



## Voltage Controlled Oscillator 7.8 - 8.7 GHz

Rev. V2

**Electrical Specifications:  $T_A = +25^\circ\text{C}$ ,  $V_{CC} = V_{BUFFER} = 5.0\text{ V}^3$ ,  $Z_0 = 50\ \Omega$**

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Output Power	RF Port, 7.8 - 8.7 GHz RF/2 Port, 3.9 - 4.35 GHz	dBm	8 0	12.5 3.5	—
SSB Phase Noise $V_{CC}=V_{BUFFER}=V_{TUNE}=5\text{V}$	RF Port, 10KHZ Offset RF Port, 100KHZ Offset	dBc/Hz	—	-90 -115	—
Harmonics/Subharmonics $V_{CC}=V_{BUFFER}=V_{TUNE}=5\text{V}$	RF Port, $\frac{1}{2} F_0$ RF Port, $2 F_0$	dBc	—	-26 -22	—
Pulling (Sensitivity to Match) $V_{CC}=V_{BUFFER}=V_{TUNE}=5\text{V}$	RF Port, VSWR = 1.95:1 to 2.25:1	MHz pk-pk	—	10.3	—
Pushing (Sensitivity to Supply Voltage)	RF Port, $V_{TUNE} = 5\text{ V}$ RF/2 Port, $V_{TUNE} = 5\text{ V}$	MHz/V	—	2 1	—
Frequency Drift Rate (Sensitivity to Temperature)	RF Port, 7.8 - 8.7 GHz RF/2 Port, 3.9 - 4.35 GHz	MHz/ $^\circ\text{C}$	—	0.75 0.3	—
Output Return Loss	RF Port, 7.8 - 8.7 GHz RF/2 Port, 3.9 - 4.35 GHz	dB	—	6 7	—
Tuning Sensitivity @ RF Port	$V_{TUNE} = 5\text{ V}$	GHz/V	—	0.14	—
Supply Current	$I_{TOTAL} (I_{CC} + I_{BUFFER})$ $I_{CC}$ $I_{BUFFER}$	mA	— — —	175 155 20	205 175 30
Tune Voltage	$V_{TUNE}$	V	1	—	13
Tuning Current Leakage	$V_{TUNE} = 13\text{ V}$	$\mu\text{A}$	—	5	10

3. VCO can operate over the 4.75 V to 5.25 V supply voltage range.

### Absolute Maximum Ratings <sup>4,5,6</sup>

Parameter	Absolute Maximum
Supply Voltage ( $V_{CC}$ & $V_{BUFFER}$ )	+5.5 Vdc
$V_{TUNE}$	0 to +15 Vdc
Storage Temperature	-55 $^\circ\text{C}$ to +150 $^\circ\text{C}$
Operating Temperature	-40 $^\circ\text{C}$ to +85 $^\circ\text{C}$
Case Temperature ( $T_C$ ) (measured @ exposed pad)	+100 $^\circ\text{C}$
Junction Temperature <sup>7</sup>	+135 $^\circ\text{C}$

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.
- Operating at nominal conditions with  $T_J \leq +135^\circ\text{C}$  will ensure MTBF >  $2.5 \times 10^6$  hours.
- Junction Temperature ( $T_J$ ) =  $T_C + \theta_{jc} * (V * I)$   
Typical thermal resistance ( $\theta_{jc}$ ) = 35 $^\circ\text{C/W}$ .
  - For  $T_C = 25^\circ\text{C}$ ,  $T_J = 56^\circ\text{C}$  @ 5 V, 175mA
  - For  $T_C = 85^\circ\text{C}$ ,  $T_J = 117^\circ\text{C}$  @ 5 V, 180 mA

### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.



