

# Synthesized Signal Generator

SSG-6000RC

50Ω -65 dBm to +14 dBm, 25-6000 MHz

## The Big Deal

- **USB or Ethernet**-TCP/IP (HTTP and Telnet protocols) control
- Wideband generator with 3 Hz frequency resolution
- 79 dB adjustable output power range
- Internal & external pulse modulation
- Configurable power up settings



Generic photo used for illustration purposes only

Case Style: LV1913



Software Package

## Applications

- Lab test equipment
- Automated test capability
- Field testing and remote operation via internet
- Production line testing

### Included Accessories

| Model No.      | Description                                  | Qty. |
|----------------|----------------------------------------------|------|
| AC/DC-12-3W    | AC/DC 12V adaptor (see Ordering Information) | 1    |
| CBL-3W-xx      | AC power cord (see Ordering Information)     | 1    |
| USB-CBL-AB-3+  | 2.7 ft. USB cable                            | 1    |
| CBL-RJ45-MM-5+ | 5 ft. network cable                          | 1    |

### RoHS Compliant

See our web site for RoHS Compliance methodologies and qualifications

## Product Overview

Mini-Circuits SSG-6000RC is a wideband synthesized signal generator operating over a frequency range of 25 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.

Full software support is provided, including our user-friendly GUI application for Windows and a full API and programming instructions for both Windows and Linux environments (32-bit and 64-bit systems). The latest version of the full software package can be downloaded from <https://www.minicircuits.com/softwaredownload/sg.html> at any time.

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 79 dB, output power from -65 dBm to +14dBm in 0.25dB steps                                                                     |
| USB & Ethernet control           | USB HID and Ethernet (HTTP / Telnet) interfaces provide easy compatibility with a wide range of software setups and programming environments |
| Pulse modulation options         | The SSG-6000RC can produce pulse modulated RF using internal or external modulating signal                                                   |
| Multiple sweep options           | The SSG-6000RC can be set to sweep either power or frequency up, down, or bidirectionally.                                                   |
| Fine frequency resolution (3 Hz) | Allows precisely setting the desired signal, simplifying test setups                                                                         |

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M176985  
EDR-11057/2  
SSG-6000RC  
RAV  
200421  
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## Electrical Specifications (General RF) at +25°C

