SOT-02240310200-KF-B6

Frequency Synthesizer Module, Low Phase Noise 0.2 to 40 GHz

SOT-02240310200-KF-B6 is a low phase noise frequency synthesizer module designed and manufactured for standard test instrumentation, communication, and Radar systems as a local oscillator. The module covers a frequency range of 0.2 to 40 GHz with an exceptional low harmonics and spurious emissions as well as superior low phase noise performance. The model is externally referenced with internal reference backup. The frequency resolution of the module is up to 0.2 Hz. The phase noise of the oscillator is dependent on the quality of the reference source. The oscillator has a maximum spurious of -60 dBc. The oscillator has a built-in voltage regulator to further improve the signal quality and provide over voltage protection. The normal operating state of the oscillator is external referenced. This module can be directly controlled with digital signals through Micro-D Connector. Proper connecting cables and user manual for system integration are provided with the synthesizer. Eravant includes a generic GUI (Graphic User Interface) for initial system set and rapid system development.

Electrical Specifications:

Parameter	Minimum	Typical	Maximum
Output Frequency Range	0.2 GHz		40 GHz
Step Size	0.1 Hz @ 0.2-20 GHz; 0.2 Hz @ 20-40 GHz		
Output Power	-40 to +10 dBm (Controllable by Command)		
Step Size	0.1 dBm		
Output Power Flatness	± 2.0 dB		
Frequency Stability	±0.2 ppm or Same as External Reference		
Frequency Accuracy	±0.2 ppm or Same as External Reference		
Output Spurious		-65 dBc	-60 dBc
Output Harmonics		-20 dBc	
External Reference Input	10 MHz/ +7 dBm ± 3 dBm		
Internal Reference Input	100 MHz/ +10 dBm Typical		
Lock Indicator (LD)	TTL High		
Phase Noise (Internal) RF Frequency at 40 GHz	≤-95 dBc/Hz @ 1 kHz; ≤-104 dBc/Hz @ 10 kHz; ≤-104 dBc/Hz @ 100 kHz; ≤-104 dBc/Hz @ 1 MHz		
Frequency Switching Time	≤200 us (Excludes the Series Port Communication Time)		

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FEATURES

- Output Power Controllable
- Low Phase Noise and Harmonics
- External Referenced with Internal Backup

APPLICATIONS

- Radar Systems
- Communication Systems
- Test instrumentations

SUPPLEMENTAL DETAILS

Bias and Environmental Specifications:

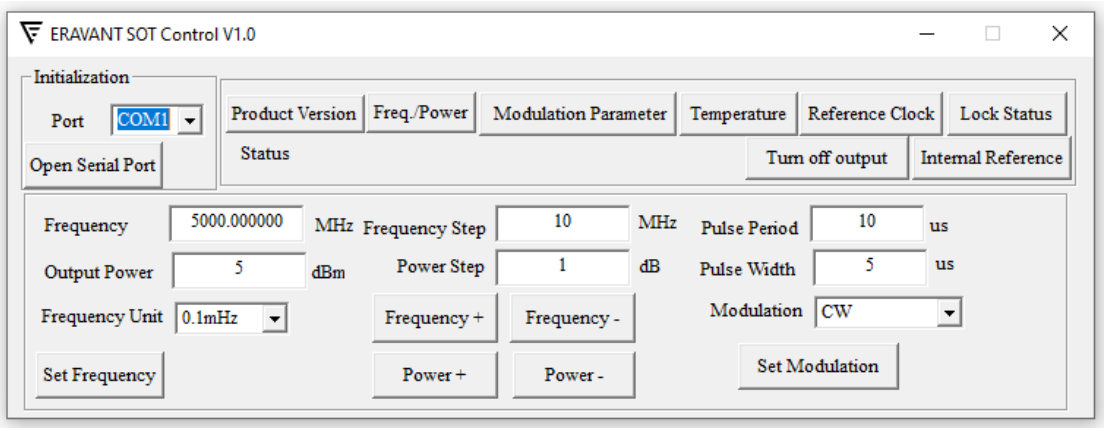
Parameter	Minimum	Typical	Maximum
Output Frequency Range	0.2 GHz		40.0 GHz
Control Protocol		RS232	
Pulse Modulation Depth		≥60 dBc @ Output Power +10 dBm	
Pulse Modulation Pulse Width	0.1 ms	5 ms	10 ms
Pulse Modulation Time		≤50 ns Raise/100 ns Fall	
DC Supply Voltage	+10.8 V_{DC}	+12 V_{DC}	+13.2 V_{DC}
DC Supply Current		1,600 mA	
Specification Temperature		+25°C	
Operating Temperature	-40°C		+70°C

