Data Sheet

SC5507A & SC5508A

DC to 6.25 GHz Signal Generator with Sensor

www.signalcore.com
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1. Definition of Terms

The following terms are used throughout this datasheet to define specific conditions:

**Specification**
Defines guaranteed performance of a calibrated instrument under the following conditions:
- **PXI/PXIe Devices**
  - 3 hours storage at room temperature (standardized to 25 °C) followed by 30 minutes minimum warm-up operation
  - Specified environmental conditions are met within the specified operating temperature range of 0 °C to 50 °C unless otherwise noted.
- **USB/RS232/SPI Devices**
  - 3 hours storage at room temperature (standardized to 25 °C) followed by 30 minutes minimum warm-up operation
  - Specified environmental conditions are met within the specified internal device operating temperature range of 0 °C to 70 °C unless otherwise noted.
  - Internal device temperature is reading from device temperature sensor.
- Recommended calibration intervals are used.

**Typical data**
This data is not guaranteed; it is the expected performance of an average unit which does not include measurement uncertainty and is valid only at room temperature (standardized to 25 °C for PXIe).

**Nominal values**
This is a descriptive term for the given parameter (e.g. nominal impedance) that does not imply a level of performance. This data is not guaranteed and is valid only at the following:
- At ambient room temperature of 25 °C for PXI/PXIe products.
- At internal device temperature between 40 °C to 45 °C for USB/RS232/SPI products

**Measured values**
Characterizes expected product performance by means of measurement results gained from individual samples.

Specifications are subject to change without notice. For the most recent product specifications, visit [www.signalcore.com](http://www.signalcore.com).
2. Description

The SC5507A and SC5508A are part of SignalCore’s performance signal generator family (PSG), whose frequency range is from True DC to 6.25 GHz, amplitude range is from -50 dBm to 15 dBm (typical) and phase noise is among the lowest in the market. Its unique ability to tune its frequency at 1 mHz resolution down to DC sets it apart from all RF signal generators on the market. Not only does it have fine tuning over a board frequency range, it also has fine step amplitude control of 0.01 dB over more than 65 dB of amplitude range. Its phase noise at 5 GHz is extremely low, < -125 dBm/Hz @10 kHz offset and < -148 dBc/Hz @10 MHz typically.

These devices also feature a power sensor port with frequency response from 1 MHz to 6 GHz, and 45 dB of sensitivity range from -25 dBm to 20 dBm.

The SC5507A and SC5508A are suitable for systems that require high dynamic range and superior spectral purity signal. They are ideal for both analog and digital applications such as LO/modulator sources and high frequency DAC/ADC clocks respectively.

![Figure 1. SC5507/8A Block Diagram](image-url)
### 3. Frequency Specifications

<table>
<thead>
<tr>
<th>RF Output Range</th>
<th>DC to 6.25 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>0.001 Hz</td>
</tr>
</tbody>
</table>

**Switching speed**<sup>1</sup>
- Automatic leveling on: < 750 us
- Automatic leveling off: < 500 us

**List Mode**
- Dwell time: 0 to 30s
- Dwell step: 0.5ms
- Points: Frequency 2048, Amplitude 2048
- Trigger: Software, External hardware

**Frequency Accuracy**
- Same as accuracy of internal time base or external reference

**Time base accuracy**<sup>2</sup>
- ± [(last adjustment x aging) ± temp effects ± cal. accuracy] ± 3 ppb
- Daily, after 30 days
- Yearly ± 0.6 ppm
- -10 °C to 80 °C ± 20 ppb
- -10 °C to 80 °C ± 10 ppb

**Reference Output**
- Amplitude
  - 100 MHz: + 5 dBm
  - 10 MHz: + 5 dBm
- Connector: SMA
- Impedance (nominal): 50 Ω

**Reference Input**
- Frequency: 10 MHz
- Lock range: ± 3 ppm
- Amplitude (nominal): 0 to 7 dBm
- Connector: SMA
- Impedance (nominal): 50 Ω

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1. On reception of command and settled to final frequency to within 1ppm.
2. Based on the internal 10 MHz OCXO reference.
3. Factory adjustment of the reference DAC with respect to a NIST traceable 10 MHz rubidium clock standard.
4. Amplitude Specifications

<table>
<thead>
<tr>
<th>Leveled Output Range&lt;sup&gt;4&lt;/sup&gt;</th>
<th>DC to 50 MHz</th>
<th>-50 dBm to 6 dBm</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 MHz to 5.5 GHz</td>
<td>-50 to +15 dBm</td>
<td></td>
</tr>
<tr>
<td>5.5 GHz to 6.25 GHz</td>
<td>-50 to +12 dBm</td>
<td></td>
</tr>
<tr>
<td>Maximum Output&lt;sup&gt;5&lt;/sup&gt;</td>
<td>DC to 50 MHz</td>
<td>+ 7 dBm, typical</td>
</tr>
<tr>
<td>25 MHz to 5.5 GHz</td>
<td>+17 dBm, typical</td>
<td></td>
</tr>
<tr>
<td>5.5 GHz to 6.25 GHz</td>
<td>+13 dBm, typical</td>
<td></td>
</tr>
</tbody>
</table>