| Parameter                              | Test Conditions                                     | Min.                                | Typ.  | Max.   | Units |
|----------------------------------------|-----------------------------------------------------|-------------------------------------|-------|--------|-------|
| Output Frequency                       | –                                                   | 25                                  | –     | 6000   | MHz   |
| Frequency Resolution <sup>1</sup>      | 25 - 3000 MHz                                       | –                                   | 3     | –      | Hz    |
|                                        | 3000 - 6000 MHz                                     | –                                   | 6     | –      | Hz    |
| Frequency accuracy                     | Using Internal Reference                            | –                                   | ±1    | –      | ppm   |
| Settling time <sup>2,4</sup>           | –                                                   | –                                   | 1.5   | 2.0    | msec  |
| Dwell time (nominal) <sup>3,4</sup>    | –                                                   | 20                                  | –     | 10,000 |       |
| VSWR                                   | 25 - 2150 MHz                                       | –                                   | 1.35  | 2.3    | :1    |
|                                        | 2150 - 4000 MHz                                     | –                                   | 1.75  | 2.6    |       |
|                                        | 4000 - 6000 MHz                                     | –                                   | 1.50  | 2.4    |       |
| Output power Max <sup>5</sup>          | 25 - 6000 MHz                                       | +10                                 | +14   | –      | dBm   |
| Output power Min <sup>5</sup>          | 25 - 3000 MHz                                       | –                                   | -65   | -60    | dBm   |
|                                        | 3000 - 5400 MHz                                     | –                                   | -60   | -55    |       |
|                                        | 5400 - 6000 MHz                                     | –                                   | -60   | -50    |       |
| Output power resolution (nom.)         | –                                                   | –                                   | 0.25  | –      | dB    |
| Dynamic range                          | –                                                   | –                                   | 79    | –      | dB    |
| Output power accuracy                  | 25 - 3000 MHz                                       | PWR <sub>out</sub> : -60 to +10 dBm | ±0.20 | ±1.00  | dB    |
|                                        | 3000-4000 MHz                                       | PWR <sub>out</sub> : -55 to +10 dBm | ±0.20 | ±1.00  |       |
|                                        | 4000 - 5400 MHz                                     | PWR <sub>out</sub> : -55 to +10 dBm | ±0.25 | ±1.30  |       |
|                                        | 5400 - 6000 MHz                                     | PWR <sub>out</sub> : -50 to +10 dBm | ±0.25 | ±1.30  |       |
| RF output level                        | @ RF OFF                                            | –                                   | -120  | –      | dBm   |
| Harmonics & Sub-Harmonics <sup>6</sup> | 25-3000 MHz                                         | -60 to -30 dBm                      | –     | -44    | dBc   |
|                                        |                                                     | -30 to 0 dBm                        | –     | -64    |       |
|                                        |                                                     | 0 to +10 dBm                        | –     | -51    |       |
|                                        | 3000-4500 MHz                                       | -55 to -30 dBm                      | –     | -34    |       |
|                                        |                                                     | -30 to 0 dBm                        | –     | -38    |       |
|                                        |                                                     | 0 to +10 dBm                        | –     | -34    |       |
|                                        | 4500-6000 MHz                                       | -55 to -30 dBm                      | –     | -43    |       |
|                                        |                                                     | -30 to 0 dBm                        | –     | -51    |       |
|                                        |                                                     | 0 to +10 dBm                        | –     | -35    |       |
| Non-Harmonic Spurious                  | –                                                   | –                                   | -60   | -50    | dBc   |
| Ethernet communication                 | Supports both Telnet and HTTP protocols over TCP/IP |                                     |       |        |       |

<sup>1</sup> Tested with external reference

<sup>2</sup> Settling time - transition time between 2 output states. During the transition, RF output is turned off to avoid transient outputs.

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

<sup>4</sup> Generator response time is Dwell time + Settling Time.

<sup>5</sup> Generator units are calibrated within typical power range, however performance is guaranteed only within power max/min limits.

<sup>6</sup> 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 |
| 25                      | -121             | -134  | -142   | -149    | -155  |
| 46.875                  | -118             | -132  | -137   | -145    | -157  |
| 93.75                   | -113             | -127  | -131   | -139    | -157  |
| 187.5                   | -105             | -121  | -125   | -133    | -156  |
| 375                     | -101             | -115  | -119   | -127    | -153  |
| 750                     | -94              | -108  | -112   | -121    | -150  |
| 1000                    | -93              | -106  | -110   | -115    | -147  |
| 1500                    | -89              | -102  | -107   | -115    | -144  |
| 2000                    | -85              | -100  | -104   | -110    | -141  |
| 2500                    | -83              | -97   | -103   | -104    | -138  |
| 3000                    | -82              | -95   | -99    | -102    | -136  |
| 3500                    | -80              | -95   | -99    | -103    | -134  |
| 4000                    | -80              | -94   | -98    | -103    | -135  |
| 4500                    | -79              | -93   | -95    | -105    | -134  |
| 5000                    | -77              | -93   | -97    | -98     | -132  |
| 6000                    | -75              | -90   | -94    | -97     | -130  |

