Wideband, USB/Ethernet

Synthesized Signal Generator SSG-6001RC

50Ω -70 dBm to +15 dBm, 1-6000 MHz

The Big Deal

- **USB** *or* **Ethernet**-TCP/IP (HTTP and Telnet protocols) control
- Wideband generator with 3 Hz frequency resolution
- 85 dB dynamic range
- Internal & External pulse modulation
- Cost effective signal generator





Installation CD with Software included

Case Style: LV1913

Product Overview

Mini-Circuits SSG-6001RC is a wideband synthesized signal generator operating over a frequency range of 1 to 6000 MHz. The signal generator is cased in a rugged metal shielded package (11" x 8.5" x 2.15") and equipped with an N-type 50Ω connector at the RF output port.

The signal generator is supplied with a CD containing user friendly GUI control software and programming APIs for 32 and 64 bit environments. Using the supplied software, the user can easily select one of several different output modes including multiple pulse modulation options, frequency sweep, and power sweep (up, down, or bidirectional).

The SSG-6001RC can be controlled from almost any Windows or Linux PC, via USB 2.0 interface, or any computer with a network interface via HTTP or Telnet. Included with the generator are a 2.7 ft. USB cable, a 5 ft. Ethernet cable and a 12V power adapter. Longer USB cables and a mounting bracket are available as additional options.

Key Features

Feature	Advantages
Wide output power dynamic range	Dynamic range 85 dB, output power from -70 dBm to +15 dBm in 0.25 dB steps
USB HID (Human Interface Device)	Plug-and-Play (no need to install a driver for the device).
Ethernet-TCP/IP- **HTTP** and **Telnet** Protocols (Supports DHCP and Static IP)	The SSG-6001RC signal generator can be controlled from any Windows®, Mac®, or Linux® computer, or even a mobile device with a network connection and Ethernet-TCP/IP (HTTP or Telnet protocols) support. Using a VPN would allow remote control from anywhere in the world.
Good Sub-Harmonics	Good Sub Harmonics (-84 dBc typ, -40 dBc max) reduces the need to filter the generator output signal.
Pulse modulation options	The SSG-6001RC can produce pulse modulated RF using internal or external modulating signal
Multiple sweep options	The SSG-6001RC can be set to sweep either power or frequency up, down, or bidirectionally.
Software CD with program instructions for various operating systems	The unit is supplied with a CD containing a user friendly Graphical User Interface (GUI) control program and API objects for Windows® operating systems. Programming instructions are included for 32 and 64 bit versions of Linux® and Windows® operating systems. The SSG-6001RC is compatible with LabVIEW®, Delphi®, C++, C#, Visual Basic®, .NET software and more; for other operating environments and languages please contact our **applications department** for support.

[1]Windows is a registered trademark of Microsoft Corporation in the United States and other countries. Linux is a registered trademark of Linus Torvalds. Mac is a registered trademark of Apple Corporation in the United States and other countries. Neither Mini-Circuits nor the Mini-Circuits SSG-series Synthesized Signal Generators are affiliated with or endorsed by the owners of the above referenced trademarks

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Wideband, USB/Ethernet

Synthesized Signal Generator

50Ω -70 dBm to +15 dBm, 1-6000 MHz

Features

- Dynamic range of 85 dB
- 3 Hz frequency resolution
- Small, light weight
- Power and/or frequency sweep options
- Good Harmonics (-56 dBc typ) and Sub-Harmonics (-84 dBc Typ)
- Multiple pulse modulation options (external, free run, triggered)
- Separate Trigger In and Trigger Out ports
- **USB** HID or **Ethernet**-TCP/IP (HTTP and Telnet) control
- Easy installation and operation
- User friendly Windows® Graphical User Interface
- Supports a wide range of programming environments (See application note **AN-49-001** for details)
- Mounting bracket (optional)