Adjustment resolution            0.01 dB, nominal

Absolute level accuracy [ALC closed]

<table>
<thead>
<tr>
<th>DC to 50 MHz</th>
<th>-50 to 6 dBm</th>
<th>± 0.4 dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 MHz to 3 GHz</td>
<td>-20 to max leveled</td>
<td>± 0.65 dB</td>
</tr>
<tr>
<td>-50 to -20 dBm</td>
<td>± 1.0 dB</td>
<td></td>
</tr>
<tr>
<td>3.0 GHz to 6.25 GHz</td>
<td>-20 to max leveled</td>
<td>± 0.8 dB</td>
</tr>
<tr>
<td>-50 to -20 dBm</td>
<td>± 1.5 dB</td>
<td></td>
</tr>
</tbody>
</table>

Measure Output power, ALC closed

4. Leveled range implies that the set amplitude is maintained over the frequency.
5. Maximum output is typical and does not guarantee that the value holds true for the frequency range. Typical minimum range is -60 dBm.
**Absolute level accuracy [ALC open]**

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Power Level Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC to 50 MHz</td>
<td>-50 to 6 dBm</td>
<td>± 0.4 dB</td>
</tr>
<tr>
<td>25 MHz to 3 GHz</td>
<td>-50 to max leveled</td>
<td>± 1.55 dB</td>
</tr>
<tr>
<td>3.0 GHz to 6.25 GHz</td>
<td>-50 to max leveled</td>
<td>± 2.0 dB</td>
</tr>
</tbody>
</table>

6. Automatic leveling is applied without the control loop closed. This open loop correction may not handle abrupt amplitude transitions well, such as filter band change. However, this removes leveling dynamics and, in most cases, would improve amplitude settling time.
5. Spectral Specifications

**Phase Noise** (Normal loop gain)

<table>
<thead>
<tr>
<th>Offset</th>
<th>100 MHz</th>
<th>1 GHz</th>
<th>3 GHz</th>
<th>6 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Typ</td>
<td>max</td>
<td>Typ</td>
<td>max</td>
</tr>
<tr>
<td>100</td>
<td>-108</td>
<td>-105</td>
<td>-90</td>
<td>-87</td>
</tr>
<tr>
<td>1 kHz</td>
<td>-145</td>
<td>-143</td>
<td>-126</td>
<td>-123</td>
</tr>
<tr>
<td>10 kHz</td>
<td>-152</td>
<td>150</td>
<td>-138</td>
<td>-135</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-153</td>
<td>-152</td>
<td>-138</td>
<td>-135</td>
</tr>
<tr>
<td>1 MHz</td>
<td>-153</td>
<td>-152</td>
<td>-144</td>
<td>-140</td>
</tr>
<tr>
<td>10 MHz</td>
<td>-156</td>
<td>-152</td>
<td>-153</td>
<td>-153</td>
</tr>
<tr>
<td>Floor</td>
<td>-156</td>
<td>-152</td>
<td>-155</td>
<td>-152</td>
</tr>
</tbody>
</table>

Measured phase noise

**Harmonics**

- **Range ≤ 0 dBm**
  - DC to 50 MHz: < -65 dBc
  - 25 MHz to 3 GHz: < -38 dBc
  - 3.5 GHz to 6.25 GHz: < -45 dBc
Harmonics (cont...)

Range ≤ 10 dBm

- DC to 50 MHz (≤ 7 dBm) < -55 dBc
- 25 MHz to 3 GHz < -35 dBc
- 3.5 GHz to 6.25 GHz < -27 dBc

Measured 2\textsuperscript{nd} and 3\textsuperscript{rd} order harmonics @ P = 0 dBm

Measured 2\textsuperscript{nd} and 3\textsuperscript{rd} order harmonics @ P = 10 dBm
### Nonharmonics – close-in spurs

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Nonharmonics (dBc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC to 50 MHz</td>
<td>&lt; -75 dBc, nominal</td>
</tr>
<tr>
<td>25 MHz to 3 GHz</td>
<td>&lt; -70 dBc, nominal</td>
</tr>
<tr>
<td>3 GHz to 6.25 GHz</td>
<td>&lt; -60 dBc, nominal</td>
</tr>
</tbody>
</table>

### Nonharmonics – far-out spurs

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Nonharmonics (dBc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC to 50 MHz</td>
<td>&lt; -80 dBc, nominal</td>
</tr>
<tr>
<td>25 MHz to 5.5 GHz</td>
<td>&lt; -75 dBc, nominal</td>
</tr>
<tr>
<td>5.5 GHz to 6.25 GHz</td>
<td>&lt; -65 dBc, nominal</td>
</tr>
</tbody>
</table>

### Subharmonics

None

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7. Close-in non-harmonics spurs include synthesizer spurs, intermodulation products of internal synthesizers, and power supply products, for carrier offsets greater than 50 kHz but less than 3 MHz.