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

| Parameter                              | Test Conditions                                                     | Min.                               | Typ.     | Max.  | Units |
|----------------------------------------|---------------------------------------------------------------------|------------------------------------|----------|-------|-------|
| Pulse Width                            | Nominal value                                                       | 10                                 | –        | –     | µSec  |
| Pulse Period                           | Measured at the 50% points                                          | 11                                 | –        | 10e7  | µSec  |
| Duty cycle (in Free Run)               | Pulse Width divided by Pulse Period                                 | 0.01                               | –        | 99.99 | %     |
| Rise / Fall time (Internal modulation) | Measured between 10% and 90%                                        | –                                  | 800 / 30 | –     | nSec  |
| Pulse Width Accuracy                   | Measured at 50% of pulse level for Internal and external modulation | –                                  | ±1       | –     | %     |
| External pulse mod. input threshold    | External pulse modulation                                           | –                                  | –        | 2.4   | V     |
| Trigger response delay                 | Trigger edge to 50% of pulse level                                  | Internal Pulse source <sup>7</sup> | 3.5      | –     | µSec  |
|                                        |                                                                     | External Pulse source              | 1.8      | –     |       |
| Pulse Power ratio                      | @PWR <sub>OUT</sub> =+10dBm, FREQ <sub>OUT</sub> =25 MHz            | –                                  | 60       | –     | dB    |
| Pulse Power ratio                      | @PWR <sub>OUT</sub> =+10dBm, FREQ <sub>OUT</sub> =6000 MHz          | –                                  | 45       | –     |       |

<sup>7</sup> Max trigger frequency is 70 kHz

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

| Parameter                   | Test Conditions                                                                 | Min.                     | Typ. | Max. | Units           |
|-----------------------------|---------------------------------------------------------------------------------|--------------------------|------|------|-----------------|
| Reference In                | Frequency                                                                       | –                        | 10   | –    | MHz             |
|                             | Power                                                                           | –3.5                     | –    | +7.5 | dBm             |
|                             | Phase Noise                                                                     | @ 10 kHz offset          | –145 | –    | dBc/Hz          |
| Reference Out               | Frequency                                                                       | –                        | 10   | –    | MHz             |
|                             | Freq. Accuracy                                                                  | Using Internal Reference | ±1   | –    | ppm             |
|                             | Power                                                                           | –                        | +6   | –    | dBm             |
| Trigger Out, Low            | –                                                                               | 0                        | –    | 0.4  | V               |
| Trigger Out, High           | –                                                                               | 2.4                      | –    | 3.3  |                 |
| Trigger In, Low             | –                                                                               | 0                        | –    | 0.4  |                 |
| Trigger In, High            | –                                                                               | 2.4                      | –    | 3.3  |                 |
| Supply Voltage <sup>8</sup> | –                                                                               | 11.4                     | 12   | 12.6 | V <sub>DC</sub> |
| Supply Current <sup>8</sup> | –                                                                               | –                        | 700  | 850  | mA              |
| USB current <sup>8</sup>    | SSG-6000RC does not draw power from the USB bus, only from the DC power adapter |                          |      |      | mA              |

<sup>8</sup> Power On Sequence: Connect the 12V power, followed by the USB or Ethernet control before turning on the Generator.

## 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 | 8 V <sub>DC</sub>                          |
| Reverse Power(DC) @ RF Out        | 8 V <sub>DC</sub>                          |
| Voltage input to Trigger ports    | -0.3V <sub>DC</sub> to +3.5V <sub>DC</sub> |

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.

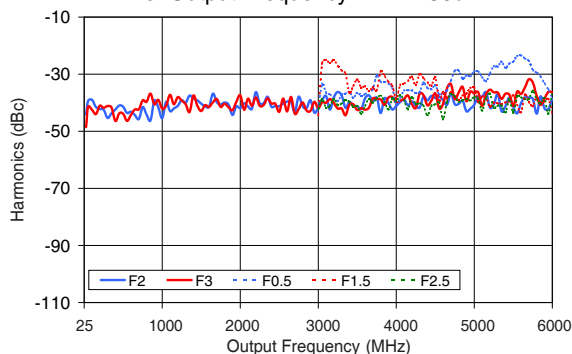
## Connections

|                        |                     |
|------------------------|---------------------|
| 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)       |

