Voltage Controlled Oscillator
12.7 - 14.2 GHz

MAOC-009268
Rev. V5

Features

- Low Phase Noise
- Wide Tuning Range
- Divide-by-Two Output
- Integrated Buffer Amplifier
- Excellent Temperature Stability
- +5 V Bias Supply
- Lead-Free 5 mm 32-Lead PQFN Package
- RoHS* Compliant

Applications

- Point-to-Point Radio
- Point-to-Multipoint Radio
- Communications Systems
- Low Phase Noise applications

Description

The MAOC-009268 is an InGaP HBT-based voltage controlled oscillator for frequency generation. No external matching components are required. This VCO is easily integrated into a phase lock loop using the divide-by-two output. The extremely low phase noise makes this part ideal for many radio applications including high capacity digital radios.

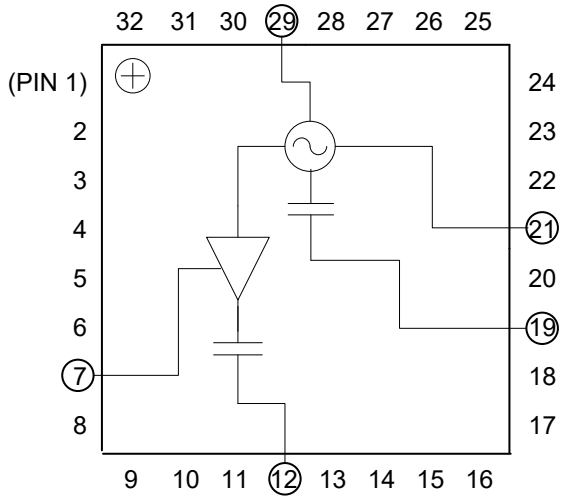
The 5 mm PQFN package has a lead-free finish that is RoHS compliant and compatible with a 260ºC reflow temperature. The package also features low lead inductance and an excellent thermal path.

Ordering Information[1]

Part Number	Package
MAOC-009268-TR0500	500 piece reel
MAOC-009268-TR1000	1000 piece reel
MAOC-009268-001SMB	Sample Board

1. Reference Application Note M513 for reel size information.

Block Diagram



Pin Designations[2]

Pin #	Function
1 - 6, 8 - 11, 13 - 18, 20, 22 - 28, 30 - 32	N/C
7	V_{BUFFER}
12	RF/2
19	RF
21	V_{CC}
29	V_{TUNE}

2. The exposed pad centered on the package bottom must be connected to RF and DC ground. Connecting all N/C pins to RF/DC Ground in the layout is also recommended.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Electrical Specifications: T_A = +25°C, V_{CC} = V_{BUFFER} = 5 V[3], Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Output Power	RF Port, 12.7 - 14.2 GHz RF/2 Port, 6.35 - 7.1 GHz	dBm	6 -3	9 1	—
SSB Phase Noise V_{CC}=V_{BUFFER}=V_{TUNE}=5V	RF Port, 10KHZ Offset RF Port, 100KHZ Offset	dBc/Hz	—	-79 -108	—
Harmonics/Subharmonics V_{CC}=V_{BUFFER}=V_{TUNE}=5V	RF Port, $^1/_2$ F_o RF Port, 2 F_o	dBc	—	-16 -38	—
Pulling (Sensitivity to Match) V_{CC}=V_{BUFFER}=V_{TUNE}=5V	RF Port, VSWR = 1.95:1 to 2.25:1	MHz pk-pk	—	10	—
Pushing (Sensitivity to Supply Voltage)	RF Port, V_{TUNE} = 5 V RF/2 Port, V_{TUNE} = 5 V	MHz/V	—	10 5	—
Frequency Drift Rate (Sensitivity to Temperature)	RF Port, 12.7 - 14.2 GHz RF/2 Port, 6.35 - 7.1 GHz	MHz/ºC	—	1.2 0.7	—
Output Return Loss	RF Port, 12.7 - 14.2 GHz RF/2 Port, 6.35 - 7.1 GHz	dB	—	2.5 6	—
Tuning Sensitivity @ RF Port	V_{TUNE} = 5 V	GHz/V	—	0.21	—
Supply Current	I_{TOTAL} (I_{CC} + I_{BUFFER}) I_{CC} I_{BUFFER}	mA	—	165 145 20	205 175 30
Tune Voltage	V_{TUNE}	V	1	—	13
Tuning Current Leakage	V_{TUNE} = 13 V	µA	—	5	10