Installation CD with Software included

SSG-6001RC

Included Accessories

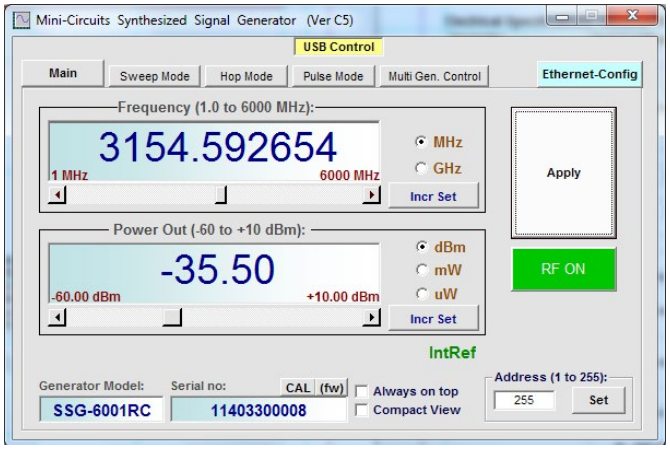
Model No.	Description	Qty.
AC/DC-12-3W1	AC/DC 12V adapter *(see Ordering Information)*	1
CBL-3W1-XX	AC power cord *(see Ordering Information)*	1
USB-CBL-AB-3+	2.7ft. USB cable	1
CBL-RJ45-MM-5+	5 ft. network cable	1
SSG-CD	Software CD	1

RoHS Compliant
See our web site for RoHS Compliance methodologies and qualifications

Applications

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

Mini-Circuits Control Program for Synthesized Signal Generators



Mini-Circuits®
www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

Electrical Specifications (General RF) at +25°C

Parameter	Test Conditions		Min.	Typ.	Max.	Units
Output Frequency	–		1	–	6000	MHz
Frequency Resolution [2]	1 - 3000 MHz		–	3	–	Hz
	3000 - 6000 MHz		–	6	–	Hz
Frequency accuracy	Using Internal Reference		–	1	–	ppm
Settling time [3,5]	–		–	2.0	–	msec
Dwell time (nominal) [4,5]	–		20	–	10,000	msec
VSWR	1 - 3000 MHz		–	1.25	1.75	:1
	3000 - 6000 MHz		–	1.55	2.3	:1
Output power Max [6]	1 - 4500 MHz		+10	+15	–	dBm
	4500 - 6000 MHz		Note 7	+11.5	–	
Output power Min [6]	1 - 6000 MHz		–	-70	-65	dBm
Power resolution (nom.)	–		–	0.25	–	dB
Dynamic range	–		–	85	–	dB
Output power accuracy [6,7]	1 - 2000 MHz	PWR_{out}: -65 to +10 dBm	–	±0.15	±0.75	dB
	2000 - 4500 MHz	PWR_{out}: -65 to -45 dBm	–	±0.20	±1.30	
		PWR_{out}: -45 to -15 dBm	–	±0.15	±0.95	
		PWR_{out}: -15 to +10 dBm	–	±0.15	±0.80	
	4500 - 6000 MHz	PWR_{out}: -65 to -45 dBm	–	±0.30	±1.50	
		PWR_{out}: -45 to -15 dBm	–	±0.25	±1.25	
		PWR_{out}: -15 to +10 dBm	–	±0.20	±1.15	
RF output level	@RF OFF		–	-120	–	dBm
Harmonics and Sub-Harmonics [6, 8]	1 - 50 MHz	-65 to +10 dBm	–	-47	-30	dBc
	50 - 3000 MHz	-65 to -55 dBm	–	-57	-28	
		-55 to -40 dBm	–	-68	-35	
		-40 to -30 dBm	–	-77	-50	
		-30 to +5 dBm	–	-70	-35	
		+5 to +10 dBm	–	-53	-30	
	3000 - 6000 MHz	-65 to -50 dBm	–	-46	–	
		-50 to -45 dBm	–	-57	-23	
		-45 to 0 dBm	–	-63	-25	
		0 to +10 dBm	–	-90	-30	
Non-Harmonic Spurious	-		–	-85	-55	dBc
Ethernet communication	Supports both HTTP and Telnet protocols over TCP/IP					

