High Power Output

USB Synthesized Signal Generator SSG-4000HP

50Ω -50 dBm to +20 dBm, 250-4000 MHz

The Big Deal

- High output power (+20 dBm max)
- 70dB Adjustable output power range
- Internal Pulse Modulation
- Cost effective Signal Generator

Case Style: LV1754

Installation CD with Software included

Product Overview

Mini-circuits' SSG-4000HP (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 8.37" 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-4000HP 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 adapter, 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 -50dBm to +20dBm 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-4000HP can be set to produce RF pulses either triggered, or continuous (1μSec resolution).
Multiple sweep options	The SSG-4000HP can be set to sweep either power or frequency up, down or bidirectionally.
$24V_{DC}$ Operating voltage	The SSG-4000HP is powered using the supplied 24V AC/DC external power adaptor with three wire line cord (Use only grounded 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-4000HP 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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USB Synthesized Signal Generator

50Ω -50 dBm to +20 dBm, 250-4000 MHz

Features

- High power output (+20 dBm max)
- 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
- 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 more[1]
- Friendly Windows® Graphical User Interface
- Mounting bracket (Optional)

Installation CD with Software included

SSG-4000HP

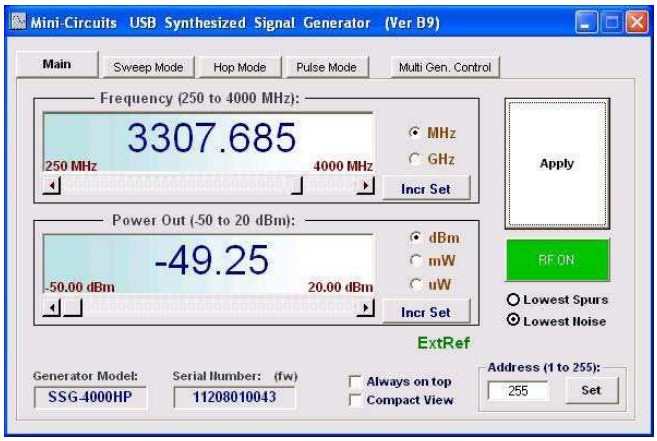
Model P/N	Description	Price	Qty.
SSG-4000HP	**USB Signal Generator**	**$1995.00 ea.**	**(1)**
Included Accessories			
AC/DC-24-3W1	AC/DC 24V Adapter *(see Ordering Information)*		1
CBL-3W1-XX	AC power cord *(see Ordering Information)*		1
USB-CBL-AB-3+	2.7ft. USB cable		1
SSG-CD	Software CD		1

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



[1] Windows, Visual Basic, and Visual Studio are registered trademarks of Microsoft Corporation in the United States and other countries. Linux is a registered trademark of Linus Torvalds. LabVIEW and CVI are registered trademarks of National Instruments Corp. Delphi is a registered trademark of Codegear LLC. MATLAB is a registered trademark of MathWorks, Inc. Agilent VEE is a registered trademark of Agilent Technologies, Inc. Neither Mini-Circuits nor the Mini-Circuits SSG-4000HP are affiliated with or endorsed by the owners of the above referenced trademarks.

