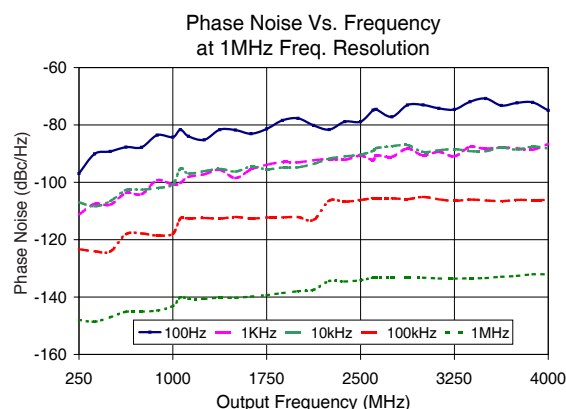
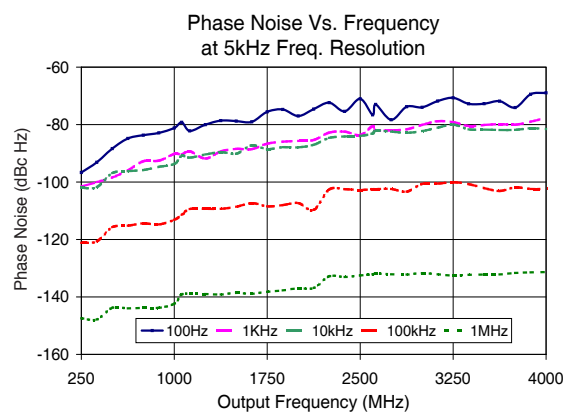
Typical Performance Curves* (continued)

*at +25°C unless mentioned otherwise

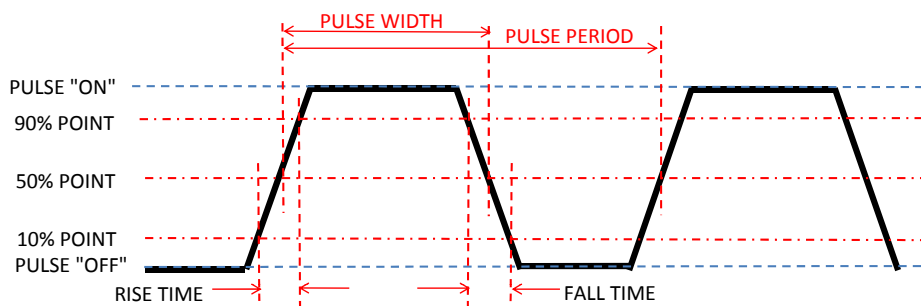


Typical Performance Curves* (continued)