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

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	-55ºC to +150ºC
Operating Temperature	-40ºC to +85ºC
Case Temperature (T_C)	+100ºC @ exposed pad
Junction Temperature[7]	+135ºC

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. MACOM does not recommend sustained operation near these survivability limits.
6. Operating at nominal conditions with T_J ≤ 135°C will ensure MTTF > 1 x 10^6 hours.
7. Junction Temperature (T_J) = T_C + Θjc * (V * I)
   Typical thermal resistance (Θjc) = 35° C/W.
   a) For T_C = 25°C, T_J = 54°C @ 5 V, 165 mA
   b) For T_C = 85°C, T_J = 115°C @ 5 V, 170 mA

Handling Procedures

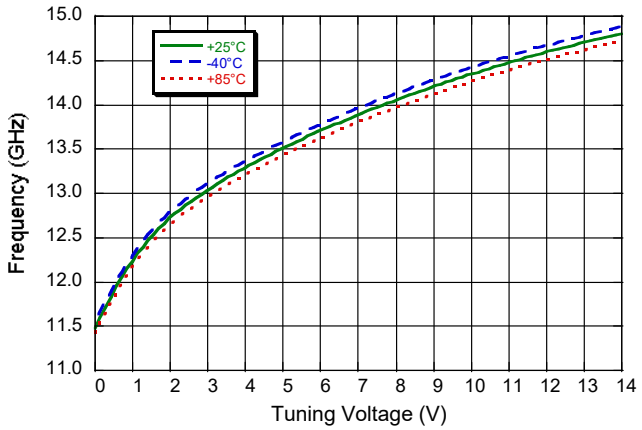
Please observe the following precautions to avoid damage:

Static Sensitivity

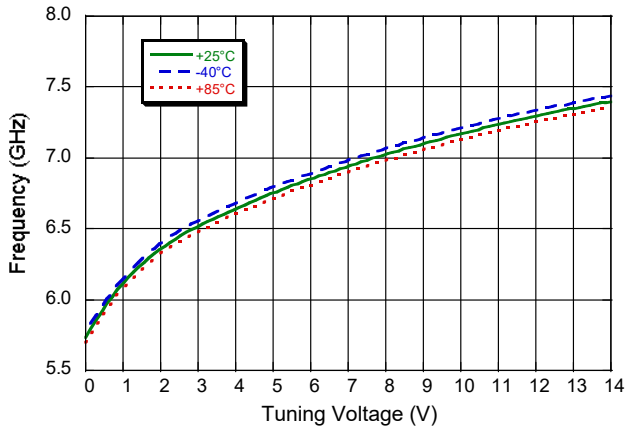
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1A devices.

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

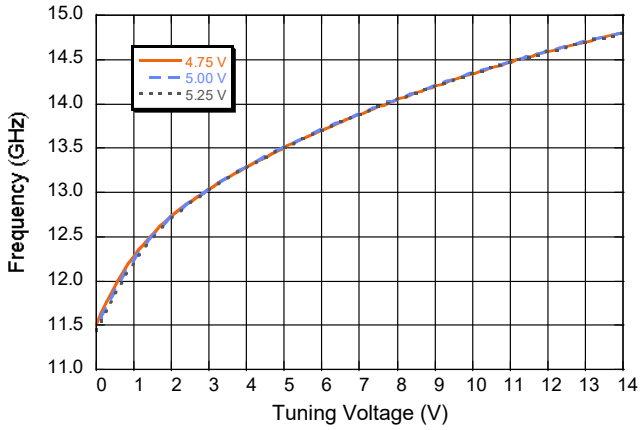
Output Frequency vs. Tuning Voltage - RF Port



