General Description

The MAX2620 evaluation kit (EV kit) simplifies evaluation of the MAX2620 integrated oscillator with buffered outputs. It includes a varactor-based tank circuit that allows the VCO to tune across an approximately 30MHz band in the 900MHz frequency range. Outputs utilize 50Ω SMA connectors. The EV kit has a test port that facilitates complete characterization of the MAX2620 tank port, enabling resonators to be designed for frequency ranges other than that supplied with the EV kit.

Component List

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>QTY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C7-C10, C12</td>
<td>6</td>
<td>1000pF, 10% ceramic capacitors</td>
</tr>
<tr>
<td>C2, C11, C14</td>
<td>0</td>
<td>Not installed</td>
</tr>
<tr>
<td>C3</td>
<td>1</td>
<td>2.7pF, 10% ceramic capacitor</td>
</tr>
<tr>
<td>C4, C6</td>
<td>2</td>
<td>1pF, 10% ceramic capacitors</td>
</tr>
<tr>
<td>C5, C13, C17</td>
<td>3</td>
<td>1.5pF, 10% ceramic capacitors</td>
</tr>
<tr>
<td>C15</td>
<td>1</td>
<td>10μF, ±10%, 25V tantalum capacitor</td>
</tr>
<tr>
<td>D1</td>
<td>1</td>
<td>Varactor diode</td>
</tr>
<tr>
<td>JU1, Vcc, GND</td>
<td>3</td>
<td>2-pin headers</td>
</tr>
<tr>
<td>L1</td>
<td>1</td>
<td>Ceramic coaxial resonator</td>
</tr>
<tr>
<td>L4</td>
<td>0</td>
<td>Not installed</td>
</tr>
<tr>
<td>L3</td>
<td>1</td>
<td>10nH inductor</td>
</tr>
<tr>
<td>OUT, OUT, TEST PORT</td>
<td>3</td>
<td>SMA connectors (edge mount)</td>
</tr>
<tr>
<td>R1, R3</td>
<td>2</td>
<td>10Ω, 5% resistors</td>
</tr>
<tr>
<td>R2</td>
<td>1</td>
<td>1kΩ, 5% resistor</td>
</tr>
<tr>
<td>R4</td>
<td>0</td>
<td>Not installed</td>
</tr>
<tr>
<td>R5</td>
<td>1</td>
<td>51Ω, 5% resistor</td>
</tr>
<tr>
<td>SHDN</td>
<td>1</td>
<td>3-pin header</td>
</tr>
<tr>
<td>U1</td>
<td>1</td>
<td>MAX2620EUA</td>
</tr>
<tr>
<td>VCONT</td>
<td>1</td>
<td>SMA connector (PC mount)</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>Shunt</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>MAX2620 circuit board</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>MAX2620 data sheet</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>PART</th>
<th>TEMP. RANGE</th>
<th>BOARD TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX2620EVKIT</td>
<td>-40°C to +85°C</td>
<td>Surface Mount</td>
</tr>
</tbody>
</table>

Component Suppliers

<table>
<thead>
<tr>
<th>SUPPLIER</th>
<th>PHONE</th>
<th>FAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha Industries</td>
<td>(617) 935-5150</td>
<td>(617) 824-4579</td>
</tr>
<tr>
<td>Coilcraft</td>
<td>(847) 639-6400</td>
<td>(847) 639-1469</td>
</tr>
<tr>
<td>Sprague</td>
<td>(603) 224-1961</td>
<td>(603) 224-1430</td>
</tr>
<tr>
<td>Trans-Tech</td>
<td>(301) 695-9400</td>
<td>(301) 695-7065</td>
</tr>
</tbody>
</table>

Quick Start

The MAX2620 EV kit is fully assembled and factory tested. Follow the instructions in the Connections and Setup section.

Test Equipment Required

- **Power supplies**. Low-noise power supplies are recommended for oscillator-noise measurements. This is especially important for the tuning voltage supplied to the varactor (VCONT). Noise or ripple on the tuning voltage frequency-modulates the oscillator and causes spectral spreading. Batteries can be used in place of power supplies, if necessary.
  - DC supply capable of supplying +2.7V to +5.25V at 20mA. Alternatively, use two or three 1.5V AA batteries.
  - DC supply capable of supplying 0V to +3V, continuously variable, for VCONT. Alternatively, use two or three 1.5V batteries with a resistive voltage divider or potentiometer.