Mini-Circuits®
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Electrical Specifications (General RF) 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]	–		–	10	–	
VSWR	250 - 3000 MHz		–	1.5	–	:1
	3000 - 4000 MHz		–	1.3	–	
Output power range [5]	–		-50	–	20	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		–	-43	–	dBc
	PWR_{out}= -30 dBm		–	-61	–	
	PWR_{out}= 0 dBm		–	-46	–	
	PWR_{out} +10 dBm		–	-45	–	
	PWR_{out} +15 dBm		–	-38	–	
Non-Harmonic Spurious [6]	@Frequency step size = 5 kHz		–	-50	–	dBc
	@Frequency step size = 100 kHz		–	-63	–	
	@Frequency step size = 1 MHz		–	-80	–	
	@Frequency step size= 10 MHz		–	-90	–	
SSB Phase Noise [6]	RF_{out}=250 MHz @Software mode: Lowest Spur / Lowest Noise	@ 100 Hz offset	–	-94 / -96	–	dBc/Hz
		@ 1 kHz offset	–	-102 / -111	–	
		@ 10kHz offset	–	-102 / -107	–	
		@ 100 kHz offset	–	-120 / -123	–	
		@ 1MHz offset	–	-147 / -147	–	
SSB Phase Noise [6]	RF_{out}=1060 MHz @Software mode: Lowest Spur / Lowest Noise	@ 100 Hz offset	–	-81 /-83	–	dBc/Hz
		@ 1 kHz offset	–	-91 / -98	–	
		@ 10kHz offset	–	-91 / -94	–	
		@ 100 kHz offset	–	-110 / -112	–	
		@ 1MHz offset	–	-139 / -139	–	
SSB Phase Noise [6]	RF_{out}=2600 MHz @Software mode: Lowest Spur / Lowest Noise	@ 100 Hz offset	–	-74 / -76	–	dBc/Hz
		@ 1 kHz offset	–	-82 / -90	–	
		@ 10kHz offset	–	-82 / -87	–	
		@ 100 kHz offset	–	-102 / -106	–	
		@ 1MHz offset	–	-132 / -133	–	
SSB Phase Noise [6]	RF_{out}=4000 MHz @Software mode: Lowest Spur / Lowest Noise	@ 100 Hz offset	–	-69 / -72	–	dBc/Hz
		@ 1 kHz offset	–	-79 / -87	–	
		@ 10kHz offset	–	-81 / -88	–	
		@ 100 kHz offset	–	-101 / -106	–	
		@ 1MHz offset	–	-131 / -132	–	

[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] Max available power out degrades over the 3300-4000 MHz range to +17 dBm
[6] 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) [7] 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 [8]	Pulse Width divided by Pulse Period	0.01	–	99.99	%
Rise / Fall time	Measured between 10% and 90%	–	35 / 45	–	nSec
Pulse Width Accuracy	Measured at the 50% points	–	±2	–	%
Trigger response delay [9,10]	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	–	

[7] 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
[8] In Free Run mode.
[9] Max trigger frequency is 200 kHz
[10] In Triggered mode the SSG-4000HP 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 [11]		–	22.8	24	25.2	V_{DC}
Supply Current [11]		–	–	400	500	mA
USB current [11]		–	–	Note 12	–	mA

[11] Power On Sequence: Connect the 24V power, followed by the USB control before turning on the Generator
[12] SSG-4000HP 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	0ºC to +50ºC
Storage Temperature	-20ºC to +60ºC
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.

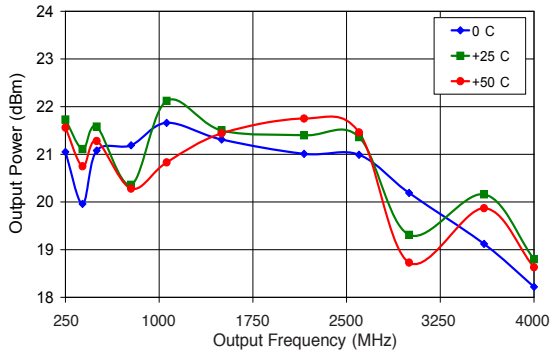
Connections

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)

