MAOC-114850

Voltage Controlled Oscillator
14.5 - 15.2 GHz

Features
- Phase Noise: -84/-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-114850 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-114850 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 260°C reflow temperature. The package features low lead inductance and an excellent thermal path.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAOC-114850-TR0500</td>
<td>500 piece reel</td>
</tr>
<tr>
<td>MAOC-114850-TR1000</td>
<td>1000 piece reel</td>
</tr>
<tr>
<td>MAOC-114850-SMB</td>
<td>Sample Board</td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.

2. Connecting all N/C pins to RF/DC ground in the layout is also recommended.
3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.
Voltage Controlled Oscillator
14.5 - 15.2 GHz

Electrical Specifications: $T_A = +25^\circ C$, $V_{CC} = 5.0 \, V^4$, $Z_0 = 50 \, \Omega$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Power</td>
<td>RF Port, 14.5 - 15.2 GHz RF/2 Port, 7.25 - 7.6 GHz</td>
<td>dBM</td>
<td>0</td>
<td>-5</td>
<td>3.5</td>
</tr>
<tr>
<td>SSB Phase Noise</td>
<td>RF Port, 10 kHz Offset, 14.5 - 15.2 GHz RF Port, 100 kHz Offset, 14.5 - 15.2 GHz</td>
<td>dBc/Hz</td>
<td>—</td>
<td>-84</td>
<td>-106</td>
</tr>
<tr>
<td>Harmonics/Subharmonics</td>
<td>$RF$, $1/2$ $F_0$ $RF$, 2 $F_0$</td>
<td>dBc</td>
<td>—</td>
<td>-29</td>
<td>—</td>
</tr>
<tr>
<td>Pulling (Sensitivity to Match)</td>
<td>RF Port, VSWR = 1.95:1 to 2.25:1</td>
<td>MHz pk-pk</td>
<td>—</td>
<td>6.2</td>
<td>—</td>
</tr>
<tr>
<td>(Sensitivity to Supply Voltage)</td>
<td>RF Port, $V_{TUNE} = 5 , V$ RF/2 Port, $V_{TUNE} = 5 , V$</td>
<td>MHz/V</td>
<td>—</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Frequency Drift Rate</td>
<td>RF Port, 14.5 - 15.2 GHz RF/2 Port, 7.25 - 7.6 GHz</td>
<td>MHz°C</td>
<td>—</td>
<td>1.5</td>
<td>0.75</td>
</tr>
<tr>
<td>(Sensitivity to Temperature)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>RF Port, 14.5 - 15.2 GHz RF/2 Port, 7.25 - 7.6 GHz</td>
<td>dB</td>
<td>—</td>
<td>3.9</td>
<td>3.7</td>
</tr>
<tr>
<td>Tuning Sensitivity @ RF Port</td>
<td>$V_{TUNE} = 5 , V$</td>
<td>GHz/V</td>
<td>—</td>
<td>0.15</td>
<td>—</td>
</tr>
<tr>
<td>Supply Current</td>
<td>$I_{CC}$</td>
<td>mA</td>
<td>—</td>
<td>90</td>
<td>—</td>
</tr>
<tr>
<td>Tune Voltage</td>
<td>$V_{TUNE}$</td>
<td>V</td>
<td>1.5</td>
<td></td>
<td>12.5</td>
</tr>
<tr>
<td>Tuning Current Leakage</td>
<td>$V_{TUNE} = 13 , V$</td>
<td>µA</td>
<td>—</td>
<td>5</td>
<td>—</td>
</tr>
</tbody>
</table>

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

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>5.5 Vdc</td>
</tr>
<tr>
<td>$V_{TUNE}$</td>
<td>0 to 15 Vdc</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55°C to +150°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>+150°C</td>
</tr>
</tbody>
</table>

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 $T_J \leq +150^\circ C$ will ensure $MTBF > 1 \times 10^6$ hours.
8. Typical thermal resistance ($\Theta_{jc}$) = 61.7°C/W.

### 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 1C devices.

---

For further information and support please visit:
https://www.macom.com/support
MAOC-114850

Voltage Controlled Oscillator
14.5 - 15.2 GHz

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

### Control Sensitivity vs. Tuning Voltage - RF Port

![Control Sensitivity vs. Tuning Voltage - RF Port](image1)

### Control Sensitivity vs. Tuning Voltage - RF/2 Port

![Control Sensitivity vs. Tuning Voltage - RF/2 Port](image2)

### Phase Noise vs. Tuning Voltage - RF Port

![Phase Noise vs. Tuning Voltage - RF Port](image3)

### Phase Noise vs. Frequency Offset - RF Port ($V_{TUNE} = 5V$)

![Phase Noise vs. Frequency Offset - RF Port](image4)
MAOC-114850

Voltage Controlled Oscillator
14.5 - 15.2 GHz

Sample Board

Parts List

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Case Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>100 pF</td>
<td>0402</td>
</tr>
<tr>
<td>C2, C4</td>
<td>0.1 µF</td>
<td>0402</td>
</tr>
<tr>
<td>C5</td>
<td>10 µF</td>
<td>0805</td>
</tr>
</tbody>
</table>

Lead-Free 5 mm 32-Lead Package†

† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 3 requirements.
Plating is ENEPIG over Copper.

M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.
Visit www.macom.com for additional data sheets and product information.

For further information and support please visit:
https://www.macom.com/support
Voltage Controlled Oscillator
14.5 - 15.2 GHz

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.