[2] Tested with external reference
[3] Settling time - transition time between 2 output states. During the transition, RF output is turned off to avoid transient outputs.
[4] Dwell time - duration of each signal point in a Sweep or Hop sequence set by user. Default is minimum dwell time.
[5] Generator response time is Dwell time + Settling Time.
[6] The generator is calibrated within typical power range, however performance is guaranteed only within power max/min limits.
[7] Max power over 4500 MHz derates linearly to +9 dBm at 6000 MHz. See max power graph on page 7 for illustration.
[8] Generator Sub-Harmonics(F0.5, F1.5, F2.5, etc...) are produced only in the 3000-6000 MHz range.

Typical Phase Noise, SSB (dBc/Hz) at +25°C

Carrier Frequency (MHz)	Frequency Offset				
	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
10	-129	-141	-141	-142	-142
25	-122	-136	-140	-144	-145
46.875	-115	-131	-136	-144	-148
93.75	-110	-127	-130	-140	-149
187.5	-105	-120	-124	-135	-150
375	-99	-113	-118	-129	-150
750	-92	-107	-112	-122	-148
1000	-90	-106	-110	-116	-145
1500	-88	-103	-106	-116	-144
2000	-84	-100	-104	-111	-141
2500	-81	-98	-103	-105	-139
3000	-80	-96	-100	-103	-136
3500	-78	-95	-99	-104	-135
4000	-77	-93	-97	-105	-135
4500	-77	-92	-95	-107	-135
5000	-75	-91	-97	-99	-133
6000	-75	-90	-94	-98	-130

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

Parameter	Test Conditions		Min.	Typ.	Max.	Units
Pulse Width resolution	Nominal value		1	–	–	µSec
Pulse "off" time [9]	Measured at the 50% of pulse level		20	–	10e7	µSec
Pulse "on" time [9]	Measured at the 50% of pulse level		10	–	10e7	µSec
Duty cycle (in Free Run)	Pulse Width divided by Pulse Period		0.0001	–	99.9999	%
Rise / Fall time	Measured between 10% and 90% of pulse level		–	1.5 / 0.8	–	µsec
Pulse Width Accuracy [10]	Measured at 50% of pulse level	Internal pulse modulation	–	±4	–	µsec
		External pulse modulation	–	±6	–	
External pulse mod. input threshold	External pulse modulation		–	–	2.4	V
Trigger response delay	Trigger edge to 50% of pulse level		–	10	–	µSec
Pulse Power ratio	@PWR_{OUT}=+10dBm, $FREQ_{OUT}$=10 MHz		–	70	–	dB
Pulse Power ratio	@PWR_{OUT}=+10dBm, $FREQ_{OUT}$=6000 MHz		–	65	–	

[9] Total pulse period max=10 Sec
[10] With long pulse widths, typ. accuracy may increase up to 3% of pulse width.

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

Parameter		Test Conditions	Min.	Typ.	Max.	Units
Aging		Using Internal Reference	–	2	–	ppm/yr
Reference In	Frequency	–	–	10	–	MHz
	Power	–	-3.5	–	+7.5	dBm
	Phase Noise	@ 10kHz Offset	–	-145	–	dBc/Hz
Reference Out	Frequency	–	–	10	–	MHz
	Freq. Accuracy	Using Internal Reference	–	±1	–	ppm
	Power	–	–	+5.5	–	dBm
Trigger Out, Low [11]		–	0	–	0.4	V
Trigger Out, High [11]		–	2.4	–	3.3	
Trigger In, Low [11]		–	0	–	0.4	
Trigger In, High [11]		–	2.4	–	5	
Supply Voltage [12]		–	11.4	12	12.6	V_{DC}
Supply Current [12]		–	–	0.85	1.3	A
USB current [12]		SSG-6001RC does not draw power from the USB bus, only from the DC power adapter				mA

[11] Supports TTL, LVTTL and CMOS triggers
[12] Power On Sequence: Connect the 12V power, followed by the USB or Ethernet control before turning on the Generator.