Mechanical Specifications:

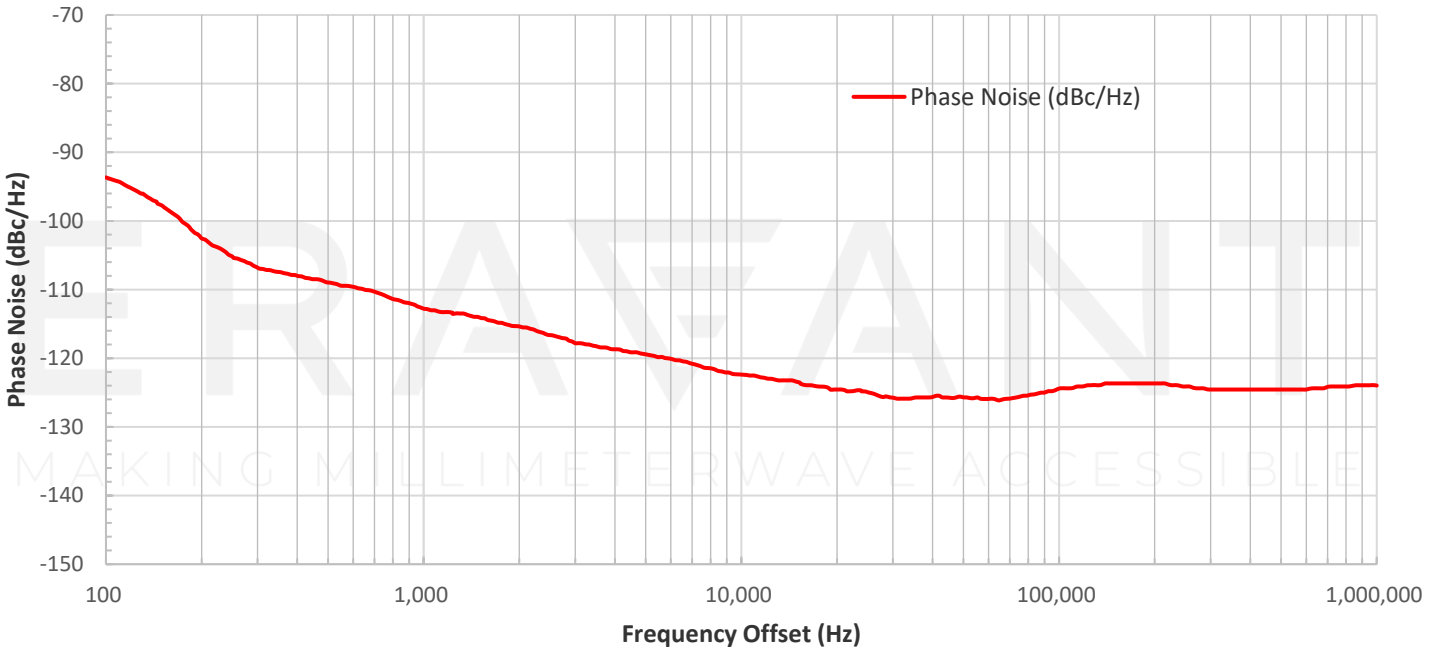
Item	Specification
RF Output	2.92 mm (F) Connector
Bias and Control Port	9 Position D-Type, Micro-D Socket (Female)
External Reference Input Port	SMA (F) Connector
Internal Reference Output Port	SMA (F) Connector
Body Material	Aluminum
Finish	Nickel Plated
Weight	15.2 Oz
Dimension	5.75” (L) x 3.74” (W) x 0.83” (H)
Outline	OT-BC-SM2

