

Voltage Controlled Oscillator 13.4 - 14.4 GHz

Rev. V3

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

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Output Power	RF Port, 13.4 - 14.4 GHz RF/2 Port, 6.7 - 7.2 GHz	dBm	4 -3	8 1	—
SSB Phase Noise	RF Port, 10 KHz Offset, 13.4 - 14.4 GHz RF Port, 100 KHz Offset, 13.4 - 14.4 GHz	dBc/Hz	—	-79 -108	— -104
Harmonics/Subharmonics $V_{CC}=V_{\text{BUFFER}}=V_{\text{TUNE}}=5\text{V}$	RF Port, $\frac{1}{2} F_0$ RF Port, $2 F_0$	dBc	—	-16 -38	—
Pulling (Sensitivity to Match) $V_{CC}=V_{\text{BUFFER}}=V_{\text{TUNE}}=5\text{V}$	RF Port, VSWR = 1.95:1 to 2.25:1	MHz pk-pk	—	10	—
Pushing (Sensitivity to Supply Voltage)	RF Port, $V_{\text{TUNE}} = 5 \text{ V}$ RF/2 Port, $V_{\text{TUNE}} = 5 \text{ V}$	MHz/V	—	10 5	—
Frequency Drift Rate (Sensitivity to Temperature)	RF Port, 13.4 - 14.4 GHz RF/2 Port, 6.7 - 7.2 GHz	MHz/ $^\circ\text{C}$	—	1.2 .7	—
Output Return Loss	RF Port, 13.4 - 14.4 GHz RF/2 Port, 6.7 - 7.2 GHz	dB	—	2.5 6	—
Tuning Sensitivity @ RF Port	$V_{\text{TUNE}} = 5 \text{ V}$	GHz/V	—	0.21	—
Supply Current	$I_{\text{TOTAL}} (I_{CC} + I_{\text{BUFFER}})$ I_{CC} I_{BUFFER}	mA	—	165 145 20	205 175 30
Tune Voltage	V_{TUNE}	V	1.5	—	12.5
Tuning Current Leakage	$V_{\text{TUNE}} = 13 \text{ V}$	μA	—	5	10

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

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Absolute Maximum Ratings ^{4,5,6}

Parameter	Absolute Maximum
Supply Voltage (V _{CC} & V _{BUFFER})	+5.5 Vdc
V _{TUNE}	0 to +15 Vdc
Storage Temperature	-55°C to +150°C
Operating Temperature	-40°C to +85°C
Case Temperature (T _C) (measured @ exposed pad)	+100°C
Junction Temperature ⁷	+135°C

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.
- Operating at nominal conditions with T_J ≤ +135°C will ensure MTBF > 2.5 x 10⁶ hours.
- Junction Temperature (T_J) = T_C + Θ_{Jc} * (V * I)
Typical thermal resistance (Θ_{Jc}) = 35° C/W.
 - For T_C = 25°C, T_J = 54°C @ 5 V, 165 mA
 - For T_C = 85°C, T_J = 115°C @ 5 V, 170 mA

Handling Procedures

Please observe the following precautions to avoid damage:

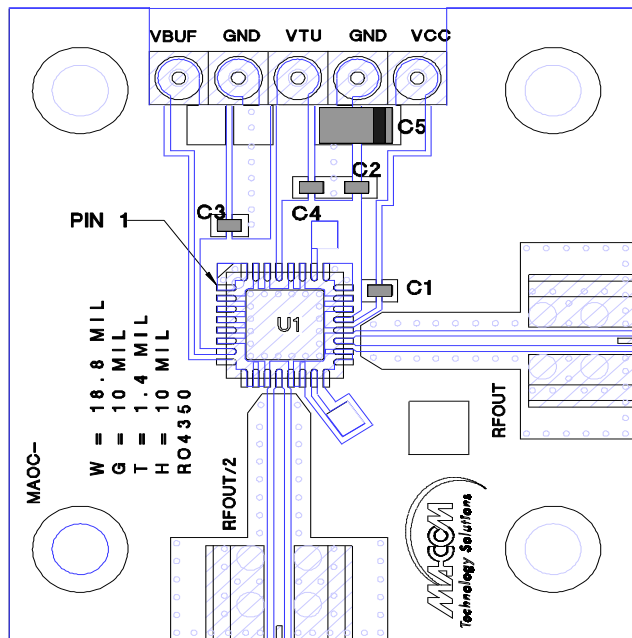
Static Sensitivity

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

Sample Board



Parts List

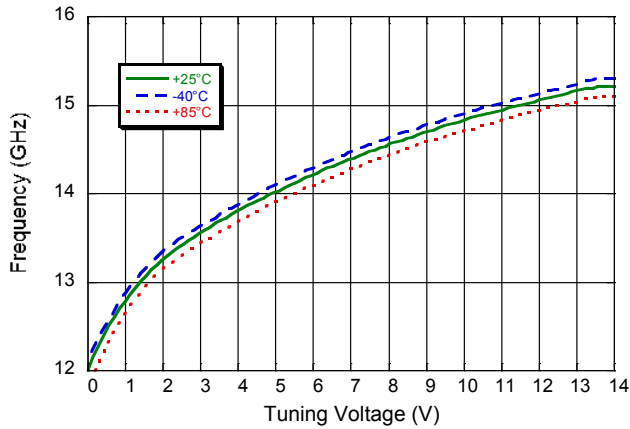
Component	Value	Case Size
C1	100 pF	0402
C2, C3, C4	0.1 μF	0402
C5	10 μF Tantalum	1206

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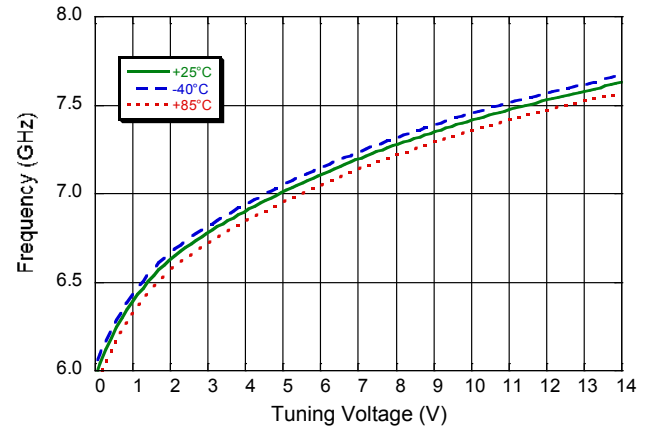
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Typical Performance Curves: $V_{CC} = V_{BUFFER} = 5V$, $T_A = +25^\circ C$ (unless otherwise indicated)

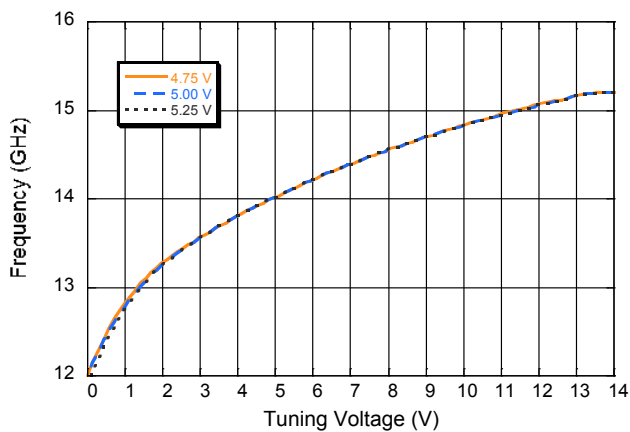
Output Frequency vs. Tuning Voltage - RF Port



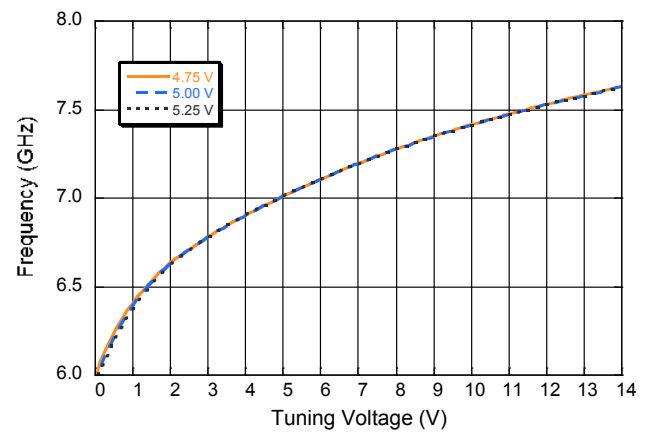
Output Frequency vs. Tuning Voltage - RF/2 Port