Minimum System Requirements

Interface	USB HID or HTTP Get/Post or Telnet protocols
Host operating system - USB Control	**Windows 32/64 Bit operating system:** Windows 98®, Windows XP®, Windows Vista®, Windows 7®, Windows 8®, Windows 10® **Linux® support:** 32/64 Bit operating system
Host operating system - Ethernet Control	Any Windows®, Mac®, or Linux® computer with a network port and Ethernet-TCP/IP (HTTP or Telnet protocols) support
Hardware	Pentium® II or better

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 type B female)
Network (Ethernet/LAN)	(RJ45 socket)

Absolute Maximum Ratings

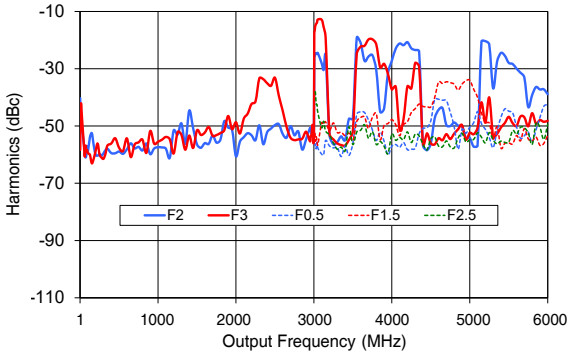
Operating Temperature	0ºC to +50ºC
Storage Temperature	-20ºC to +60ºC
Power in @ Reference In	+10 dBm
Reverse Power(DC) @ Reference Out	8 V_{DC}
Reverse Power(DC) @ RF Out	8 V_{DC}
Voltage input to Trigger ports	-0.3V_{DC} to +3.5V_{DC}

Permanent damage may occur if any of these limits are exceeded. Operating in the range between operating power limits and absolute maximum ratings for extended periods of time may result in reduced life and reliability.

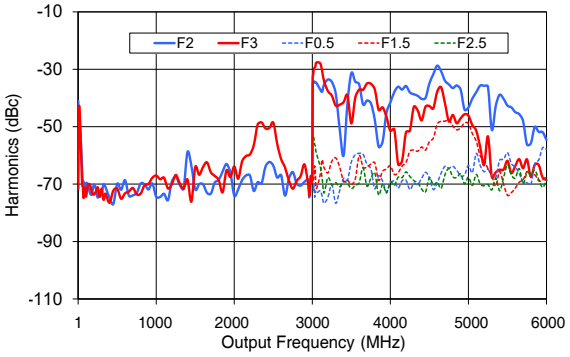
Typical Performance Curves*

*at +25°C unless noted otherwise

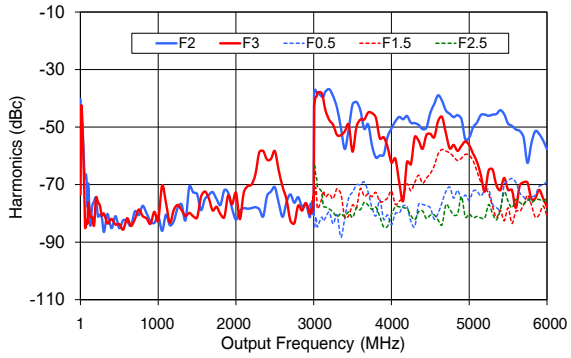
Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=-65dBm



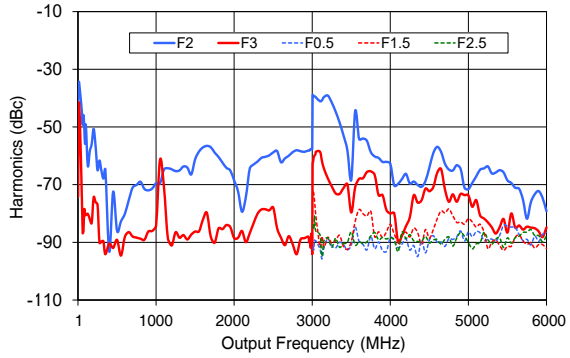
Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=-50dBm