GUI (Graphic User Interface):

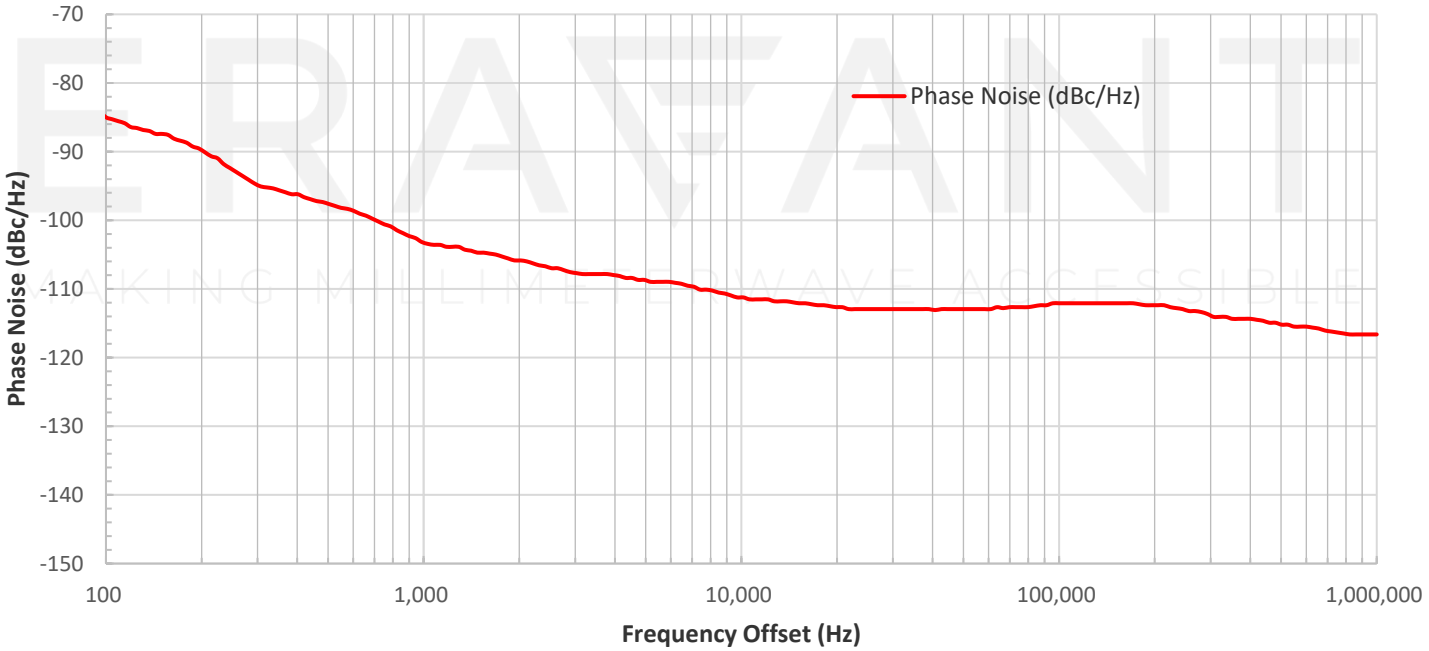
The GUI allows the users to easily tune the synthesized frequency of this module manually.