Output Frequency vs. Tuning Voltage - RF/2 Port



Output Frequency vs. Tuning / Supply Voltage - RF Port



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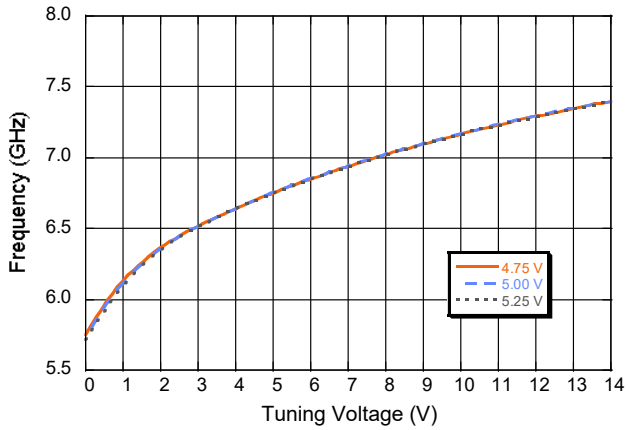
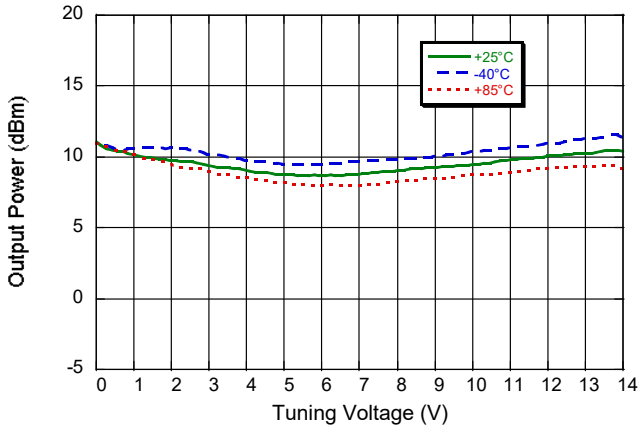
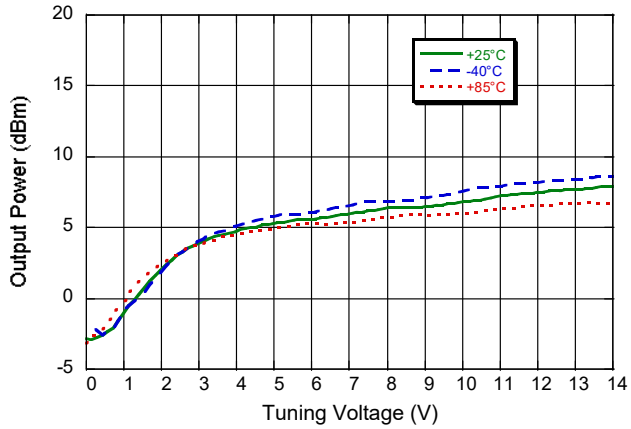