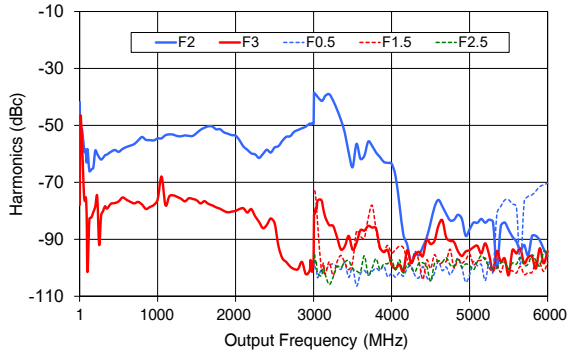
Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=-40dBm



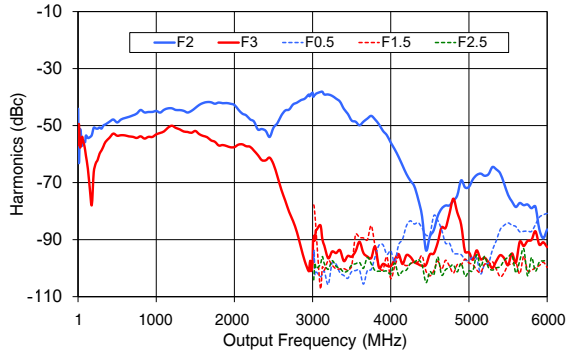
Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=-20dBm



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

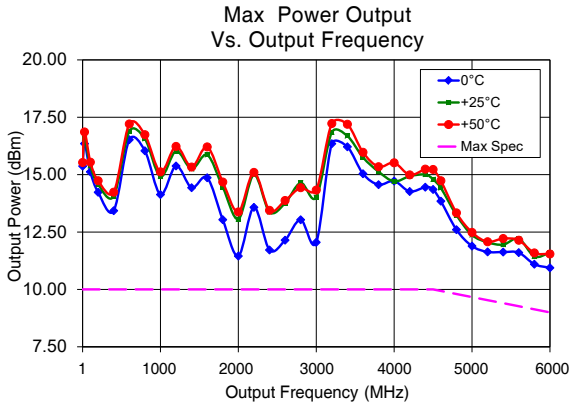


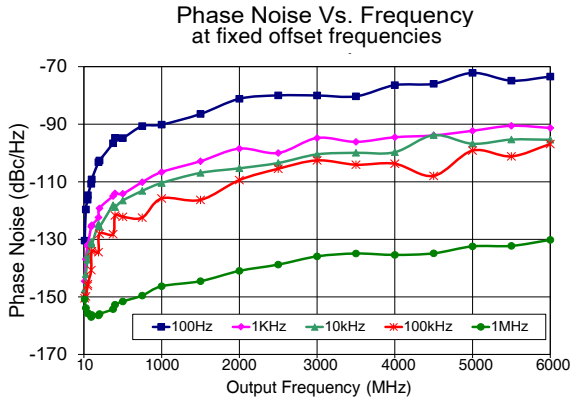
Harmonics & Sub-Harmonics Levels
Vs. Output Frequency PWR=+10dBm