**ESD Rating: Class 1A**

**ADVANCED:** Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed.

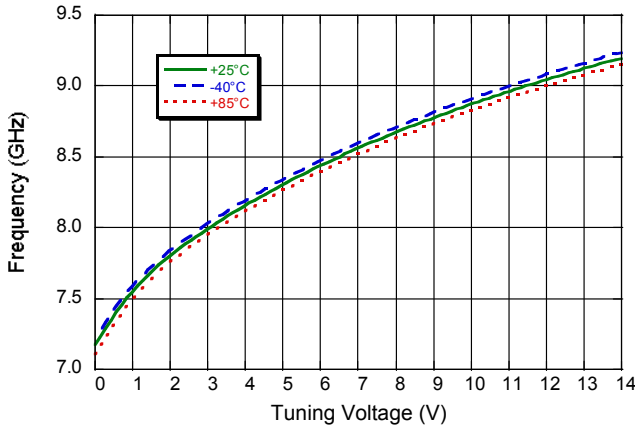
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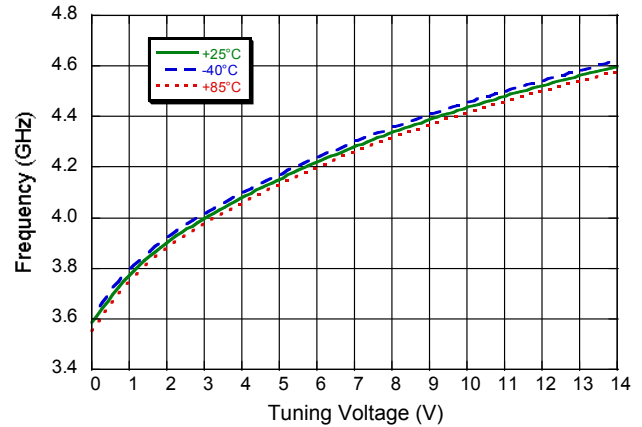
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**Typical Performance Curves:  $V_{CC} = V_{BUFFER} = 5V$ ,  $T_A = +25^\circ C$  (unless otherwise indicated)**

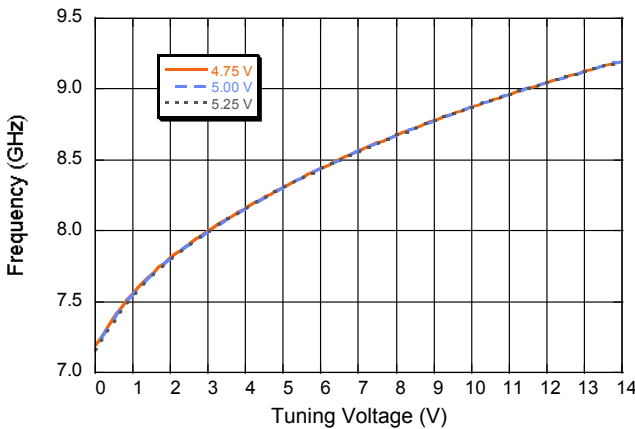
**Output Frequency vs. Tuning Voltage - RF Port**



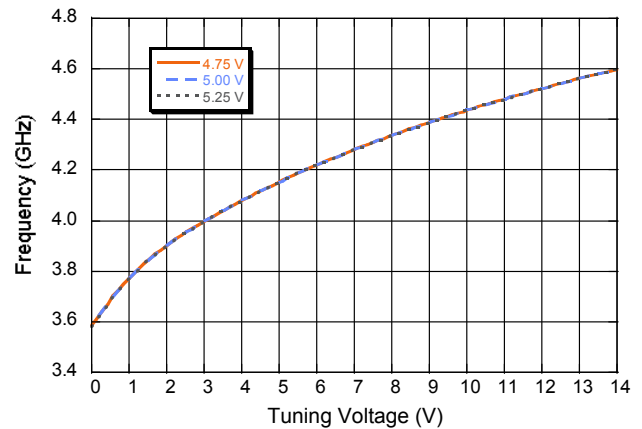
**Output Frequency vs. Tuning Voltage - RF/2 Port**



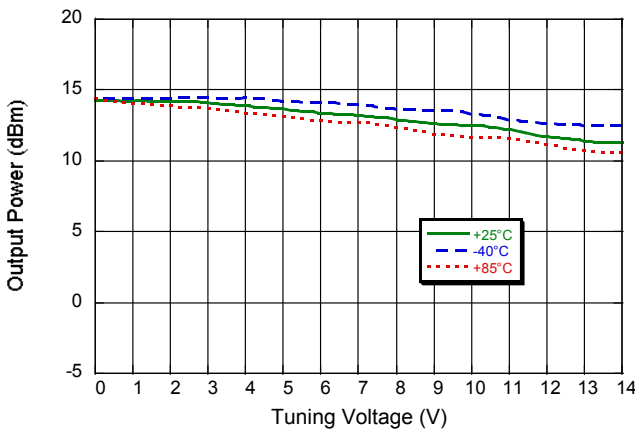
**Output Frequency vs. Tuning / Supply Voltage - RF Port**



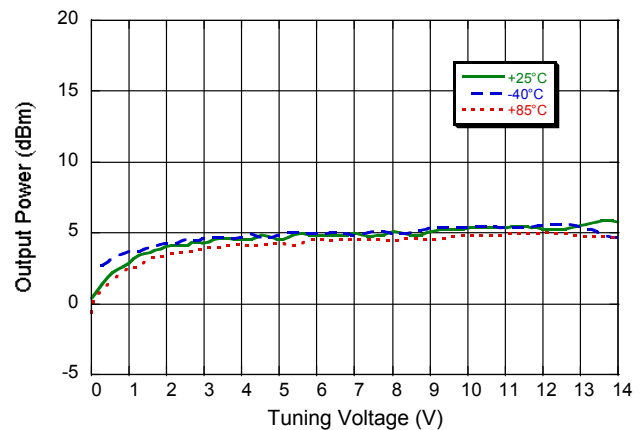
**Output Frequency vs. Tuning / Supply Voltage - RF/2 Port**