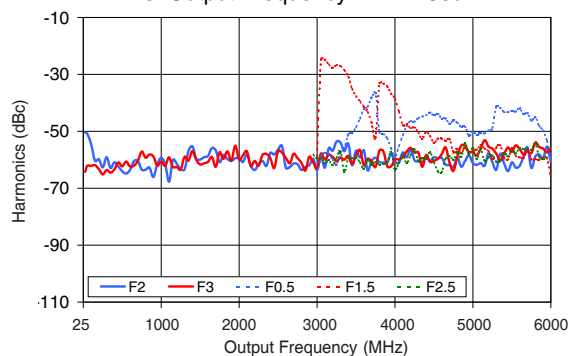
## Typical Performance Curves\*

\*at +25°C unless noted otherwise

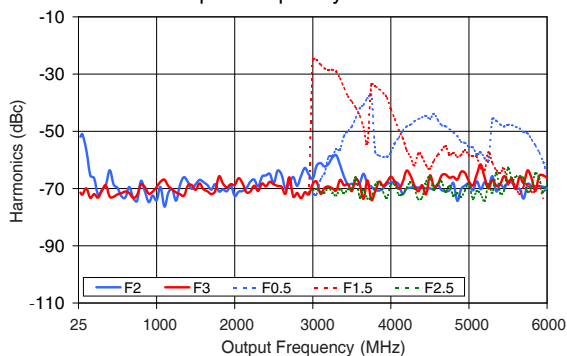
Harmonics & Sub-Harmonics Levels  
Vs. Output Frequency PWR=-50dBm



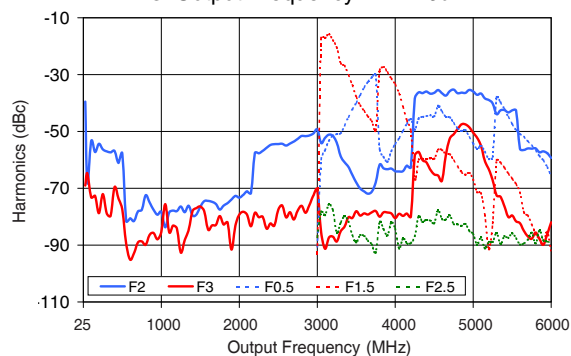
Harmonics & Sub-Harmonics Levels  
Vs. Output Frequency PWR=-30dBm



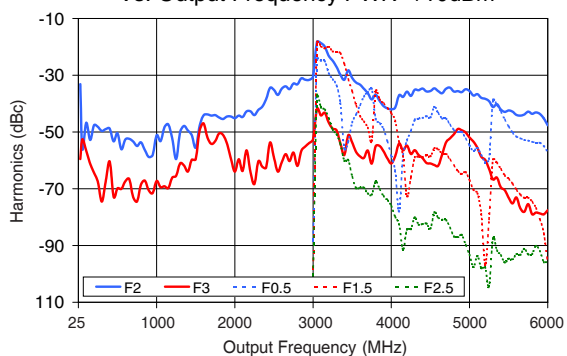
Harmonics & Sub-Harmonics Levels  
Vs. Output Frequency PWR=-20dBm