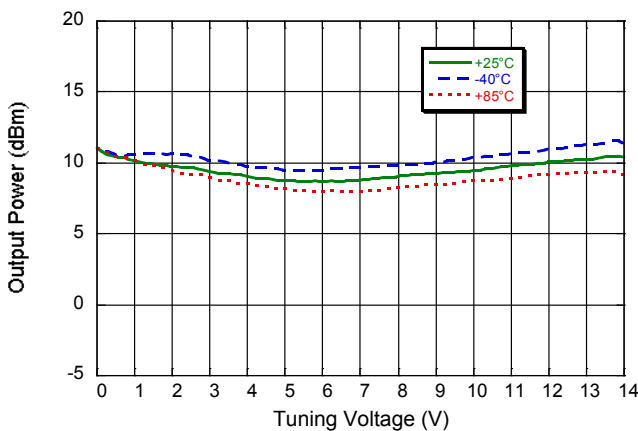
Output Frequency vs. Tuning / Supply Voltage - RF Port



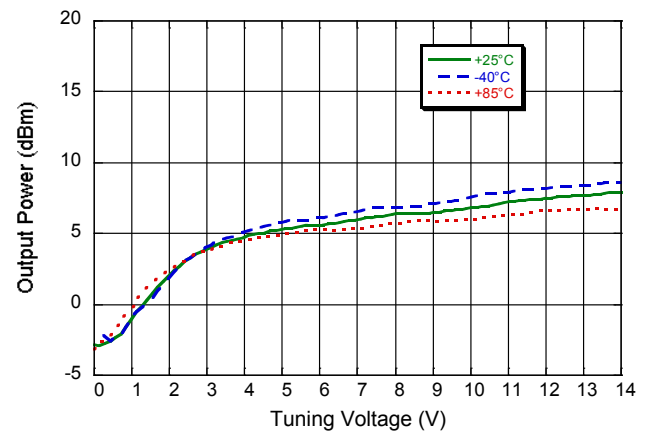
Output Frequency vs. Tuning / Supply Voltage - RF/2 Port



Output Power vs. Tuning Voltage - RF Port



Output Power vs. Tuning Voltage - RF/2 Port

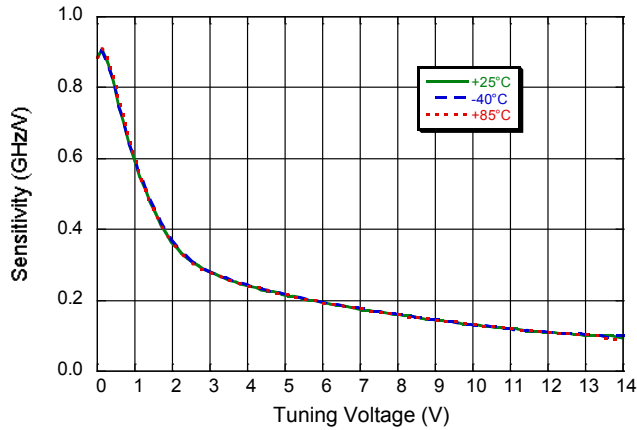


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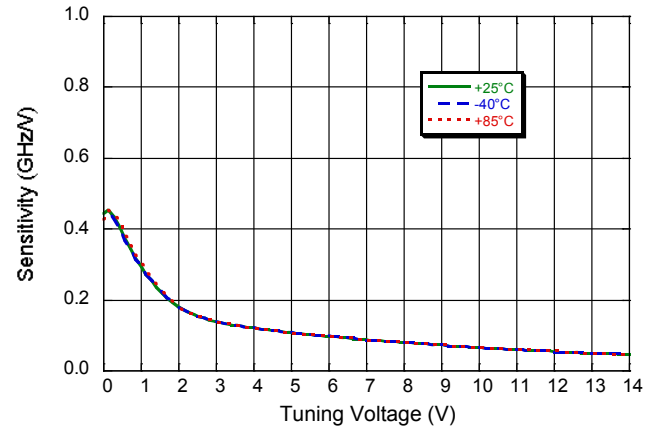
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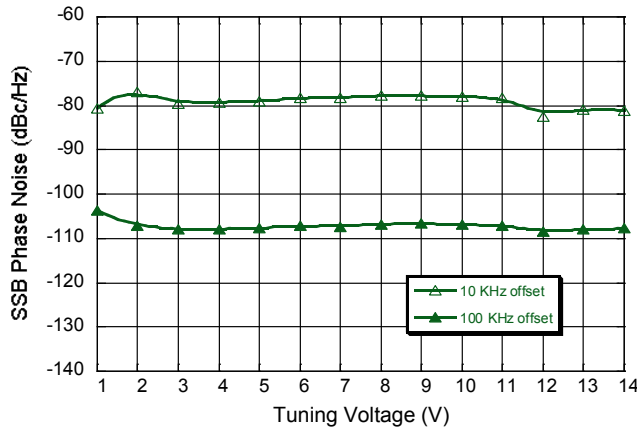
Frequency Sensitivity vs. Tuning Voltage - RF Port