Measured Phase Noise @ 10 GHz Output:
25 °C Operating Temperature



Measured Phase Noise @ 20 GHz Output:
25 °C Operating Temperature



Measured Phase Noise @ 40 GHz Output:
25 °C Operating Temperature

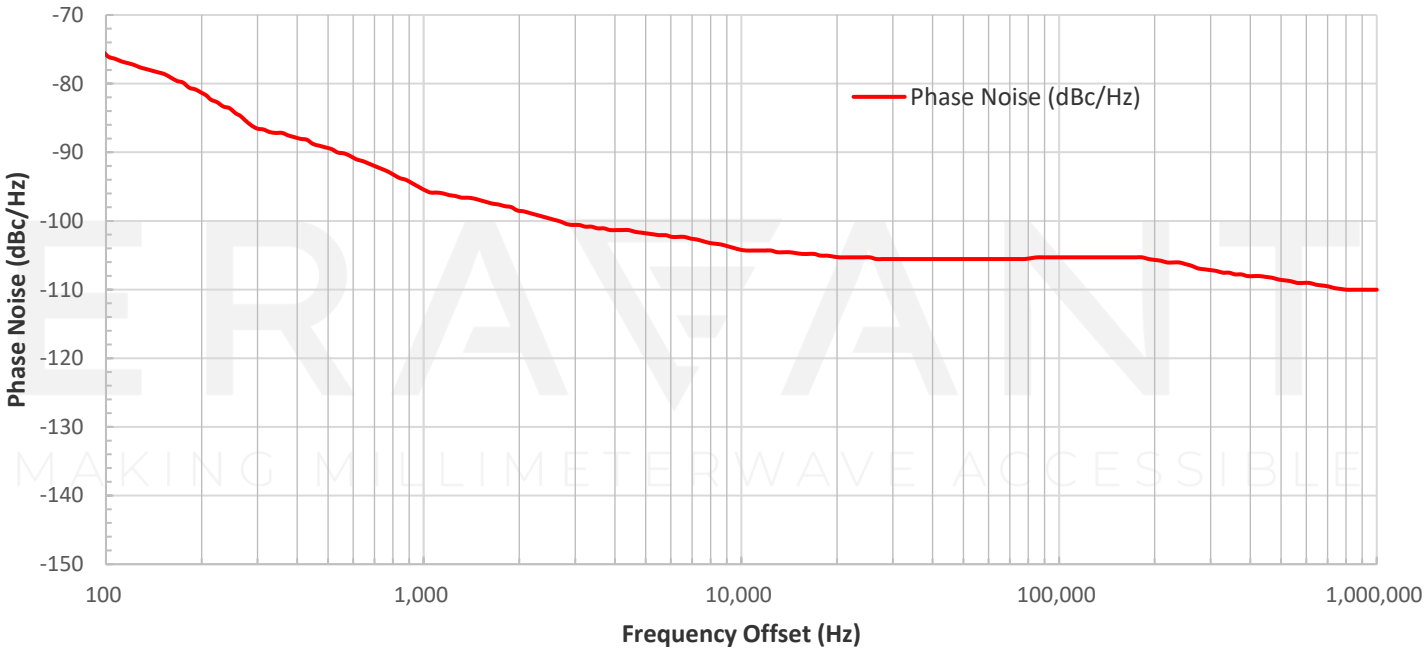
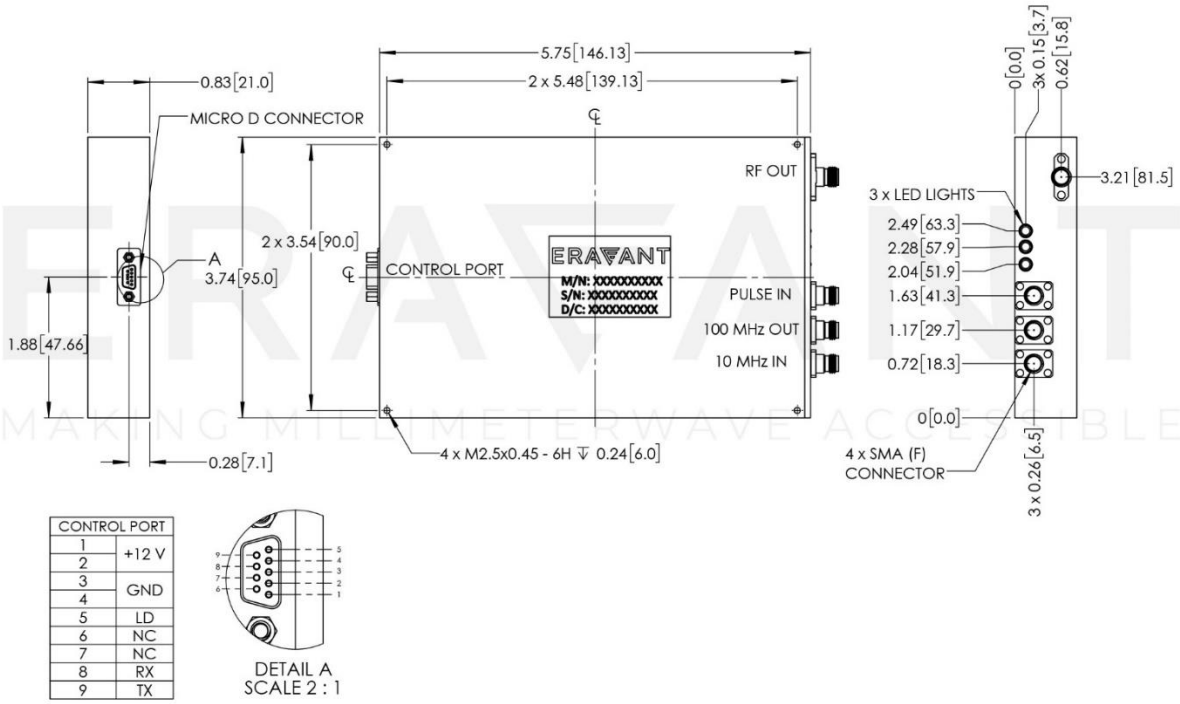