**Output Power vs. Tuning Voltage - RF Port**



**Output Power vs. Tuning Voltage - RF/2 Port**



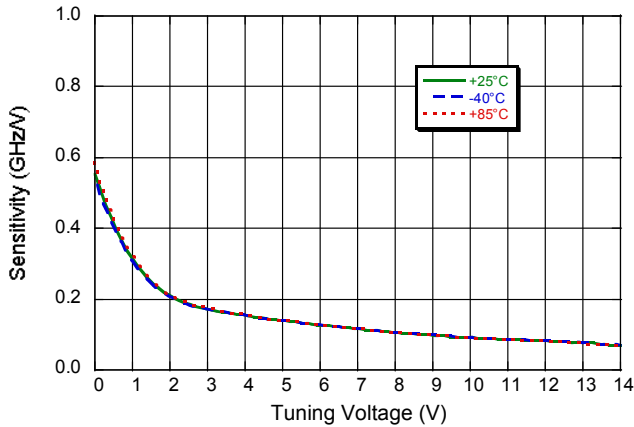
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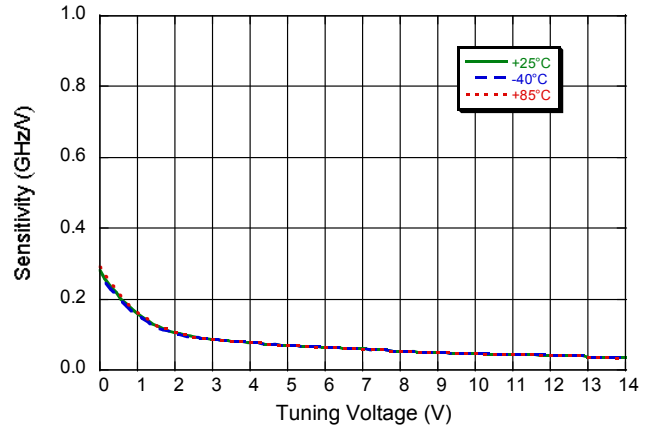
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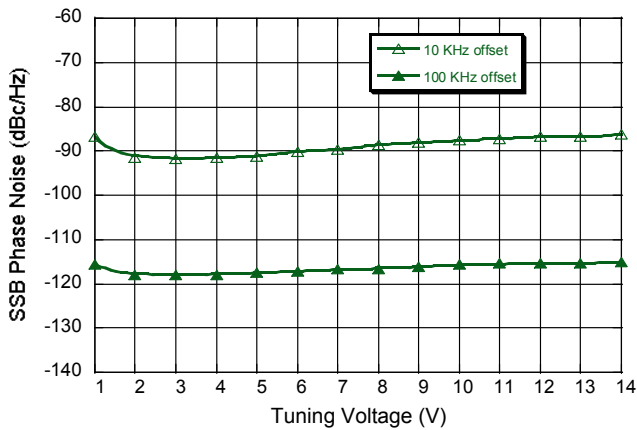
**Frequency Sensitivity vs. Tuning Voltage - RF Port**



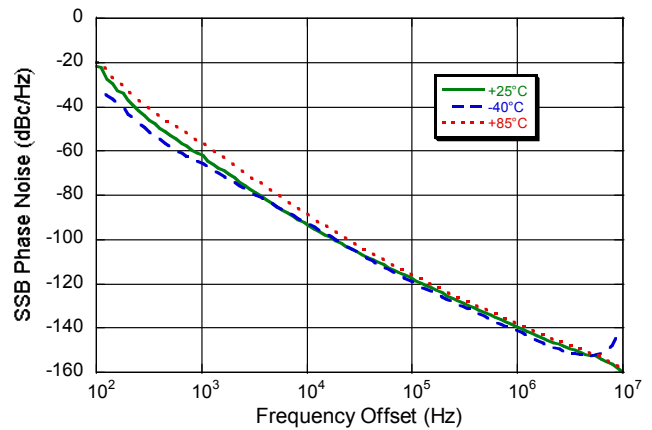
**Frequency Sensitivity vs. Tuning Voltage - RF/2 Port**