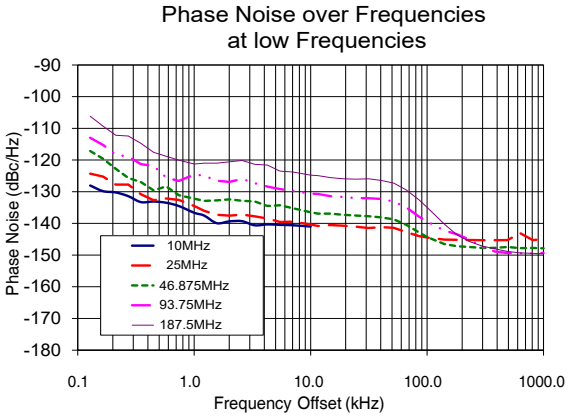


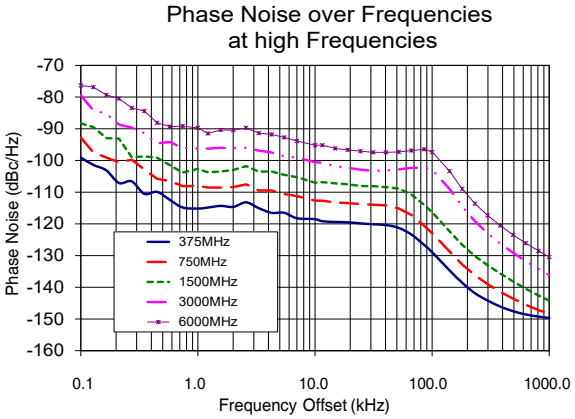
Typical Performance Curves* (continued)

*at +25°C unless noted otherwise





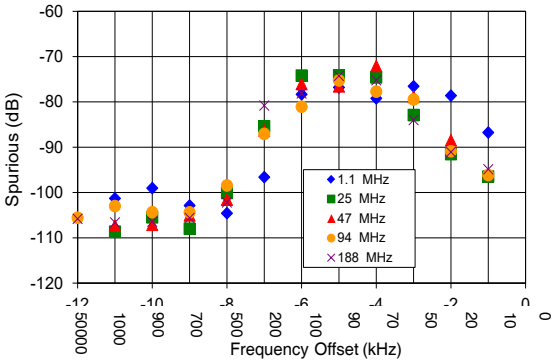




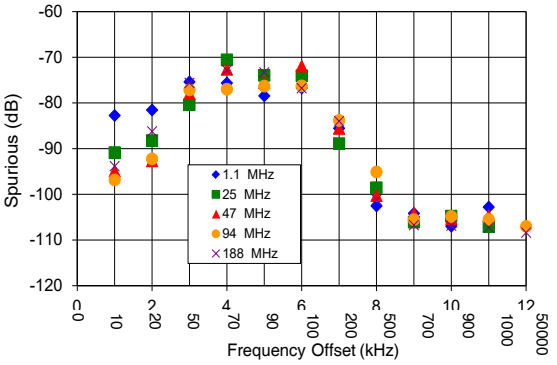
Typical Performance Curves* (continued)

*at +25°C unless noted otherwise

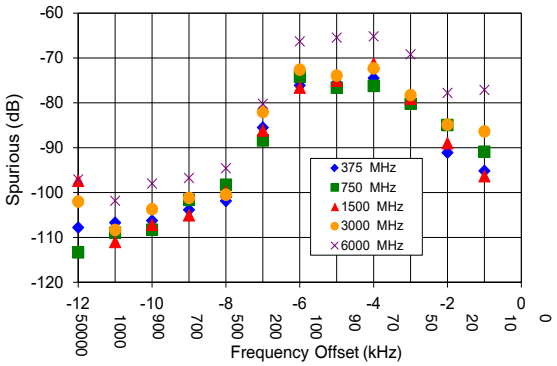
Spurious @Negative Offset & Low Freq Output
Vs Frequency Offset



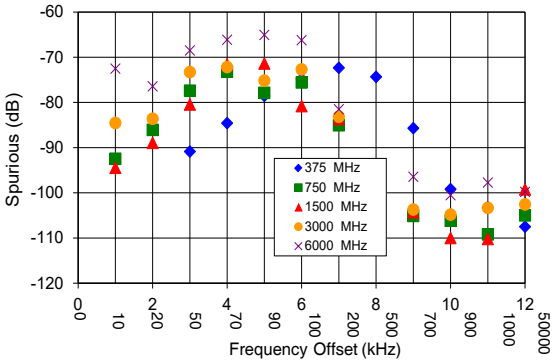
Spurious @Positive Offset & Low Freq Output
Vs Frequency Offset