Table of Measured Phase Noise vs Output Frequency

	Output Frequency				
Frequency Offset	**1 GHz**	**5 GHz**	**10 GHz**	**20 GHz**	**40 GHz**
100 Hz	-105 dBc/Hz	-91 dBc/Hz	-85 dBc/Hz	-79 dBc/Hz	-73 dBc/Hz
1 kHz	-125 dBc/Hz	-113 dBc/Hz	-107 dBc/Hz	-101 dBc/Hz	-95 dBc/Hz
10 kHz	-135 dBc/Hz	-122 dBc/Hz	-116 dBc/Hz	-110 dBc/Hz	-104 dBc/Hz
100 kHz	-135 dBc/Hz	-122 dBc/Hz	-116 dBc/Hz	-110 dBc/Hz	-104 dBc/Hz
1 MHz	-135 dBc/Hz	-122 dBc/Hz	-116 dBc/Hz	-110 dBc/Hz	-104 dBc/Hz

Mechanical Outline: Unless otherwise specified, all dimensions are in inches [millimeters])



CONTROL PORT	
1	+12 V
2	
3	GND
4	
5	LD
6	NC
7	NC
8	RX
9	TX

NOTE:

- All data presented is collected from a sample lot. Actual data may vary unit to unit, slightly.
- All testing was performed under +25 °C case temperature.
- All well-regulated DC power supply capable of delivering +12 V_{DC}/2A is required. The proper pin designation of the power supply on the Micro-D connector is illustrated in the outline drawing above.
- The output power is controllable by the command.
- The device is controlled via Personal Computer. A USB to Micro-D connector cable is needed to form the connection.

While the standard interconnection cables are included as a kit with details shown in below table for convenient customer setup, the step-by-step custom cable configurations are given in the Appendix below.

Item	Model Number	Quantity
USB (Type A) to RS232 (DB9 Male) Cable	SOT-CC-D9MUB-S1	1
DB9 to Micro-D Cable	SOT-CC-D9FM9M-S1	1

- The phase noise shown in with internal reference at room temperature. If external reference is used, phase noise can be estimated from the **external reference phase noise + 20*log(N) + 3**, where N is the multiplication factor.
- Eravant reserves the right to change the information presented without notice.

