



## Frequency Synthesizer Module, High Speed, 0.1 to 10 GHz, 3 μs

### Description:

**Model SOT-01210313003-SF-B6** is a fast-hopping 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 0.1 to 10 GHz with an exceptional high hopping speed of 3 μs, low harmonics and spurious emissions as well as superior low phase noise performance. The frequency resolution of the module is up to 10 kHz. The phase noise of the oscillator is dependent on the quality of the reference source. When the oscillator operates with the internal reference, the phase noise is -102 dBc/Hz at 10 kHz offset at 10 GHz frequency point. 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. This module can be directly controlled with digital signals following parallel communication protocol through Mini Delta Ribbon (MDR) connector. Eravant offers an evaluation kit including the control board under model number, **SOT-EVA-S1**, with the GUI (Graphic User Interface) for initial system set and rapid system development.



### Features:

- 3 μs Frequency hopping Speed
- Low Phase Noise and Harmonics
- External Referenced with Internal Backup

### Applications:

- Radar Systems
- Communication Systems
- Test instrumentations

### Electrical Specifications:

Parameter	Minimum	Typical	Maximum
Output Frequency Range	0.100 GHz		10.000 GHz
Step Size	10 kHz		
Output Power	+10 dBm	+13 dBm	+16 dBm
Frequency Stability	±0.5 ppm or Same as External Reference		
Frequency Accuracy	±0.5 ppm or Same as External Reference		
Output Spurious			-60 dBc
Output Harmonics	≤-7 dBc/0.1-0.5 GHz and ≤-40 dBc/0.5-10 GHz		
Internal Reference	100 MHz		
Internal Reference Output	100 MHz/10 dBm (Typical)		
External Reference	10 MHz/ +5 dBm ± 3 dBm		
Lock Indicator	TTL High		
Phase Noise (Internal)	≤-98 dBc/Hz @ 1 kHz; ≤-102 dBc/Hz @ 10 kHz		
RF Frequency at 10 GHz	≤-102 dBc/Hz @ 100 kHz; ≤-104 dBc/Hz @ 1,000 kHz		
Frequency Hopping Time	≤3 μs (Time required to Stabilize the Frequency to ±1 MHz)		
Power Stability		±2 dB	
Control Method	Parallel Port Communication Protocol		
Pulse Modulation Depth	≥60 dBc		
Pulse Modulation Pulse Width	0.1 ms	5 ms	10 ms
Pulse Modulation Time	≤30 ns Raise/50 ns Fall		





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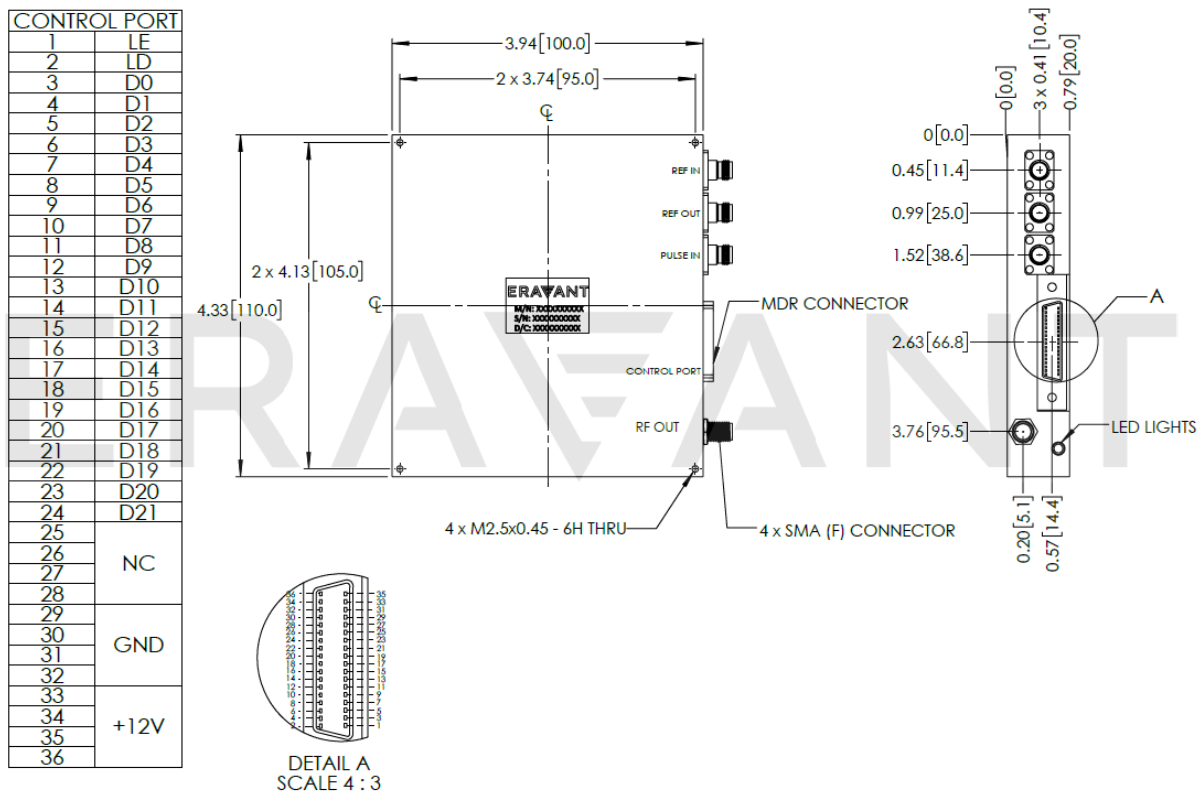
### Bias and Environmental Specifications:

Parameter	Minimum	Typical	Maximum
Supply Voltage/Current	+10.8 V <sub>DC</sub>	+12 V <sub>DC</sub> /1,600 mA	+13.2 V <sub>DC</sub>
Specification Temperature		+25 °C	
Operating Temperature	-40 °C		+70 °C

### Mechanical Specifications:

Item	Specification
RF Port	SMA(F) Connector
Bias and Control Port	Mini Delta Ribbon (MDR) Socket, 36 Positions, 2 Rows
External Reference Input Port	SMA(F) Connector
Internal Reference Output Port	SMA(F) Connector
Pulse Modulation Input Port	SMA(F) Connector
Body Material	Aluminum
Finish	Nickel Plating
Weight	0.7 Lbs
Dimension	4.33" (L) x 3.94" (W) x 0.79" (H)
Outline	OT-B6-01

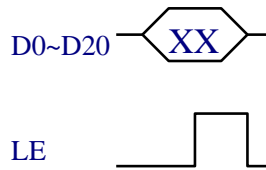
### Mechanical Outline: (Unless otherwise specified, all dimensions are in inches)





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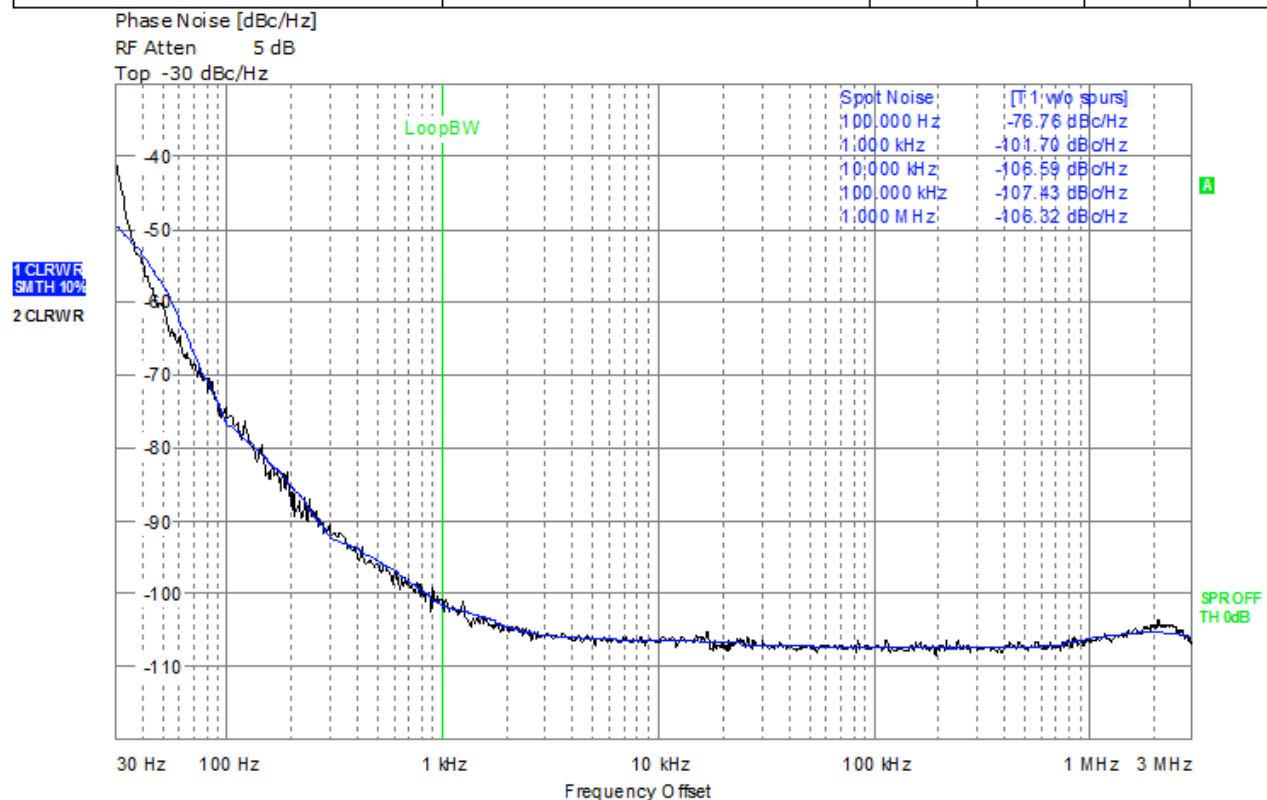
### Parallel Communication Port:



The device is controlled with a parallel communication port. Digital high level (TTL High) is +3.3 V, and its effective range is from +2.7 V to +3.6 V; digital low level (TTL Low) is 0 V and its effective range is from 0 to +0.6 V. The data is sampled at the rising edge of LE (latch enable) signal. The TTL High and TTL Low of LE needs to maintain at least 30 ns. Pins D0-D20 controls the synthesized frequency. The unit of synthesized frequency is 10 KHz. For example, when frequency is synthesized to 9.8 GHz, the control data is 980000. The data sent through parallel port is EF420H. Pin D21 is reserved.

### Measured Phase Noise @ 10 GHz Output:

R&S FSUP 26 Signal Source Analyzer				LOCKED	
Settings		Residual Noise [T1 w/o spurs]		Phase Detector +0 dB	