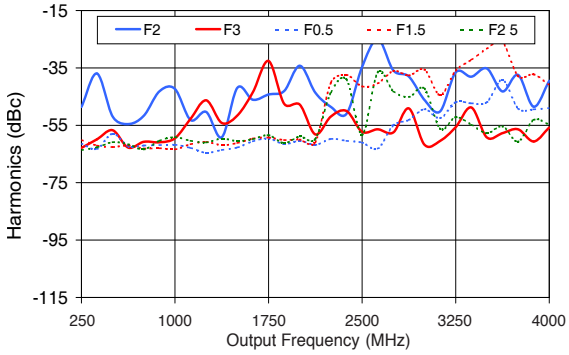
Typical Performance Curves*

*at +25°C unless mentioned otherwise

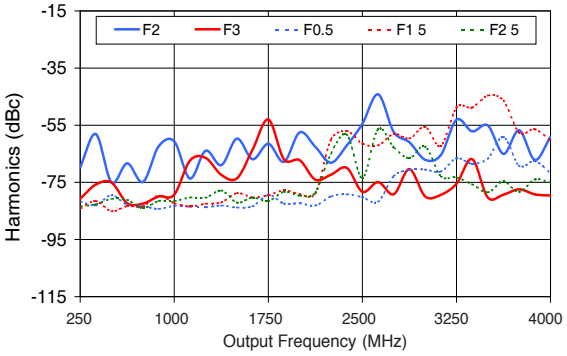
Max. Power Output
Vs. Output Frequency



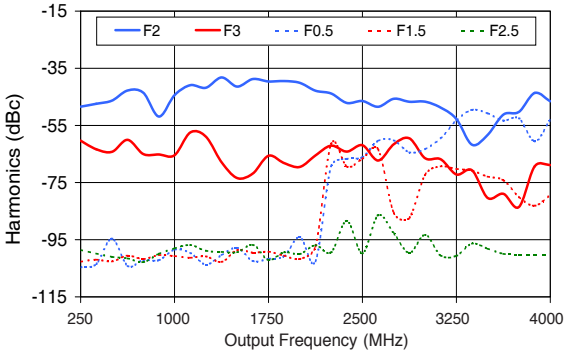
Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=-50dBm



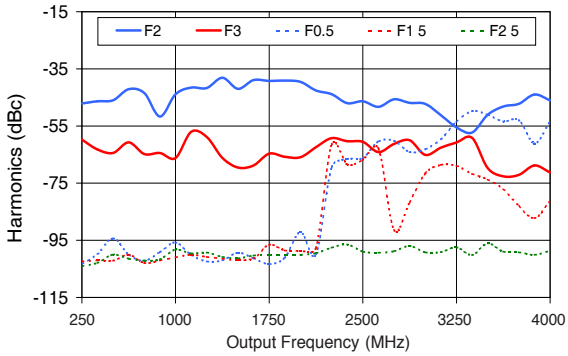
Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=-30dBm



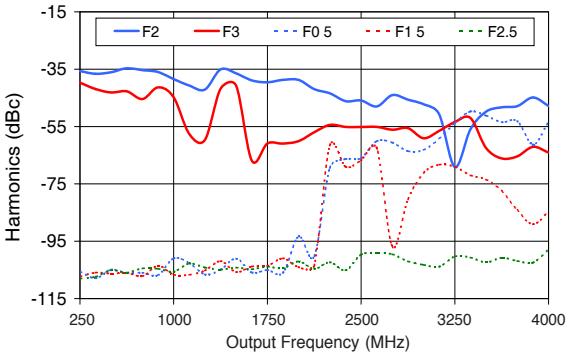
Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=0dBm



Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=+10dBm



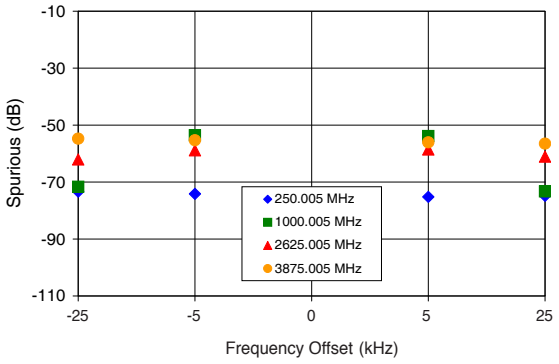
Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=+15dBm



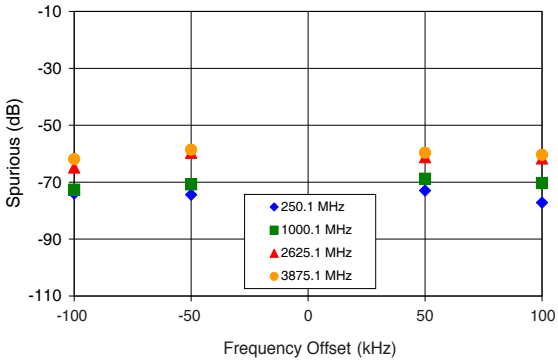
Typical Performance Curves* (continued)