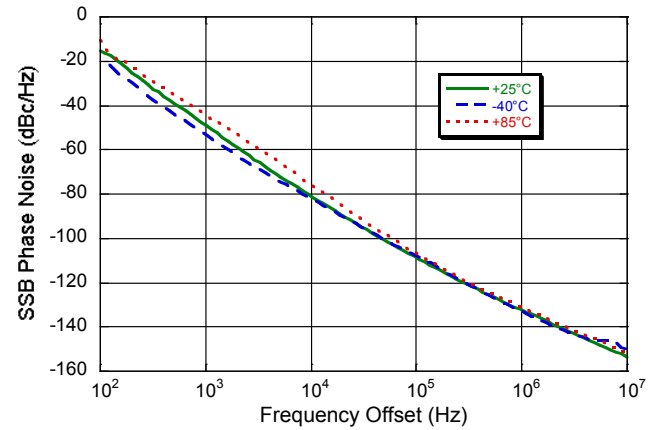
Frequency Sensitivity vs. Tuning Voltage - RF/2 Port



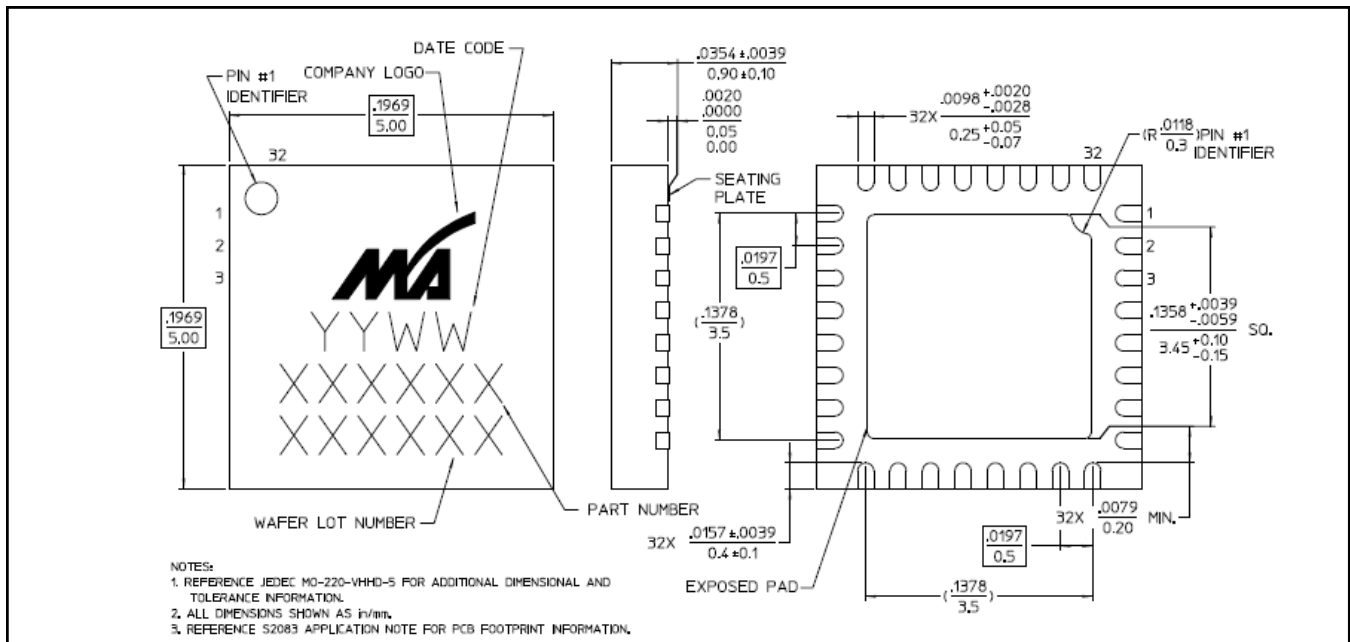
Single Side Band Phase Noise vs. Tuning Voltage
RF Port



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



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.

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