Output Power vs. Tuning Voltage - RF Port

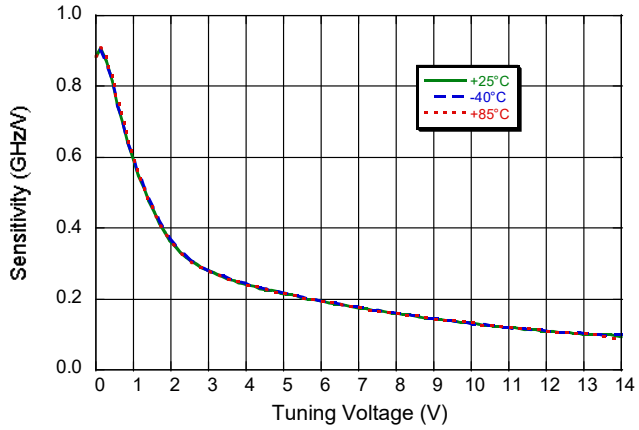


Output Power vs. Tuning Voltage - RF/2 Port

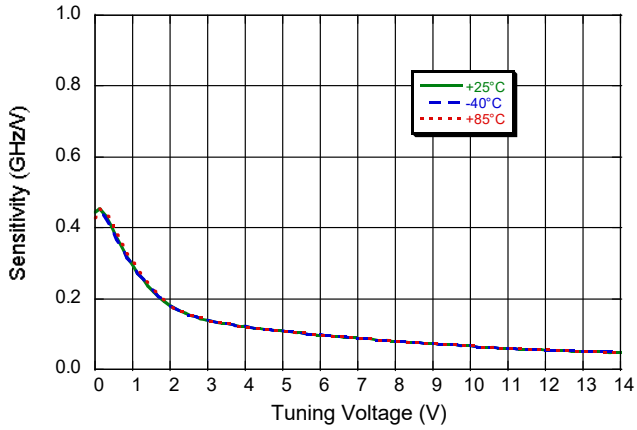


Typical Performance Curves: $V_{CC} = V_{BUFFER} = 5V$, $T_A = +25°C$ (unless otherwise indicated)

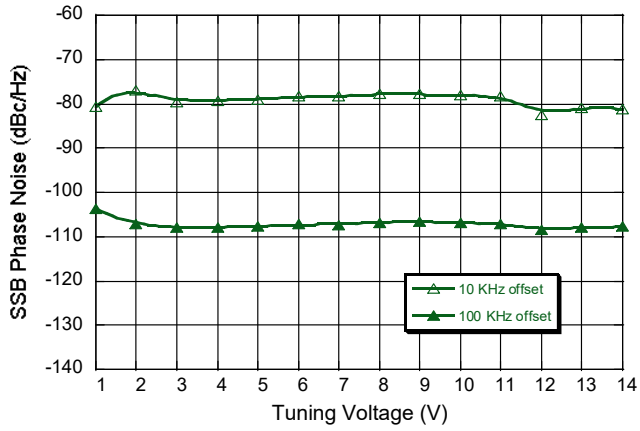
Frequency Sensitivity vs. Tuning Voltage - RF Port



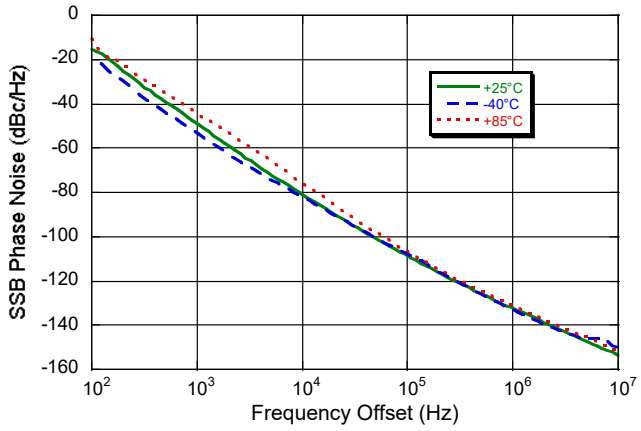
Frequency Sensitivity vs. Tuning Voltage - RF/2 Port