*at +25°C unless mentioned otherwise

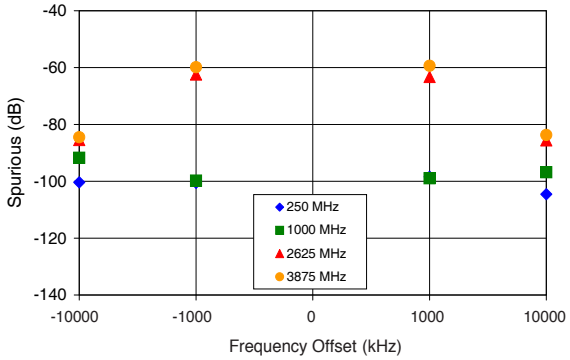
Spurious @ Freq. Resolution 5 kHz
Vs Frequency Offset



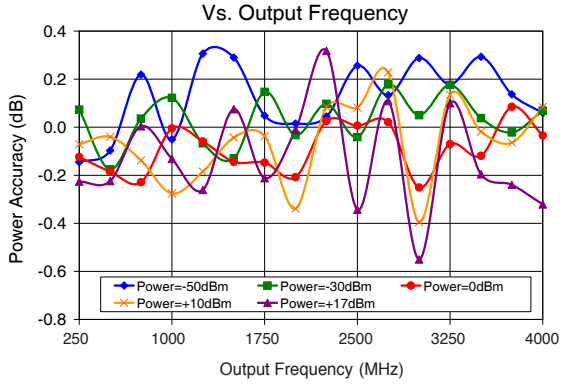
Spurious @ Freq. Resolution 100 kHz
Vs Frequency Offset



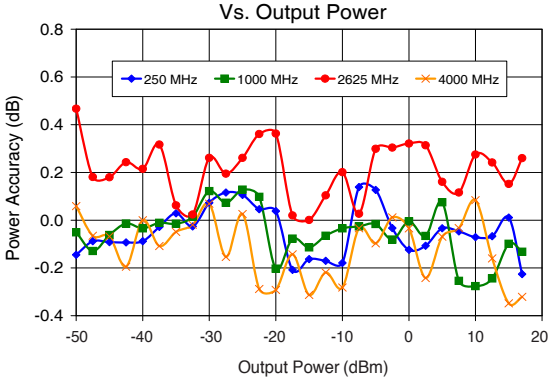
Spurious @ Freq. Resolution 1 MHz
Vs Frequency Offset



Power Accuracy
Vs. Output Frequency



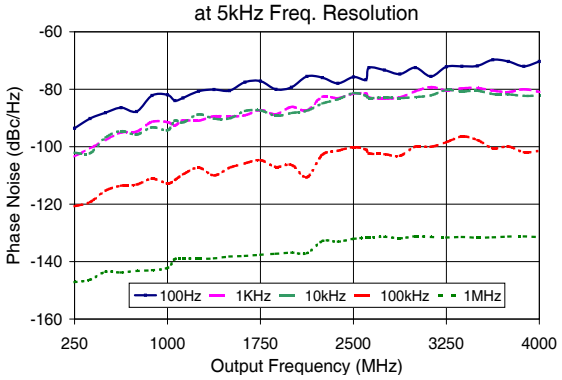
Power Accuracy
Vs. Output Power



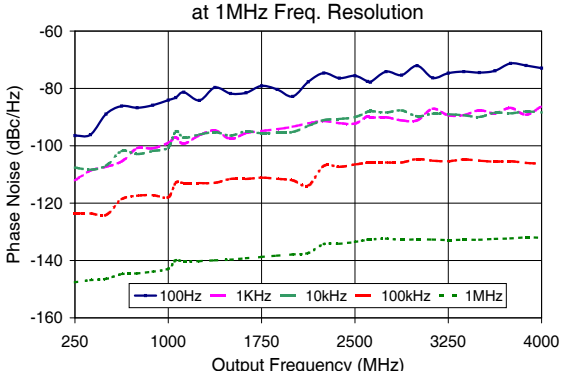
Typical Performance Curves* (continued)