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

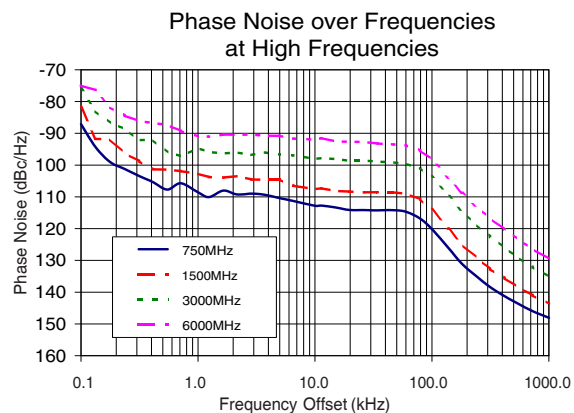
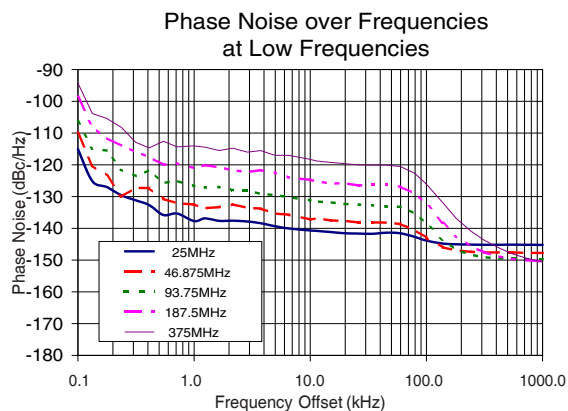
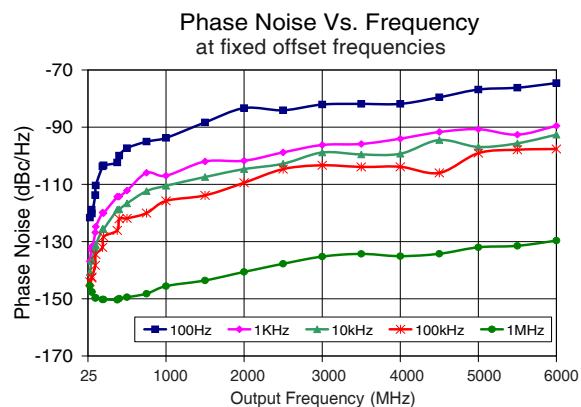
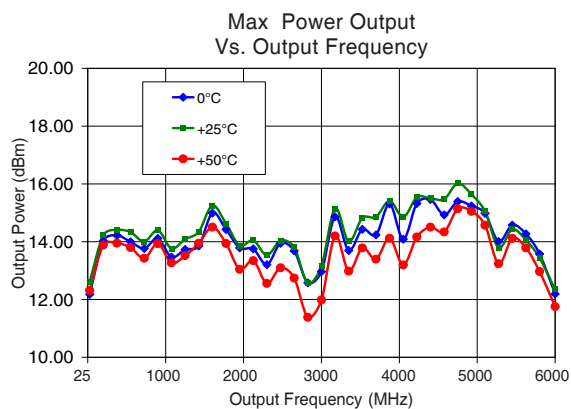


Harmonics & Sub-Harmonics Levels  
Vs. Output Frequency PWR=+10dBm



## Typical Performance Curves\* (continued)

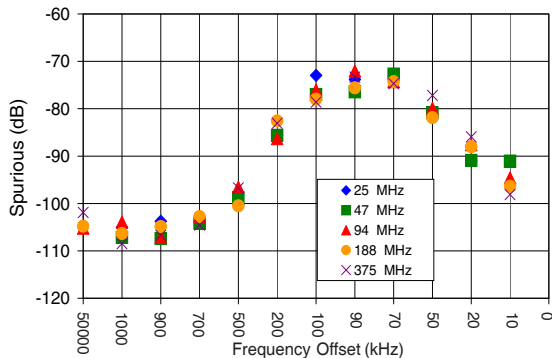
\*at +25°C unless noted otherwise



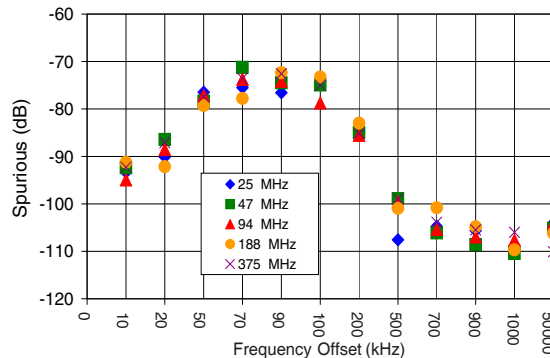
## Typical Performance Curves\* (continued)