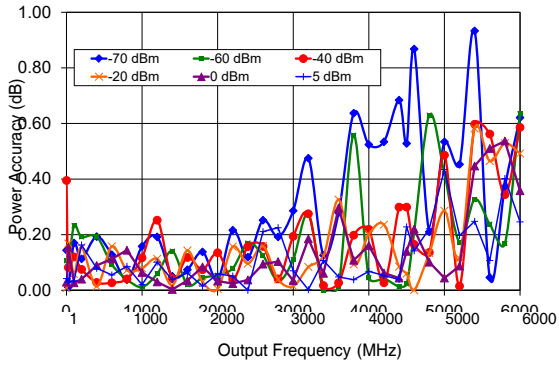
Spurious @Negative Offset & High Freq Output
Vs Frequency Offset



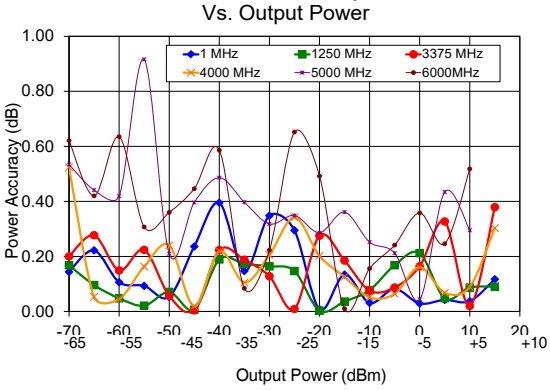
Spurious @Positive Offset & High Freq Output
Vs Frequency Offset