CAUTION:

- The device is static sensitive. Always follow ESD rules when working with the device.
- Wrong bias or reverse bias the synthesizer will damage the device.
- Exceeding absolute maximum ratings shown will damage the device. Use additional heatsink or fan if necessary. The case temperature of the device should never exceed **+70 °C**.
- Proper torque should be applied: 8.0 ± 0.15 inch-pounds (0.90 ± 0.02 Nm). Torque wrench model SCH-08008-S1 is highly recommended.

Appendix (Wiring Instructions)**:**

- To connect **SOT-02240310200-KF-E6** with computer USB port, the following components are required.
  - An USB to Serial Adapter with USB to RS-232 9-Pin DB9 Male connectors.
  - A Customized cable with DB9 female (9 pin, 2 row) and D-Sub Micro-D male (9 pin, 2 row) connectors
- To make customized cable, follow steps below:
  - Use 9-wire D-sub cable or flat ribbon cable. The pin designations are shown in Table 1.

Table 1. Micro-D to DB9 Cable Connecting Diagram

Micro-D Socket (Female)	DB9 Socket (Female)
Pin-9 TX	Pin-2 TX
Pin-8 RX	Pin-3 RX
Pin-4 GND	Pin-5 GND

  - The cable with color-coded designations is recommended for easy identification.

Pin Number	Wire Color
1	White
2	Brown
3	Red
4	Orange
5	Yellow
6	Green
7	Blue
8	Purple
9	Gray

    - Use Figure 1 to identify pin callouts of standard Micro-D and DB9 connectors.

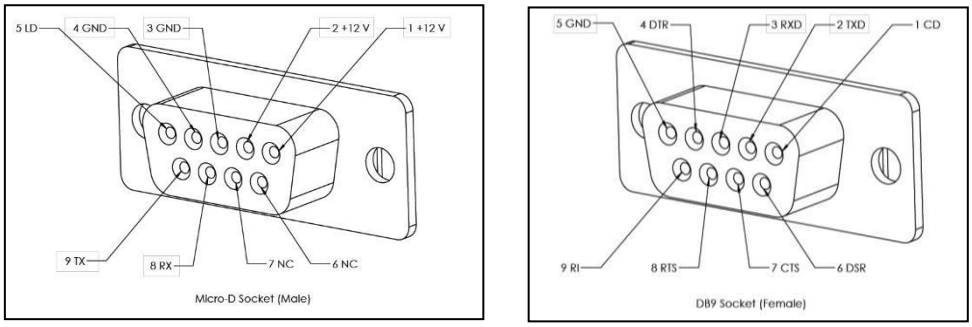


Figure 1. Pin Callouts for Micro-D Socket and DB9 Socket

    - Solder the cable to connect the pins of Micro-D and DB9 connectors per Table 1. For DB9 connector, TX, RX and ground pins are connected to Micro-D connector and the first three pins are for power supply. For Micro-D connector, Pin 1 and Pin 2 are for +12 V_{DC} power supply, and Pin 3 is for ground. Pin 5, 6 and 7 are not used.

- Follow schematic show in Figure 2 to connect the computer and synthesizer so that the communication can be established via Eravant provided GUI program.

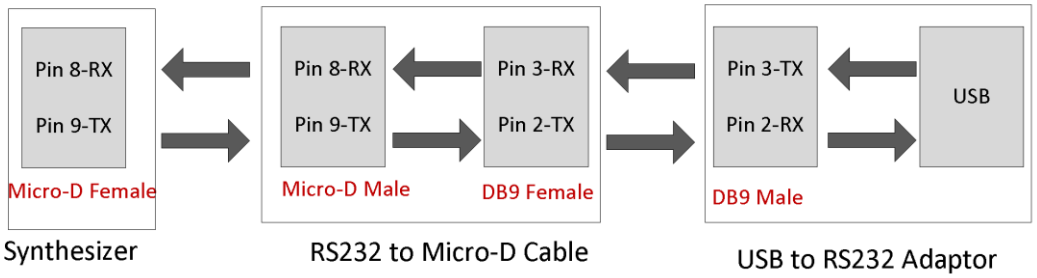


Figure 2. Connecting interface block diagram