*at +25°C unless mentioned otherwise

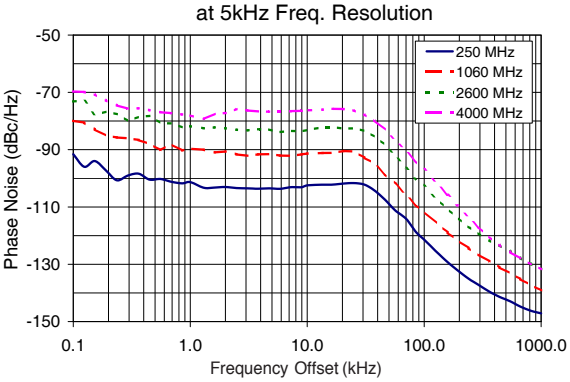
Phase Noise Vs. Frequency
at 5kHz Freq. Resolution



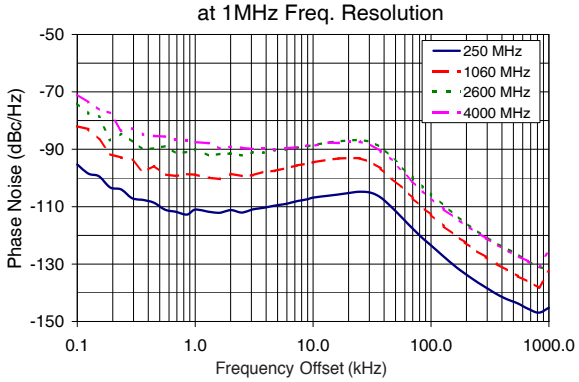
Phase Noise Vs. Frequency
at 1MHz Freq. Resolution



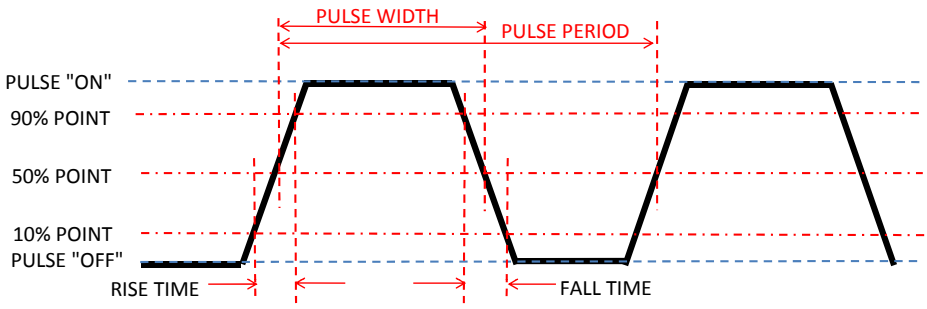
Phase Noise over Frequencies
at 5kHz Freq. Resolution



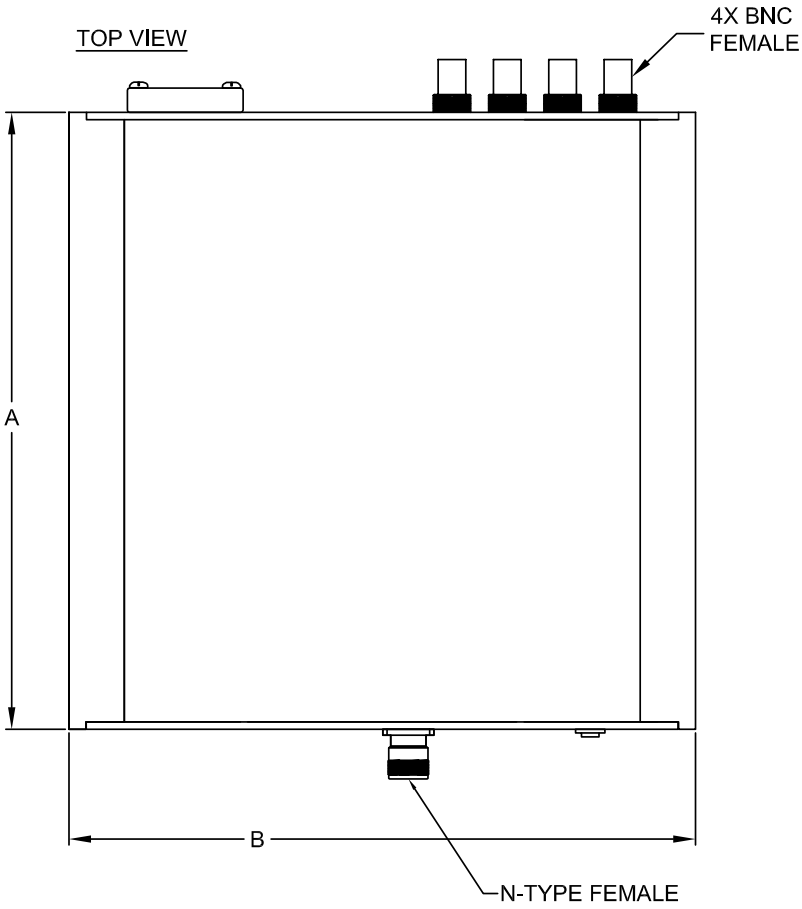
Phase Noise over Frequencies
at 1MHz Freq. Resolution