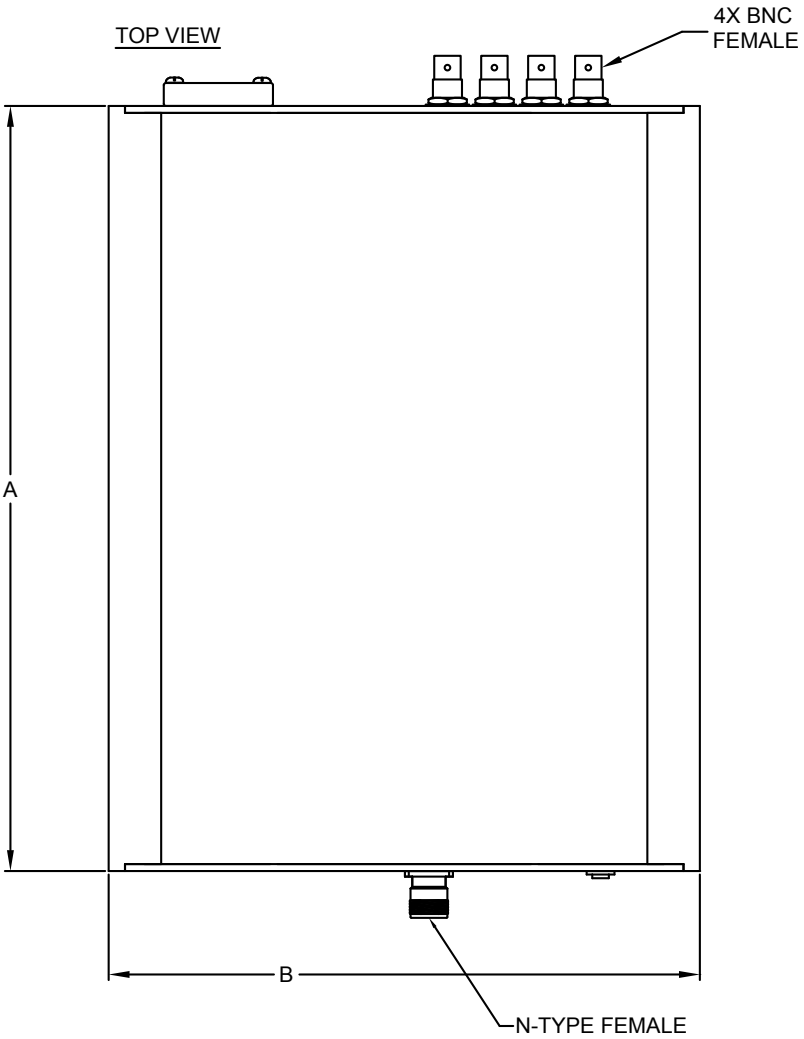
Power Accuracy
Vs. Output Frequency

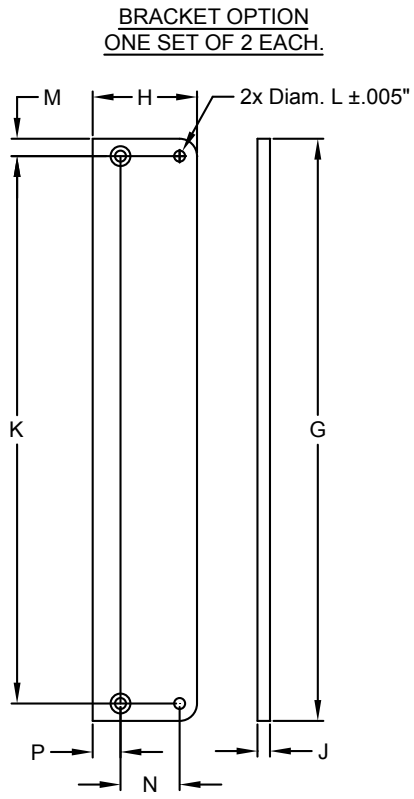


Power Accuracy
Vs. Output Power

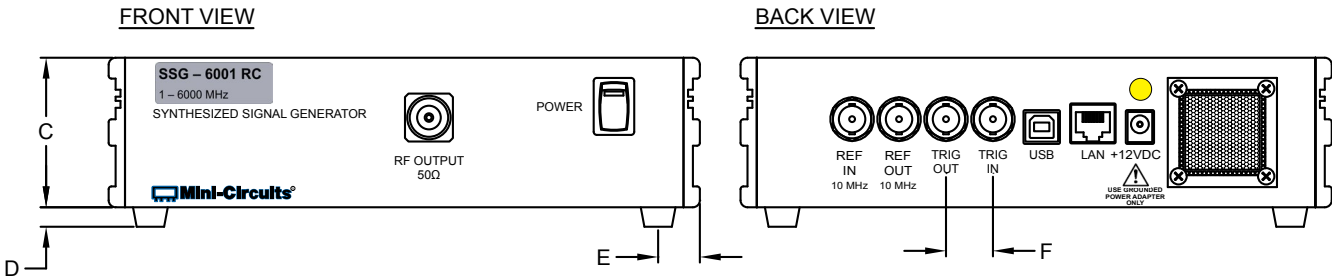


Outline Drawing LV1913





INSTRUCTION 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.



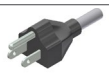
Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT. GRAMS
11.00	**8.50**	**2.15**	**0.28**	**0.60**	**0.68**	**8.37**	**1.50**	**0.18**	**7.870**	**0.158**	**0.25**	**0.850**	**0.40**	3200
279.4	215.9	54.6	7.1	15.2	17.27	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-6001RC	USB/Ethernet Synthesized Signal Generator

Included Accessories	Part No.	Description
	AC/DC-12-3W1	AC/DC Grounded Power adapter. 0°C to +40°C AC Input: 100-240V, 50/60 Hz, I_{Max}=1.2A DC Output 12±0.6 V , I_{Max}=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)
	CBL-RJ45-MM-5+	5 ft. network cable: RJ45(Male) to RJ45(Male) Cat 5E cable.

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 type A(Male) to USB type B(Male)
USB-CBL-AB-7+	6.8 ft (2.1 m) USB Cable: USB type A(Male) to USB type B(Male)
USB-CBL-AB-11+	11 ft (3.4 m) USB Cable: USB type A(Male) to USB type B(Male)
BKT-280-06+	Bracket (One set of 2 each)

Calibration	Description	
CALSSG-6001RC	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