\*at +25°C unless noted otherwise

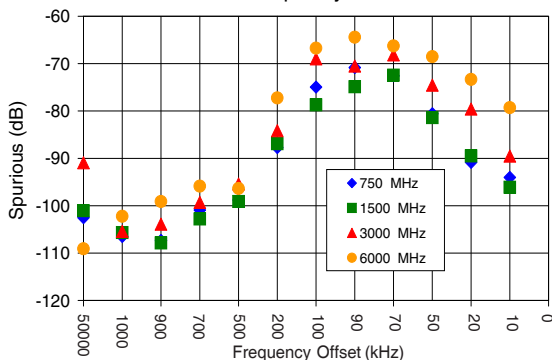
Spurious @Negative Offset & Low Freq Output  
Vs Frequency Offset



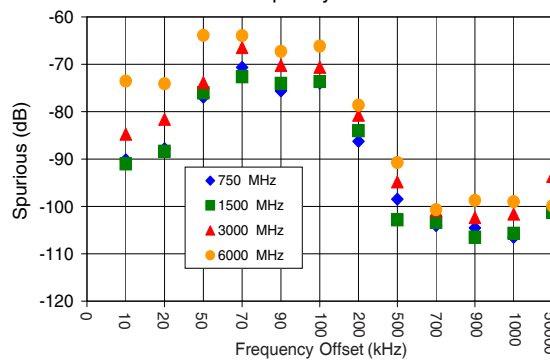
Spurious @Positive Offset & Low Freq Output  
Vs Frequency Offset



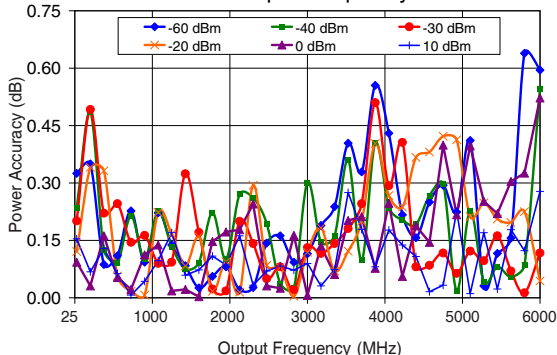
Spurious @Negative Offset & High Freq Output  
Vs Frequency Offset



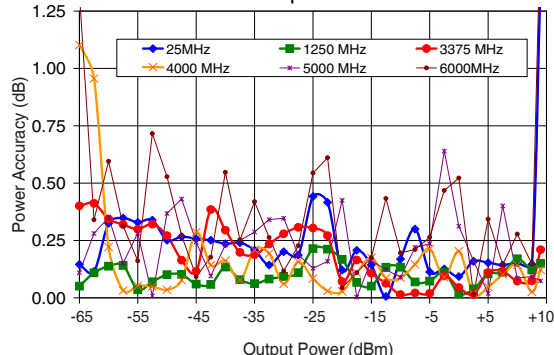
Spurious @Positive Offset & High Freq Output  
Vs Frequency Offset