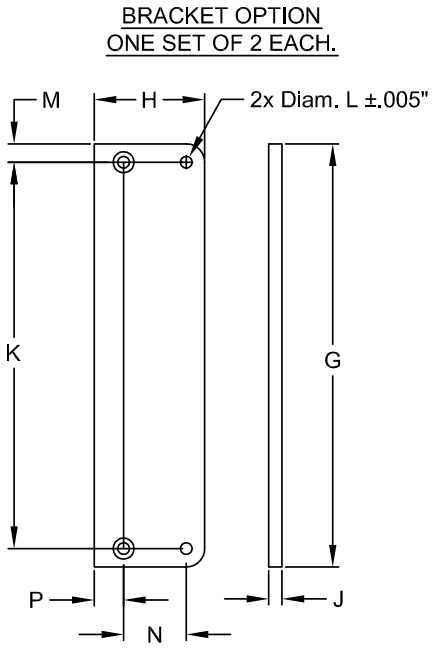


Pulse mode definitions

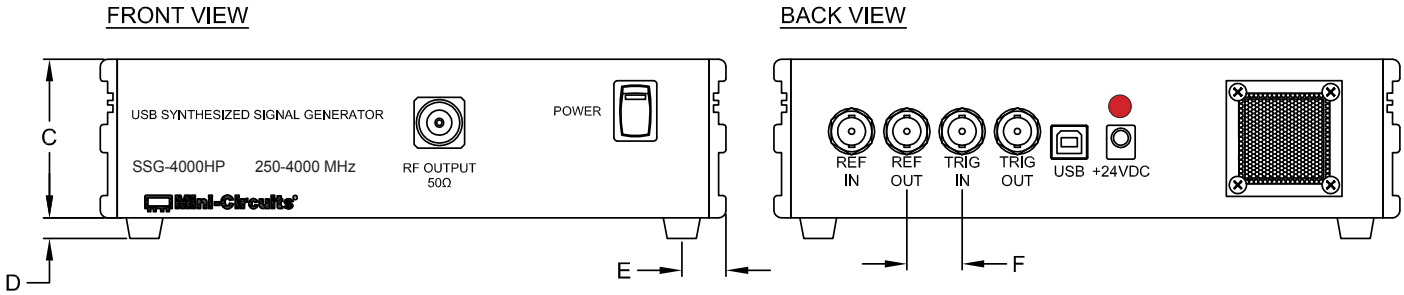


Outline Drawing LV1754





INSTUCTION FOR MOUNTING BRACKETS:
TOOL REQUIRED: PHILLIPS HEAD SCREW DRIVER
STEP 1: REMOVE RUBBER FEET FROM THE BOTTOM OF THE UNIT.
DO NOT DISCARD THE FASTENERS.
STEP 2: MOUNT THE BRACKETS WITH THE FASTENERS REMOVED IN STEP 1, USING THE COUNTER BORE HOLES IN THE BRACKET.



Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT. GRAMS
8.37	**8.50**	**2.15**	**0.28**	**0.60**	**0.75**	**5.74**	**1.50**	**0.18**	**5.240**	**0.158**	**0.25**	**0.850**	**0.40**	1900
212.6	215.9	54.6	7.1	15.2	19.05	145.8	38.1	4.6	133.1	4.0	6.35	21.6	10.2	

Ordering, Pricing & Availability Information see our web site

Model	Description
SSG-4000HP	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

11. 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-280-07+	Bracket (One set of 2 each)

Calibration	Description	
CALSSG-4000HP	Calibration Service	Click Here

Additional Notes

A. 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.

B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp