MAOC-113900

Broadband Voltage Controlled Oscillator
13.4 - 14.4 GHz

Rev. V1

Features

- Phase Noise: -82/-108dBc/Hz @ 10/100kHz
- Wide Tuning Range
- Low Current Consumption: 90 mA
- Excellent Temperature Stability
- Proven Microphonic Performance
- +5 V Bias
- Lead-Free 5 mm 32-Lead Package
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MAOC-113900 is a 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 MAOC-113900 primary applications are Point-to-Point Radio, Point-to-Multipoint Radio, Communications Systems, and Low Phase Noise applications.

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

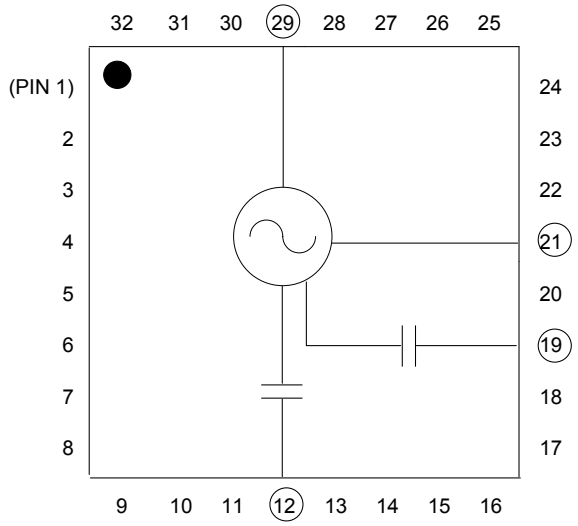
Ordering Information[1]

Part Number	Package
MAOC-113900-TR0500	500 part Reel
MAOC-113900-TR1000	1000 part Reel
MAOC-113900-001SMB	Sample Board

1. Reference Application Note M513 for reel size information.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

Block Diagram



Pin Configuration[2]

Pin	Function
1 - 11	N/C
12	RF/2
13 - 18	N/C
19	RF
20	N/C
21	V_{CC}
22 - 28	N/C
29	V_{TUNE}
30 - 32	N/C
33[3]	GND

2. MACOM recommends connecting unused package pins to ground.
3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

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Electrical Specifications: T_A = +25°C, V_{CC} = 5.0 V[4], Z_0 = 50 Ω

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 -2	8 2	—
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	—	-83 -109	— -104
Harmonics/Subharmonics V_{CC} = V_{TUNE} = 5 V	RF Port, $^1/_2$ F_o RF Port, 2 F_o	dBc	—	-32 -52	—
Pulling (Sensitivity to Match) V_{CC} = V_{TUNE} = 5 V	RF Port, VSWR = 1.95:1 to 2.25:1	MHz pk-pk	—	5.0	—
Pushing (Sensitivity to Supply Voltage)	RF Port, V_{TUNE} = 5 V RF/2 Port, V_{TUNE} = 5 V	MHz/V	—	18 9	—
Frequency Drift Rate (Sensitivity to Temperature)	RF Port, 13.4 - 14.4 GHz RF/2 Port, 6.7 - 7.2 GHz	MHz/°C	—	1.4 0.7	—
Output Return Loss	RF Port, 13.4 - 14.4 GHz RF/2 Port, 6.7 - 7.2 GHz	dB	—	6 3	—
Tuning Sensitivity @ RF Port	V_{TUNE} = 5 V	GHz/V	—	0.18	—
Supply Current	I_{CC}	mA	—	90	120
Tune Voltage	V_{TUNE}	V	1.5	—	12.5
Tuning Current Leakage	V_{TUNE} = 13 V	µA	—	5	—

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

Absolute Maximum Ratings [5,6,7]

Parameter	Absolute Maximum
Voltage	5.5 Vdc
V_{TUNE}	0 to 15 Vdc
Storage Temperature	-55ºC to +150ºC
Operating Temperature	-40ºC to +85ºC
Junction Temperature[8]	+150ºC

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.
7. Operating at nominal conditions with $T_J \leq +150°C$ will ensure MTBF > 1 x 10^6 hours.
8. Junction Temperature (T_J) = T_C + Θjc * (V * I)
   Typical thermal resistance (Θjc) = 42° C/W.
   a) For T_C = 25°C, T_J = 44°C @ 5 V, 90 mA
   b) For T_C = 85°C, T_J = 104°C @ 5 V, 91 mA

Handling Procedures

Please observe the following precautions to avoid damage:

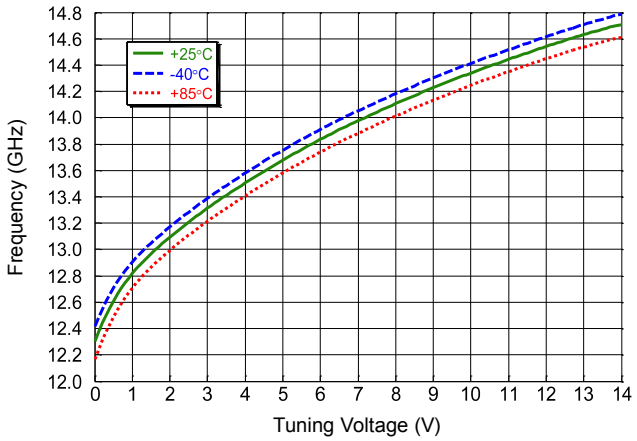
Static Sensitivity

These electronic devices 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 1B devices.

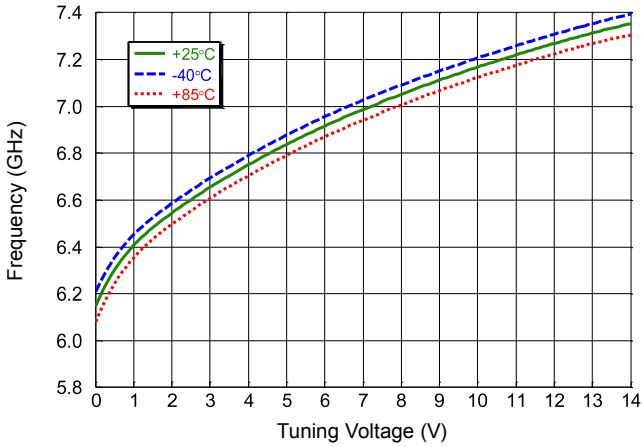
ESD Rating: Class 1B

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

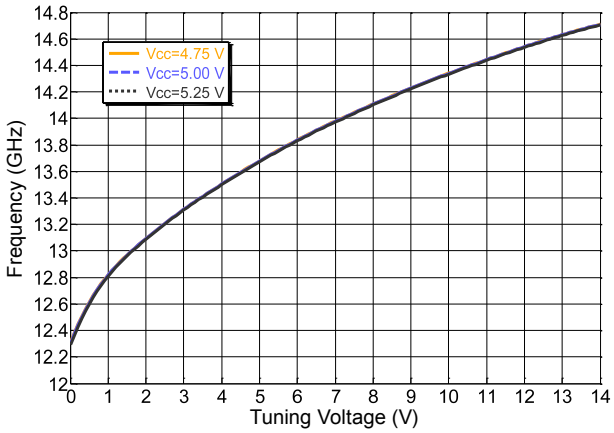
Output Frequency vs. Tune Voltage - RF Port



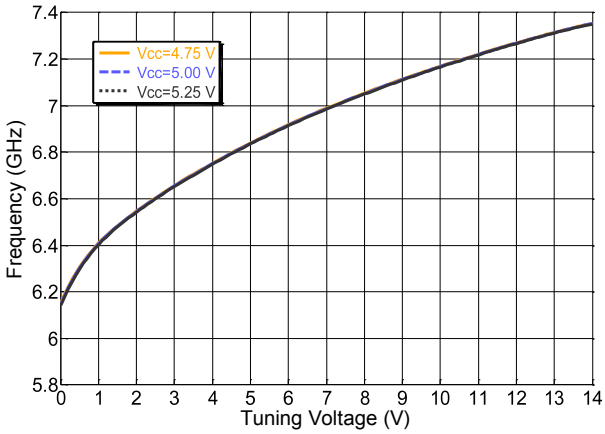
Output Frequency vs. Tune Voltage - RF/2 Port



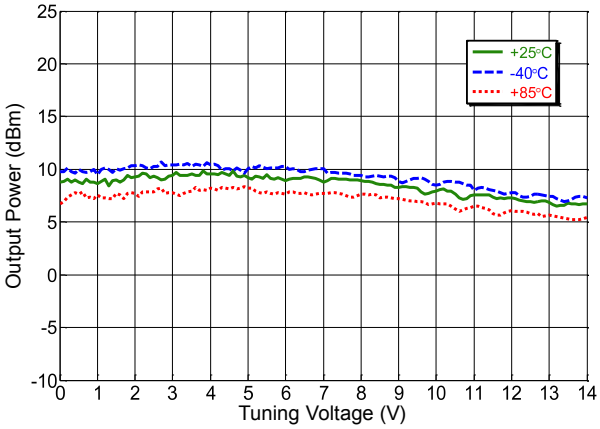
Output Frequency vs. Tuning / Supply Voltage - RF Port



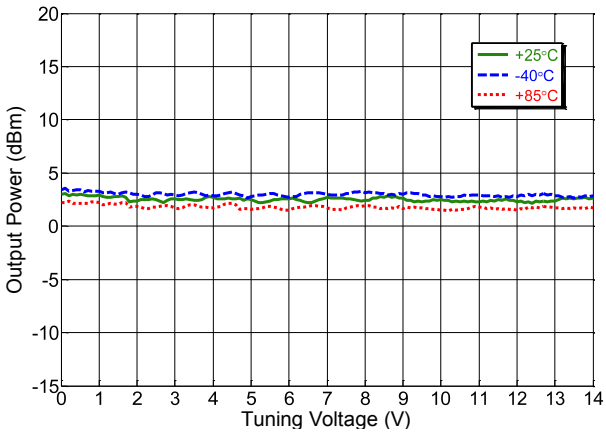
Output Frequency vs. Tuning / Supply Voltage - RF/2 Port



Output Power vs. Tuning Voltage - RF Port

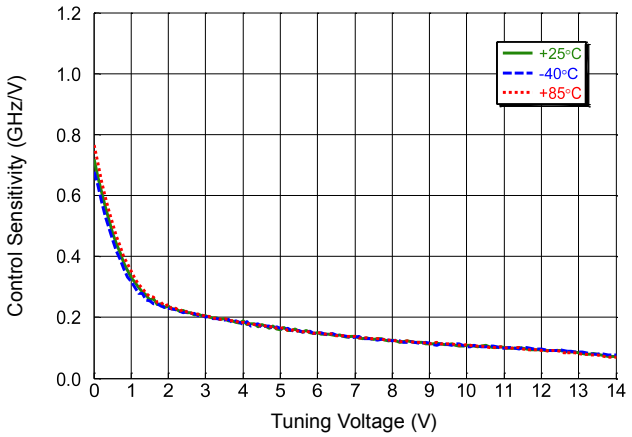


Output Power vs. Tuning Voltage - RF/2 Port

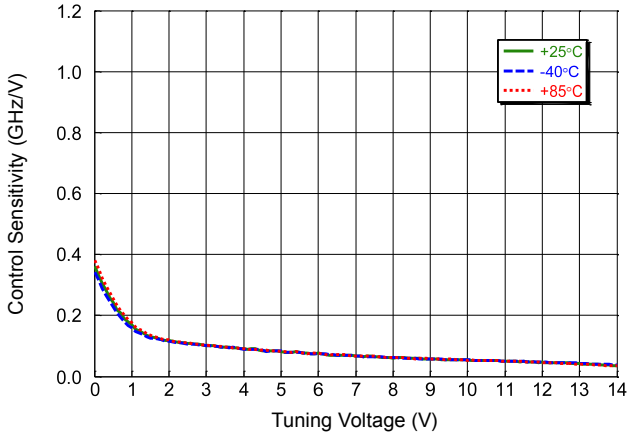


Typical Performance Curves: V_{CC} = 5 V, T_A = +25°C (unless otherwise indicated)

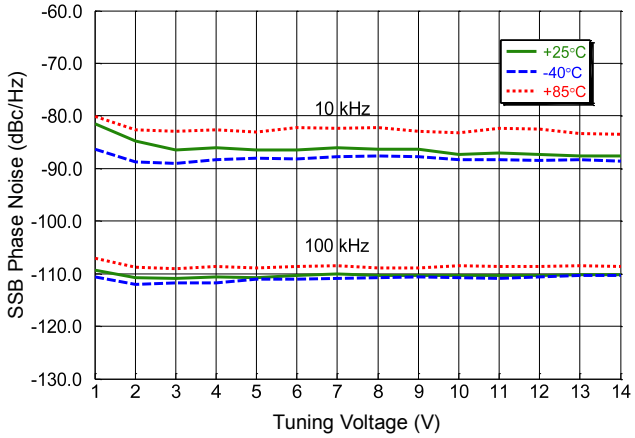
Frequency Sensitivity vs. Tuning Voltage - RF Port



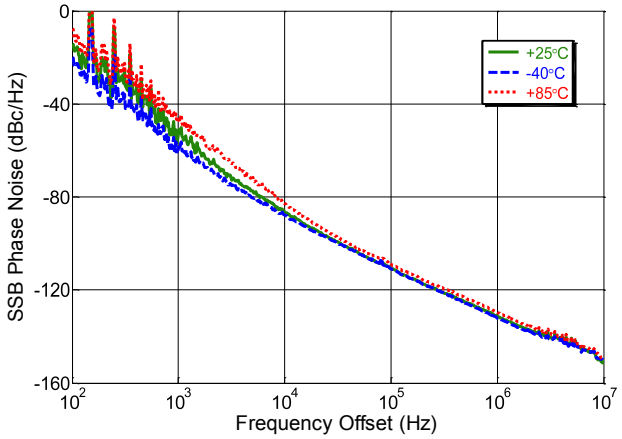
Frequency Sensitivity vs. Tuning Voltage - RF/2 Port