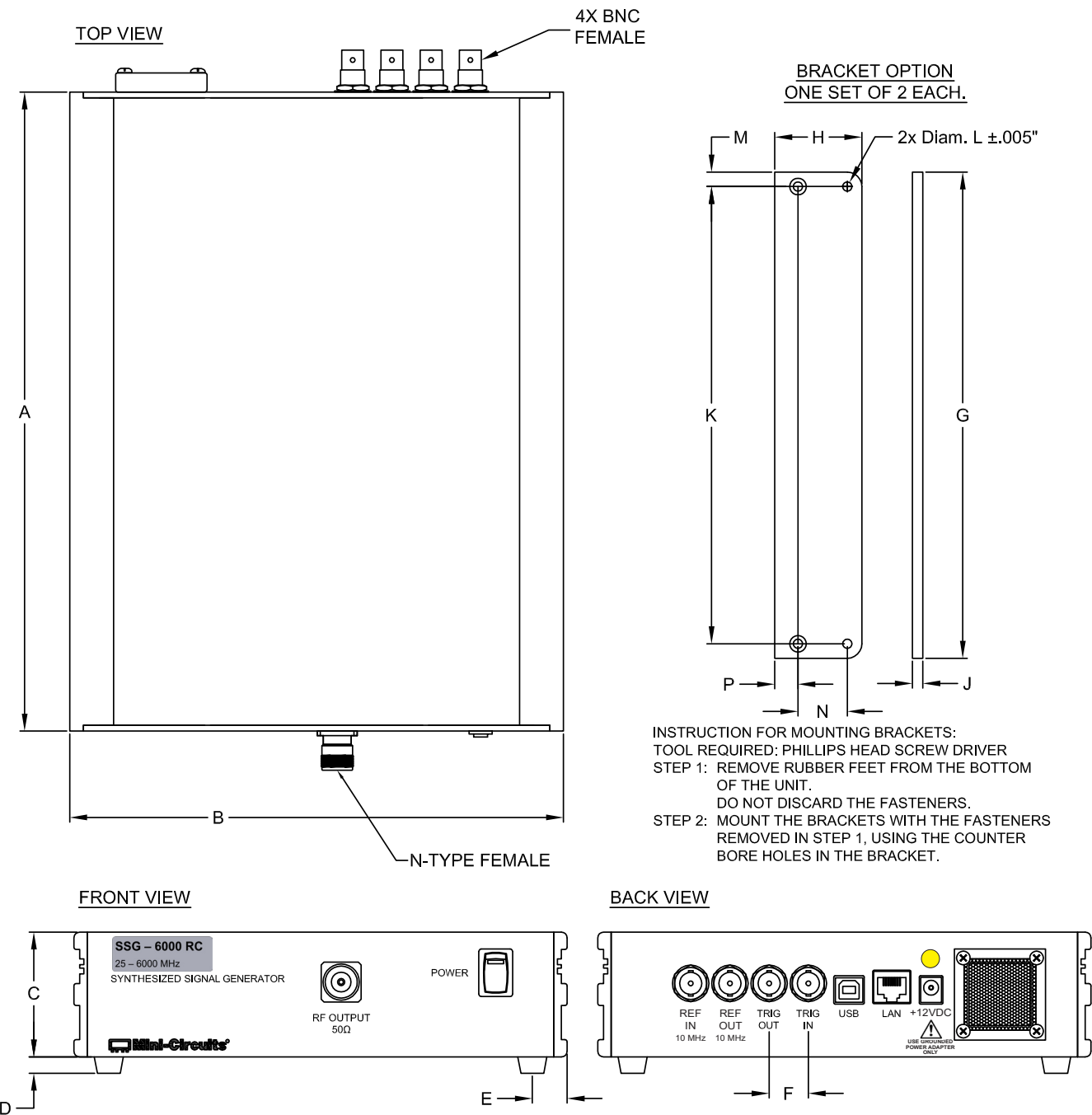
Power Accuracy  
Vs. Output Frequency



Power Accuracy  
Vs. Output Power



Outline Drawing LV1913



Outline Dimensions ( inch mm )

| A     | B     | C    | D    | E    | F     | G     | H    | J    | K     | L     | M    | N     | P    | WT.<br>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 | 2500         |
| 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 |              |

## Software & Documentation Download:

- Mini-Circuits' full software and support package including user guide, Windows GUI, DLL files, programming manual and examples can be downloaded free of charge from <https://www.minicircuits.com/softwaredownload/sg.html>
- Please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com) for support