Signal Frequency:	10.000000 GHz	Int PHN (30.0 .. 3.0 M)	-37.1 dBc		
Signal Level:	14.11 dBm	Residual PM	1.134 °		
Cross Corr Mode	Harmonic 1	Residual FM	21.928 kHz		
Internal Ref Tuned	Internal Phase Det	RMS Jitter	0.3149 ps		



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### GUI (Graphic User Interface)

The evaluation kit includes a control board, **SOT-EVA-S1**, and GUI. The control board is not included in this product, but it can be ordered separately. The evaluation kit allows the users to easily set up the system and control the synthesized frequency of this module manually. The computer display of the GUI interface is shown below.



#### 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.
- A well-regulated DC power supply capable of delivering +12 V<sub>DC</sub>/2A is required. The proper connection of the power supply to the MDR connector is illustrated in the outline drawing above.
- Standard MDR male to MDR male cable **SOT-CC-M36MM36M-S1** is provided to connect synthesizer with Evaluation Kit **SOT-EVA-S1**.
- The phase noise shown is 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.
- The device is controlled via Personal Computer. A parallel-to-serial adapter is needed between the device and PC.
- SAGE Millimeter, Inc. 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 on the sensor 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 shall never exceed **+50 °C**.
- Proper torque, 8.0 ± 0.15 inch-pounds (0.90 ± 0.02 Nm), should be applied. **SAGE Millimeter torque wrench, model SCH-08008-S1, is highly recommended.**