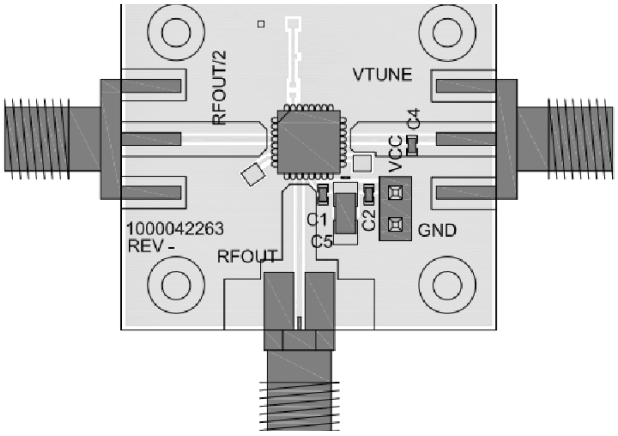
Single Side Band Phase Noise vs. Tuning Voltage- RF port



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



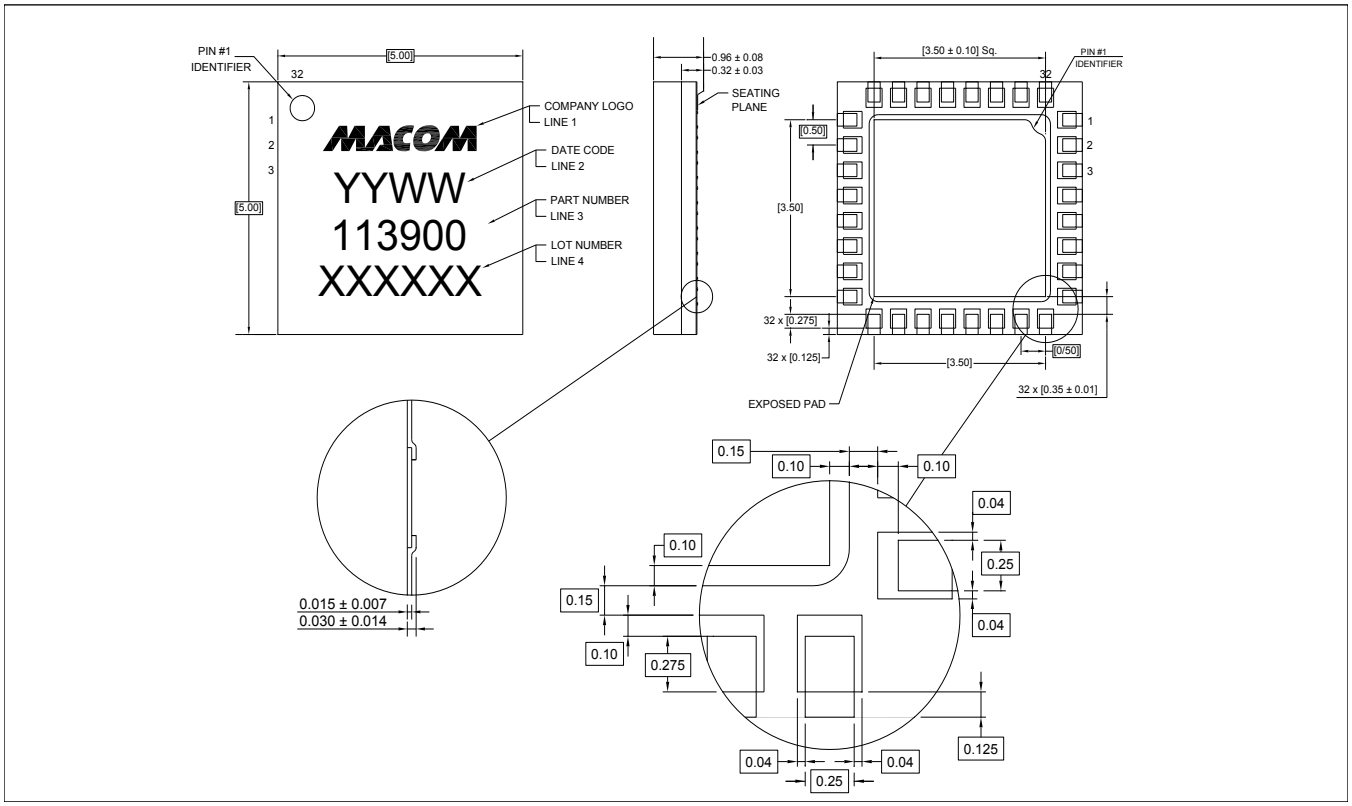
Sample Board



Parts List

Component	Value	Case Size
C1	100 pF	0402
C2, 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 3 requirements.
Plating is ENEPIG over copper.