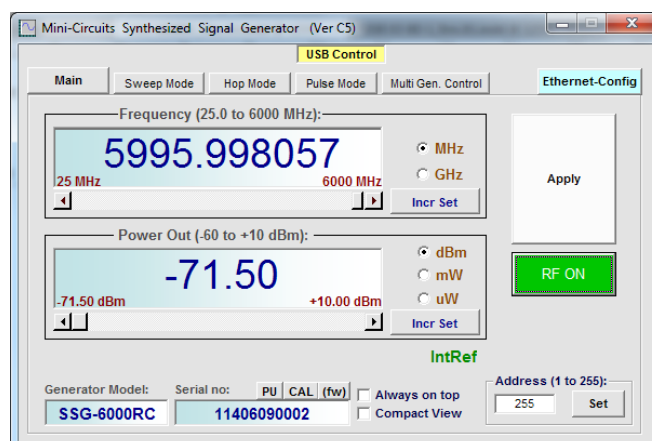
## Minimum System Requirements

| Parameter           | Requirements                                 |                                                                                           |
|---------------------|----------------------------------------------|-------------------------------------------------------------------------------------------|
| Interface           | USB HID or HTTP Get/Post or Telnet protocols |                                                                                           |
| System requirements | GUI:                                         | Windows 32 & 64 bit systems from Windows 98 up to Windows 10                              |
|                     | USB API (ActiveX & .Net)                     | Windows 32 & 64 bit systems with ActiveX or .Net support from Windows 98 up to Windows 10 |
|                     | USB direct programming support               | Linux, Windows systems from Windows 98 up to Windows 10                                   |
|                     | HTTP or Telnet                               | Any computer with a network port and Ethernet-TCP/IP (HTTP or Telnet protocols) support   |
| Hardware            | Pentium® II or better                        |                                                                                           |

## Graphical User Interface (GUI) for Windows

### Key Features:

- Set frequency and power
- Configure generator state at power-up
- Track operating time since last calibration and set reminder for calibration.
- Freq. & Power sweeps, up, down and bi-directional
- Pulse modulation signals
- Synchronize frequency and power sweeps from up to 4 generators.
- USB, HTTP or Telnet control of SSG
- Setting Ethernet configuration



## Application Programming Interface (API)

### Windows Support:

- API DLL files exposing the full power sensor functionality
  - ActiveX COM DLL file for creation of 32-bit programs
  - .Net library DLL file for creation of 32 / 64-bit programs
- HTTP Get/Post and Telnet protocols use SCPI commands to provide full control.
- Supported by most common programming environments (refer to application note [AN-49-001](#) for summary of tested environments)

### Linux Support:

- Full power sensor control in a Linux environment is achieved by way of USB interrupt commands.



Ordering, Pricing & Availability Information see our web site

| Model      | Description                               |
|------------|-------------------------------------------|
| SSG-6000RC | USB/Ethernet Synthesized Signal Generator |

| Included Accessories                                                              | Part No.       | Description                                                                                                  |
|-----------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------|
|  | AC/DC-12-3W    | AC/DC 12V <sub>DC</sub> Grounded Power Adaptor.<br>Operating temperature: 0°C to +40°C, I <sub>Max</sub> =5A |
|                                                                                   | CBL-3W-xx      | AC Power Cord (Select one power cord from below with each Signal Generator)                                  |
|  | 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 <sup>9</sup>                                                         | Part No.  | Description                        |
|-------------------------------------------------------------------------------------|-----------|------------------------------------|
|    | CBL-3W-US | Power Cord for United States       |
|   | CBL-3W-EU | Power Cord for Europe              |
|  | CBL-3W-UK | Power Cord for United Kingdom      |
|  | CBL-3W-AU | Power Cord for Australia and China |
|  | CBL-3W-IL | Power Cord for Israel              |

<sup>9</sup> Power cords for other countries are also available, if you need a power cord for a country not listed in the table please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com) for support.

| 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-6000RC | 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.
- 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](http://www.minicircuits.com/MCLStore/terms.jsp)

