RSYN01G20GA

**Ultra Low Phase Noise USB Controlled RF Synthesizer**

**0.039GHz - 22GHz**

**Product Description**

RSYN01G20GA is an ultra low phase noise usb controlled RF synthesizer with a frequency range of 0.039 to 22GHz.

The power output of this RF synthesizer is +10dBm. The frequency stability is ± 0.5ppm using the onboard reference.

The RSYN01G20GA is an easy-to-use high frequency signal generator controlled through a standard USB port. Using advanced VCO and DDS based technology along with a temperature compensated crystal reference, it offers ultra-low phase noise and high frequency resolution.

**Features**

- DDS Driven RF Synthesizer
- TCXO Reference
- External 10MHz.
- Low Phase Noise.
- DLL programming supported.
- USB2.0 Interface

**Typical Applications**

- Wireless Infrastructure
- Military and Aerospace Applications
- Test Instrumentation
- Radar Systems
- 5G Wireless Communications
- Microwave Radio Systems
- TR Modules
- Research and Development
- Cellular Base Stations

**Electrical Specifications (T_A=+25°C)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>0.039</td>
<td>22</td>
<td>GHz</td>
<td></td>
</tr>
<tr>
<td>Output Power</td>
<td>10</td>
<td></td>
<td>dBm</td>
<td></td>
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<tr>
<td>Output Power Accuracy</td>
<td>±1.5</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Output Power Tuning range</td>
<td>31.5</td>
<td>dB</td>
<td>dB</td>
<td></td>
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<tr>
<td>Frequency stability</td>
<td>±0.5</td>
<td></td>
<td>ppm</td>
<td></td>
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<tr>
<td>Frequency Aging(10 years)</td>
<td>±3</td>
<td></td>
<td>ppm</td>
<td></td>
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<tr>
<td>Tuning Speed (Not including programming time)</td>
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<td></td>
<td>us</td>
<td></td>
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<tr>
<td>Reference tuning range</td>
<td>±100</td>
<td></td>
<td>ppm</td>
<td></td>
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<tr>
<td>Tuning Step</td>
<td>0.001</td>
<td></td>
<td>Hz</td>
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<tr>
<td>SFDR 1MHz Tuning Step</td>
<td>65</td>
<td></td>
<td>dBc</td>
<td></td>
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<tr>
<td>2nd Harmonic</td>
<td>30</td>
<td></td>
<td>dBc</td>
<td></td>
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<tr>
<td>3rd Harmonic</td>
<td>35</td>
<td></td>
<td>dBc</td>
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</tr>
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</table>

**Phase Noise @ 10GHz Typical**

-116dBc/Hz(@10KH)
-117dBc/Hz (@100KHz)
-118dBc/Hz (@1MHz)
-140dBc/Hz (@10MHz)

| Power Supply Voltage                    | +15  |      | V    |       |
| Power Supply current                    | 900   | mA   |      |       |
| EXT Reference Input Level               | 0     | 10   | dBm  |       |
| Output Connector                        | SMA-Female |      |      |       |
| External Reference Input Connector      | SMA-Female |      |      |       |
Typical Performance Plots

Tuning Speed < 110μS

10GHz

20GHz

Phase Noise

Phase Noise of all Frequencies
Typical Performance Plots

Phase Noise Comparison

Competitor's Signal Generator Phase Noise

RF-Lambda Ultra Low Phase Noise Signal Generator Phase Noise

Video Instruction Link:
http://www.rflambda.com/product_signalgenerator.jsp

Harmonics Chart

Harmonics Chart

Frequency (GHz)

Harmonic (dB)

1st Harmonic
2nd Harmonic
3rd Harmonic
User Instructions

1. Download the GUI and diver from RF-LAMBDA website.

   ![GUI Diagram]

   **RF Signal Generator**

   Frequency Range (GHz)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Frequency Range (GHz)</th>
<th>Resolution (Hz)</th>
<th>Speed (us)</th>
<th>Max. Power (dBm)</th>
<th>THz Phase Noise</th>
<th>Spurious (dBc)</th>
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<tbody>
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<td>USB Control Signal Generator</td>
<td>0.0005-32.0000</td>
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<td>100</td>
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<td>-10 dB@100Hz</td>
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</table>

2. Driver Installation:

   ![Driver Installation Diagram]

   - **USBXpressInstaller_x64.exe**
3. Install “RF Signal Source A2 Setup.exe”.

4. Connect the USB cable to the device and double click “Signal Source.exe” then turn on the +15V power supply. Right click the refresh button, and then the part number, serial number, and revision number will show up in the top right corner.
1. Select Max frequency and Start frequency in GHz then click Transfer Data.