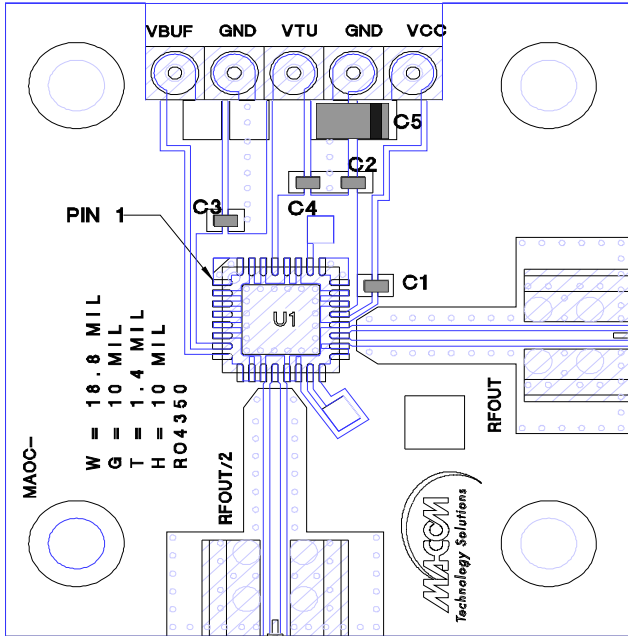
**Single Side Band Phase Noise vs. Tuning Voltage  
RF Port**



**Single Side Band Phase Noise vs. Frequency Offset  
RF Port ( $V_{TUNE} = 5V$ )**



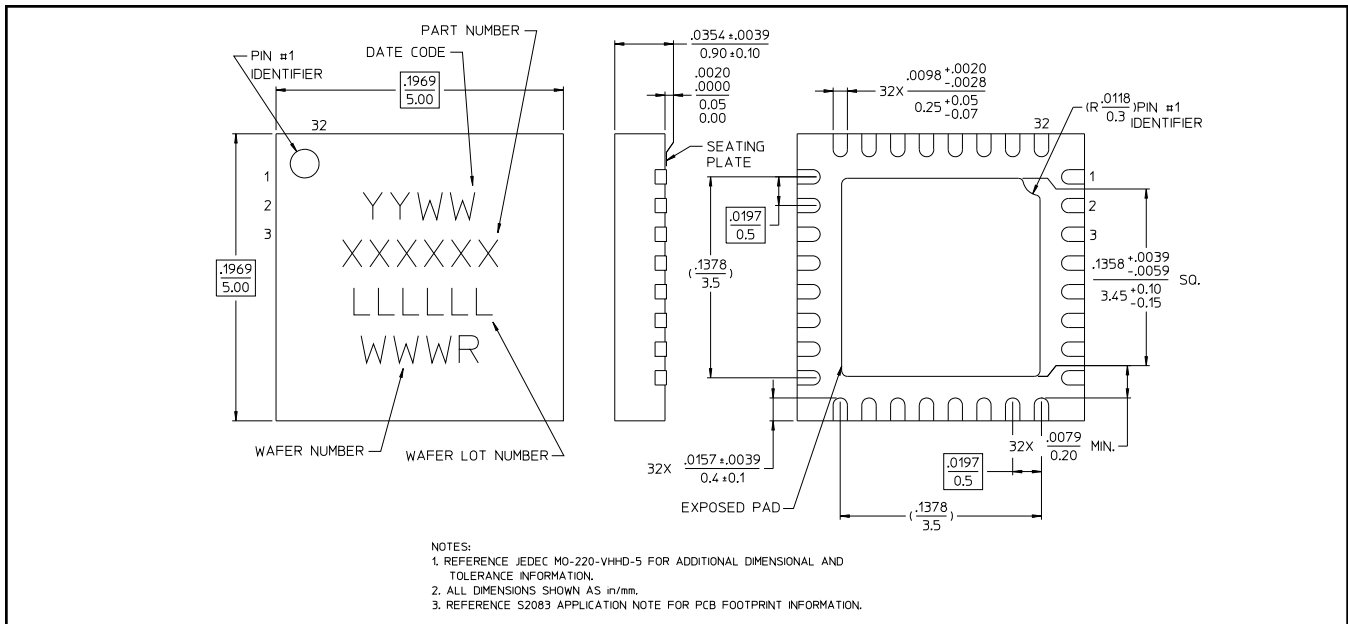
### Sample Board



### Parts List

Component	Value	Case Size
C1	100 pF	0402
C2, C3, C4	0.1 $\mu$ F	0402
C5	10 $\mu$ F Tantalum	1206

### Lead-Free 5 mm 32-Lead PQFN†



† Reference Application Note S2083 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.  
Plating is 100% matte tin over copper.