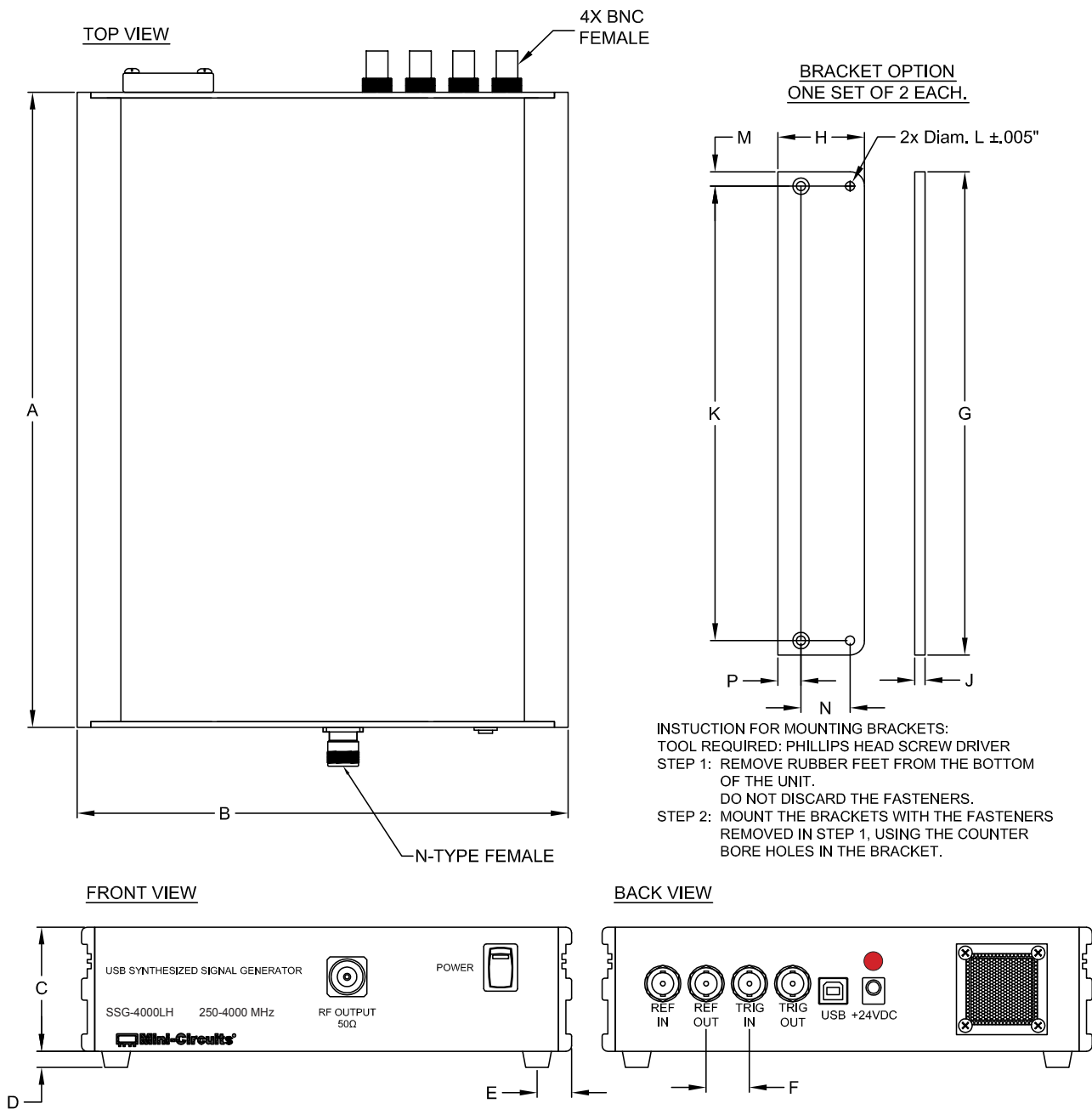
*at +25°C unless mentioned otherwise



Pulse mode definitions



Outline Drawing LV1753



Outline Dimensions (inch mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT. GRAMS
11.00	8.50	2.15	0.28	0.60	0.75	8.37	1.50	0.18	7.870	0.158	0.25	0.850	0.40	2500
279.4	215.9	54.6	7.1	15.2	19.05	212.6	38.1	4.6	199.9	4.0	6.35	21.6	10.2	

Ordering, Pricing & Availability Information see our web site

Model	Description
SSG-4000LH	USB Synthesized Signal Generator

Included Accessories	Part No.	Description
	AC/DC-24-3W1	AC/DC 24V _{DC} Grounded Power Adaptor. Operating temperature: 0°C to +40°C, I _{Max} =2.5A
	CBL-3W1-XX	AC Power Cord (Select one power cord from below with each Signal Generator)
	SSG-CD	Software CD
	USB-CBL-AB-3+	2.7 ft (0.8 m) USB Cable: USB type A(Male) to USB type B(Male)

AC Power Cords ¹³	Part No.	Description
	CBL-3W1-US	Power Cord for United States
	CBL-3W1-EU	Power Cord for Europe
	CBL-3W1-UK	Power Cord for United Kingdom
	CBL-3W1-AU	Power Cord for Australia and China
	CBL-3W1-IL	Power Cord for Israel

¹³ Power cords for other countries are also available, if you need a power cord for a country not listed in the table please contact apps@minicircuits.com or check <http://www.minicircuits.com/contact/offices.html> for regional offices e-mail and phone numbers.

Optional Accessories	Description
USB-CBL-AB-3+ (spare)	2.7 ft. (0.8 m) USB cable
USB-CBL-AB-7+	6.8 ft. (2.1 m) USB Cable
USB-CBL-AB-11+	11 ft. (3.4 m) USB Cable
BKT-280-06+	Bracket (One set of 2 each)

Calibration	Description
CALSSG-4000LH	Calibration Service

[Click Here](#)

Additional Notes

- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
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