2. External Ref = 10MHz.

3. RF OFF = No output power.

4. Step Tuning = Step Tuning mode

5. Hopping = Hopping mode
Step Tuning Mode

1. Input “Start Frequency”, “Step Frequency”, “Stop Frequency”, and “Step Tuning Delay(ms)”. Check “Step Tuning” mode then click “Transfer Data”. The device will automatically follow the instruction setup to output frequencies and start to looping until the user click stop.

A. Start Frequency: The starting frequency in GHz

B. Step Frequency: The difference between each frequency in GHz.

C. Stop Frequency: The last frequency in GHz.

D. Step Tuning Delay(ms): Delay in between each frequency in microseconds.
Hopping Mode needs create a file in the installation directory, so please run “Signal Source.exe” as an administrator.

1. Check “Hopping” mode then click Hopping Table.

2. The frequency setup is the same as the “Step Tuning Mode”, after that click “Create Table”. The table give the customer options to manually edit the frequency, attenuation, and delay. After all the modifications click “Save Table Data”. Then click “close”.

![Image of Signal Source software interface with Hopping mode selected]
3. Check “Hopping” mode and Click “Transfer Data” to start the hopping function.
1. Input “Start Frequency”, “Output Attenuation”, and then click “Set as Default”. The device will store the frequency and the attenuation into flash. It will allow the unit automatically output this frequency and attenuation when the device wakes up. If the customer is using external 10MHz reference, please check “External Ref” button and then set the default state into flash.
Remote Control

Please see the detailed instructions in the driver folder.

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</table>
Notes:
1. Package Material: Aluminium or Copper
2. Plating: Black
3. All dimensions are in millimeters [inches].
4. Housing Tolerances ±0.2 [0.008] unless otherwise specified.
5. Heat sink required during operation (sold separately). Matching heatsink is listed on our website. If customer would like to use their own cooling method, please make sure the amplifier will operate under the specs that listed in page 2 of this datasheet.
6. Standard torque wrench must be used to secure RF connectors.

Additional Information

<table>
<thead>
<tr>
<th>Documentation</th>
<th>Webpage</th>
</tr>
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<tbody>
<tr>
<td>Heatsink Lookup Specifications</td>
<td><a href="https://rflambda.com/search_heatsink.jsp">https://rflambda.com/search_heatsink.jsp</a></td>
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### Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Modification</th>
<th>Description</th>
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<tr>
<td>RSYN01G20GA</td>
<td>Input connector SMA-Female and Output connector SMA-Female</td>
<td>0.039GHz-22GHz Ultra Low Phase Noise USB Controlled RF Synthesizer</td>
</tr>
</tbody>
</table>

### Amplifier Use

Ensure that the amplifier input and output ports are safely terminated into a proper 50 ohm load before turning on the power. Never operate the amplifier without a load. A proper 50 ohm load is defined as a load with impedance less than 1.9:1 or return loss larger than 10dB relative to 50 Ohm within the specified operating bandwidth.

**Power Supply Requirements**

- Power supply must be able to provide adequate current for the amplifier. Power supply should be able to provide 1.5 times the typical current or 1.2 times the maximum current (whichever is greater).

- In most cases, RF-Lambda amplifiers will withstand severe mismatches without damage. However, operation with poor loads is discouraged. If prolonged operation with poor or unknown loads is expected, an external device such as an isolator or circulator should be used to protect the amplifier.

- Ensure that the power is off when connecting or disconnecting the input or output of the amp.

- Prevent overdriving the amplifier. Do not exceed the recommended input power level.

- Adequate heat-sinking required for RF amplifier modules. Please inquire.

- Amplifiers do not contain Thermal protection, Reverse DC polarity or Over voltage protection with the exception of a few models. Please inquire.

- Proper electrostatic discharge (ESD) precautions are recommended to avoid performance degradation or loss of functionality.

- What is not covered with warranty?

Each RF-Lambda amplifier will go through power and temperature stress testing. Since the die, ICs or MMICs are fragile, these are not covered by warranty. Any damage to these will NOT be free to repair.

### Important Notice

The information contained herein is believed to be reliable. RF-Lambda makes no warranties regarding the information contained herein. RF-Lambda assumes no responsibility or liability whatsoever for any of the information contained herein. RF-Lambda assumes no responsibility or liability whatsoever for the use of the information contained herein. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the user. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for RF-Lambda products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information.

RF-Lambda products are not warranted or authorized for use as critical components in medical, life-saving, or life sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.