The TLCO06981 is a general purpose MMIC oscillator with an individually biased output buffer amplifier. A 0.15µm MMHEMT process was chosen to provide >10 dBm of output power from 11 to 30 GHz and low power consumption. The center frequency is mechanically tunable by plucking air bridges. Additional ports are provided for varactor tuning up to 1GHz.

- 0.15 mm MMHEMT Process
- 11 to 30 GHz
- Up to 1 GHz (VTuning)
- > 250 MHz fine tuning (Vgate)
- P_{OUT} ≥ 10 dBm
- Chip Dimension 2.17 x 1.3 x 0.1 mm

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Rating</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{D1&amp;2}</td>
<td>Positive Supply Voltages</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>V_{G1&amp;2}</td>
<td>Negative Supply Voltages</td>
<td>-2</td>
<td>V</td>
</tr>
<tr>
<td>I_{D1+2}</td>
<td>Positive Supplies Current</td>
<td>250</td>
<td>mA</td>
</tr>
<tr>
<td>V_{DIODE}</td>
<td>Diode Supply Voltage</td>
<td>-20</td>
<td>V</td>
</tr>
<tr>
<td>T_c</td>
<td>Operating Temperature</td>
<td>-50 to 130</td>
<td>°C</td>
</tr>
<tr>
<td>T_{STG}</td>
<td>Storage Temperature</td>
<td>-65 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

### Performance Summary

(At 25 C, 50 ohm system)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>11</td>
<td>30</td>
<td></td>
<td>(GHz)</td>
</tr>
<tr>
<td>P_o</td>
<td>10</td>
<td>16</td>
<td>20</td>
<td>(dBm)</td>
</tr>
<tr>
<td>P_{N@ 100 KHz}</td>
<td>-70</td>
<td>-80</td>
<td>-100</td>
<td>(offset)</td>
</tr>
<tr>
<td>Drain Supply Voltage</td>
<td>-2.0</td>
<td>4.5</td>
<td>6.0</td>
<td>(V)</td>
</tr>
<tr>
<td>Gate Supply Voltage</td>
<td>-0.5</td>
<td>-1</td>
<td>-1.5</td>
<td>(V)</td>
</tr>
<tr>
<td>Drain Supply Current</td>
<td>10</td>
<td>40</td>
<td>100</td>
<td>(mA)</td>
</tr>
<tr>
<td>Diode Supply Voltage</td>
<td>-18</td>
<td>0</td>
<td></td>
<td>(V)</td>
</tr>
</tbody>
</table>

TLC reserves the right to change performance data and specifications without notice (patent pending)
**TLCO06981**

**K-Band MMIC Oscillator**

### Recommended Operating Procedure

1. Apply recommended gate supply voltage to VG1 & 2.
2. Increase VD1 & 2 to recommended operating voltage.
3. Vary VDIODE for VCO operation (optional).
4. Vary VG1 for voltage tuning.
5. Turn off in the following sequence:
   - i Turn off diode supply voltage (VDIODE)
   - ii Turn off drain supply voltage (VD1 & 2)
   - iii Turn off gate supply voltage (VG1 & 2)

### MMIC Layout and Bond Pad Location

![MMIC Layout and Bond Pad Location Diagram]

**Units: millimeters**

- Bond Pad 1 (VDIODE)   0.1 x 0.1
- Bond Pad 2 (VG 1)      0.1 x 0.1
- Bond Pad 3 (VD1)       0.1 x 0.1
- Bond Pad 4 (VD2)       0.1 x 0.1
- Bond Pad 5 (VG2)       0.1 x 0.1
- Bond Pad 6 (RF Output) 0.1 x 0.1

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Recommended Assembly

Diagram

VDIODE¹ (Negative)

100 pF

VG1 (Negative)

VD1 (Positive)

100 pF

100 pF

Note: Use one (1) 0.003” by 0.0005” gold ribbon or two (2) 0.0007” wire for bonding the RF input. Mount chip using silver epoxy (e.g. Epo-Tek H32C) or Gold-Tin (AuSn: 80/20) solder. For best heat sinking, use either gold plated copper or composite matrix material, e.g. Thermocon.

1. VDIODE pad is optional. For more information, please contact TLC.

(Contact TLC for flip-chip ready bonding @ volume quantities)
Performance Data

**Oscillator Section**
- $V_d$: 3.65 V
- $I_d$: 154.40 mA
- $V_g$: -0.097 V
- $P_{out}$ = 15.56 dBm

**Amplifier Section**
- $V_d$: 3.65 V
- $I_d$: 154.40 mA
- $V_{tune}$: -7.0 V

$P_{out}$ = 15.56 dBm

TLCO-06981 VCO (Phase Noise)

* Spectrum Analyzer phase noise not reliable below 100 KHz
Examples of MMW VCO MMICs

TLC WBW VCO TLC05981
24 to 35 GHz Vtune > 1GHz
PN < -85 dBC/Hz @ 100KHz

TLC VCO TLC06981 (w/ pos. Vt)
22 to 30 GHz Vtune > 0.8 GHz
PN < -85 dBC/Hz @ 100KHz

<table>
<thead>
<tr>
<th>CHIP #</th>
<th>Vdiode</th>
<th>P(out) dBm</th>
<th>Freq GHz</th>
<th>Type tuning</th>
</tr>
</thead>
<tbody>
<tr>
<td>#124</td>
<td>0.00</td>
<td>16.71</td>
<td>25.666</td>
<td>no plucks</td>
</tr>
<tr>
<td>#124</td>
<td>0.00</td>
<td>14.00</td>
<td>30.280</td>
<td>Max pluck</td>
</tr>
<tr>
<td>#124</td>
<td>18.00</td>
<td>14.00</td>
<td>31.170</td>
<td>Vtune</td>
</tr>
</tbody>
</table>