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- HP8561E spectrum analyzer, or equivalent high-sensitivity spectrum analyzer with approximately 3GHz frequency range. Contact the instrument manufacturer for information regarding phase-noise measurement capabilities.
- Digital multimeter (DMM) to monitor DC supply and VCONT, if desired
- Male SMA 50Ω terminator
- Network analyzer such as HP8753D (required only if additional device characterization for oscillator tank design at other frequencies is desired)

Connections and Setup
1) Verify that the shunt on jumper SHDN is installed between pins 1 and 2 (SHDN = VCC). Placing the shunt between pins 2 and 3 (SHDN = GND) puts the MAX2620 into low-current shutdown mode.
2) Connect the spectrum analyzer to either OUT or OUT. Connect a 50Ω terminator to the output (OUT or OUT) not connected to the spectrum analyzer.
3) Connect a +2.7V to +5.25V supply across VCC to GND. VCC should be the most positive terminal.
4) Connect the tuning voltage supply to either VCONT or JU1. This supply should be positive when referenced to ground.

Analysis
1) Using the spectrum analyzer, observe the voltage-controlled oscillator’s output. With 1.5V applied to VCONT, the fundamental output frequency will be near 900MHz. The output power level will be approximately -2dBm at OUT, or -12.5dBm at OUT. Varying the voltage applied to VCONT increases the frequency, and vice versa. The typical tuning range is a 30MHz band centered near 900MHz with VCONT between 0.5V and 3V. To avoid damaging the varactor, do not apply voltages greater than 15V to VCONT. (The varactor on the EV kit board has a 15V breakdown specification.)
2) Allow the oscillator to operate for about 5 minutes to thermally stabilize the frequency. Since the frequency is not phase-locked to a reference, this minimizes frequency drift and measurement error.
3) Center the fundamental on the spectrum analyzer and set the frequency span to 100kHz.
4) Set the spectrum analyzer for single sweep. This minimizes errors due to oscillator frequency drift.
5) Set the marker on the waveform’s peak.
6) Set another marker to measure the difference between this peak and the signal level at 25kHz offset from the peak. (Phase noise can be observed at frequencies other than 25kHz offset.)
7) Under the Marker function, select marker noise and turn it on. This automatically scales the spectrum analyzer’s output to take into account the resolution BW filter’s non-ideal characteristics. If your spectrum analyzer does not offer this feature, contact the manufacturer for proper scaling for noise measurements.
8) Verify that the resolution bandwidth is 1kHz.
9) Verify that the video bandwidth is 1kHz.
10) Read the measurement directly from the screen. Phase noise will be about -110dBc/Hz. In some environments that have ambient pulse noise, this measurement may be difficult to achieve without additional shielding or the use of a shielded enclosure.

Outputs
The MAX2620 EV kit is assembled with OUT matched to 50Ω (at approximately 900MHz) using L3 and C13. OUT is resistively pulled up to the supply with a 51Ω resistor, R5. R5 provides a simple broadband 50Ω output matching network but offers less output power than OUT. The EV kit provides additional component pads at R4, C14, L4, and C11 to accommodate any output match configuration for OUT and OUT. Refer to the Output Matching Configuration section in the MAX2620 data sheet for more information.

Resonator and Varactor
The resonator tank circuit is critical in determining VCO performance. It typically contains a varactor (voltage-variable capacitance) for voltage-tuning the center frequency. For best performance, use high-Q components and choose values carefully.

The external resonant circuit on the MAX2620 EV kit has been designed to operate near 900MHz. To synthesize the component values for other frequency ranges, use the following procedure.

On the EV kit, C3 and C4 are feedback capacitors that set the oscillator’s negative resistance and impedance. Their values have been chosen to provide adequate performance over a 650MHz to 1050MHz frequency range. To optimize the values of these components for a specific application, refer to the Feedback Capacitors section in the MAX2620 data sheet.

Measure the MAX2620 TANK pin’s input impedance with feedback capacitors C3 and C4 but without the resonant circuit. This measurement takes into account parasitic circuit elements that are specific to board lay-
The MAX2620 Evaluation Kit

**Layout Considerations**

The MAX2620 EV kit can serve as a guide for your board layout. To minimize the effects of parasitic elements, which may alter circuit performance, remove the ground plane around and under the components that make up the resonant circuit (C3–C6, C17, D1, and L1). Keep PC board trace lengths as short as possible to minimize parasitic inductance. Also keep decoupling capacitors C1, C7, and C9 as close to the MAX2620 as possible, with direct connection to the ground plane.

![MAX2620 EV Kit Schematic](image-url)
Evaluates: MAX2620

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