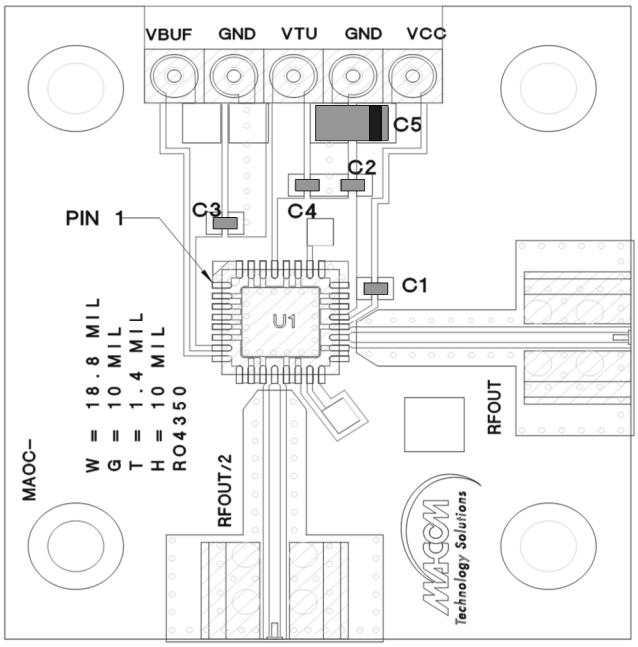
Single Side Band Phase Noise vs. Tuning Voltage RF Port



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



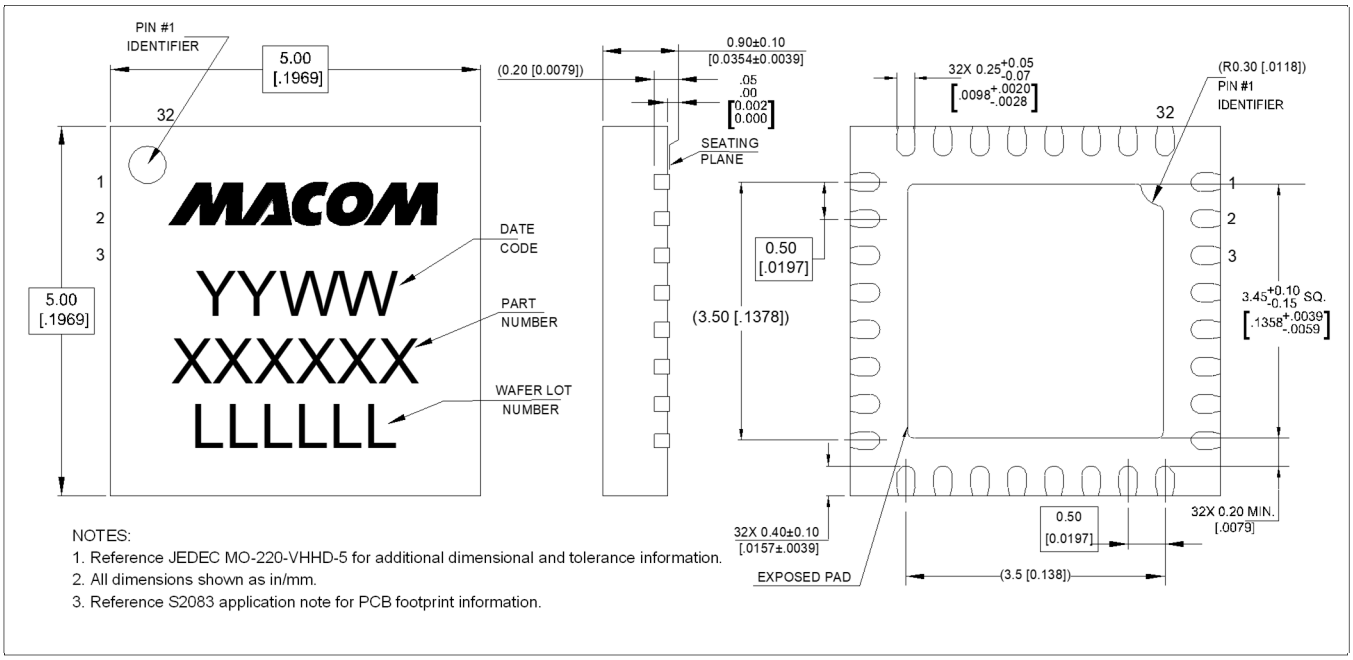
Sample Board



Parts List

Component	Value	Case Size
C1	100 pF	0402
C2, C3, C4	0.1 µF	0402
C5	10 µF 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 in accordance to JEDEC J-STD-020D.
Plating is NiPdAuAg over Copper.