8. Operating the low frequency generator from DC to 50 MHz; low frequency generator register enabled to extend upper frequency from 25 MHz to 50 MHz.

9. Far-out spurs are those that are farther than 3 MHz from the carrier.

### 6. Sensor Specifications

<table>
<thead>
<tr>
<th><strong>Frequency</strong></th>
<th><strong>Range</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 MHz to 6 GHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Sensitivity</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RMS mode</td>
<td>TBD</td>
</tr>
<tr>
<td>Envelope mode</td>
<td>TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Reading</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>TBD</td>
</tr>
<tr>
<td>Averaging</td>
<td>TBD</td>
</tr>
</tbody>
</table>
# 7. General Specifications

## Environmental

<table>
<thead>
<tr>
<th></th>
<th>SC5508A</th>
<th>SC5507A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Device Operating Temperature</td>
<td>-10°C to +75°C</td>
<td>0°C to +55°C</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>SC5508A</td>
<td>SC5507A</td>
</tr>
<tr>
<td>Ambient Storage Temperature</td>
<td>-40°C to +100°C</td>
<td>-40°C to +100°C</td>
</tr>
<tr>
<td>Operating Relative Humidity</td>
<td>10% to 90%, non-condensing</td>
<td>10% to 90%, non-condensing</td>
</tr>
<tr>
<td>Storage Relative Humidity</td>
<td>5% to 90%, non-condensing</td>
<td>5% to 90%, non-condensing</td>
</tr>
<tr>
<td>Operating Shock</td>
<td>30 g, half-sine pulse, 11 ms duration</td>
<td>30 g, half-sine pulse, 11 ms duration</td>
</tr>
<tr>
<td>Storage Shock</td>
<td>50 g, half-sine pulse, 11 ms duration</td>
<td>50 g, half-sine pulse, 11 ms duration</td>
</tr>
<tr>
<td>Operating Vibration</td>
<td>5 Hz to 500 Hz, 0.31 g&lt;sub&gt;rms&lt;/sub&gt;</td>
<td>5 Hz to 500 Hz, 0.31 g&lt;sub&gt;rms&lt;/sub&gt;</td>
</tr>
<tr>
<td>Storage Vibration</td>
<td>5 Hz to 500 Hz, 2.46 g&lt;sub&gt;rms&lt;/sub&gt;</td>
<td>5 Hz to 500 Hz, 2.46 g&lt;sub&gt;rms&lt;/sub&gt;</td>
</tr>
<tr>
<td>Altitude</td>
<td>Up to 10,000 feet (de-rate max device temperature to 60 °C)</td>
<td>Up to 10,000 feet (de-rate max device temperature to 60 °C)</td>
</tr>
</tbody>
</table>

## Physical

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (W x H x D, max envelope)</td>
<td>3.7” x 0.75” x 5.75”</td>
</tr>
<tr>
<td>Weight</td>
<td>1.0 lb.</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>10 to 15 VDC</td>
</tr>
<tr>
<td>Current</td>
<td>Peak (initial) 2.7 A max @ 12V</td>
</tr>
<tr>
<td></td>
<td>Steady (average) 1.90 A @ 12V</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>24 W max</td>
</tr>
<tr>
<td>Communication Interface</td>
<td>PXIe, USB and RS-232 / SPI</td>
</tr>
</tbody>
</table>

## Electromagnetic Compatibility (EMC)

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Basic immunity
- EN 55011 (CISPR 11): Class A Radiated emissions
- EN 55011 (CISPR 11): Class A Conducted emissions
- EN 61000-4-2: Electrostatic Discharge
- EN 61000-4-3: Radiated Immunity
- EN 61000-4-6: Conducted Immunity
- FCC 15.109: Radiated emissions
- ICES-003: Class A emissions
CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Warranty

3 years on parts and labor on defects in materials or workmanship
8. Revision Table

<table>
<thead>
<tr>
<th>Revision</th>
<th>Revision Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>3/14/2019</td>
<td>Document Created</td>
</tr>
<tr>
<td>0.2</td>
<td>4/29/2019</td>
<td>Preliminary</td>
</tr>
<tr>
<td>0.3</td>
<td>5/2/2019</td>
<td>Added EMC info, corrected harmonics graphs</td>
</tr>
</tbody>
</table>