

# LTC1799, LTC6900, LTC6905, LTC6905-XXX, LTC6906, LTC6907 LTC6908 SOT23 Silicon Oscillators

## DESCRIPTION

DC2073B demo board features Linear Technology's SOT23 packaged silicon oscillators. The DC2073B demo board is available in eleven different options; DC2073B-A through DC2073B-K. These eleven options provide for the evaluation of resistor-set oscillator ICs and fixed frequency ICs (Table1).

**Design files for this circuit board are available at**  
<http://www.linear.com/demo/DC2073B>

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**Table 1. Resistor-Set Oscillator ICs and Maximum Frequency Error at  $T_A = 25^\circ\text{C}$**

| PART NUMBER, BOARD ASSEMBLY             | FREQUENCY PROGRAM METHOD                                                                        | DESCRIPTION                                                                                                                                              |
|-----------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">LTC®6905</a> , DC2073B-A    | Resistor Programmable                                                                           | $17.225\text{MHz} \leq f_{\text{OSC}} \leq 170\text{MHz}$ , $\pm 1.4\%$ at $V^+ = 2.7\text{V}$ and $\pm 2.2\%$ at $V^+ = 5\text{V}$                      |
| <a href="#">LTC1799</a> , DC2073B-B     | Resistor Programmable                                                                           | $5\text{kHz} \leq f_{\text{OSC}} \leq 10\text{MHz}$ , $\pm 1.5\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ at $V^+ = 5\text{V}$ (Up to 20MHz)                |
| <a href="#">LTC6900</a> , DC2073B-C     | Resistor Programmable                                                                           | $5\text{kHz} \leq f_{\text{OSC}} \leq 10\text{MHz}$ , $\pm 1.5\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ at $V^+ = 5\text{V}$ (Up to 20MHz)                |
| <a href="#">LTC6905-133</a> , DC2073B-D | Three Fixed Frequencies Set by Three-State Input                                                | $f_{\text{OSC}} = 133\text{MHz}$ , $66.7\text{MHz}$ and $33.5\text{MHz}$ , $\pm 1.0\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ Typical at $V^+ = 5\text{V}$ |
| <a href="#">LTC6905-100</a> , DC2073B-E | Three Fixed Frequencies Set by Three-State Input                                                | $f_{\text{OSC}} = 100\text{MHz}$ , $50\text{MHz}$ and $25\text{MHz}$ , $\pm 1.0\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ Typical at $V^+ = 5\text{V}$     |
| <a href="#">LTC6905-96</a> , DC2073B-F  | Three Fixed Frequencies Set by Three-State Input                                                | $f_{\text{OSC}} = 96\text{MHz}$ , $48\text{MHz}$ and $24\text{MHz}$ , $\pm 1.0\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ Typical at $V^+ = 5\text{V}$      |
| <a href="#">LTC6905-80</a> , DC2073B-G  | Three Fixed Frequencies Set by Three-State Input                                                | $f_{\text{OSC}} = 80\text{MHz}$ , $40\text{MHz}$ and $20\text{MHz}$ , $\pm 1.0\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ typical at $V^+ = 5\text{V}$      |
| <a href="#">LTC6906</a> , DC2073B-H     | Resistor Programmable                                                                           | $10\text{kHz} \leq f_{\text{OSC}} \leq 1\text{MHz}$ , $\pm 0.5\%$ at $V^+ = 2.7\text{V}$ to $3.6\text{V}$ and $\pm 0.7\%$ at $V^+ = 2.25\text{V}$        |
| <a href="#">LTC6907</a> , DC2073B-I     | Resistor Programmable                                                                           | $400\text{kHz} \leq f_{\text{OSC}} \leq 4\text{MHz}$ , $\pm 0.65\%$ at $V^+ = 3\text{V}$ to $3.6\text{V}$                                                |
| <a href="#">LTC6908-1</a> , DC2073B-J   | Spread Spectrum Modulation, Complementary Outputs ( $0^\circ/180^\circ$ ) Resistor Programmable | $250\text{kHz} \leq f_{\text{OSC}} \leq 5\text{MHz}$ , $\pm 1.5\%$ at $V^+ = 2.7\text{V}$ and $\pm 2.0\%$ at $V^+ = 5\text{V}$                           |
| <a href="#">LTC6908-2</a> , DC2073B-K   | Spread Spectrum Modulation, Quadrature Outputs ( $0^\circ/90^\circ$ ) Resistor Programmable     | $250\text{kHz} \leq f_{\text{OSC}} \leq 5\text{MHz}$ , $\pm 1.5\%$ at $V^+ = 2.7\text{V}$ and $\pm 2.0\%$ at $V^+ = 5\text{V}$                           |

## QUICK START PROCEDURE

### Test Equipment:

1. A single 3V power supply.
2. An oscilloscope with a bandwidth of at least  $5 \times f_{OSC}$ . (For example, if  $f_{OSC} = 100\text{MHz}$  then use a 500MHz oscilloscope).
3. A screwdriver to adjust the potentiometer.

**Note:** The DC2073B potentiometer is shorted with a zero ohm resistor for factory testing. The zero ohm (RJ10) resistor must be removed to allow setting the frequency with a screwdriver. If the potentiometer is set to a high value ( $>100\text{k}$ ), then touching the DC2073B can produce output jitter.

### Basic Test Procedure:

1. Connect power supply to  $V^+$  and GND, turrets E4 and E5.
2. Connect oscilloscope probe to OUT1 and GND.

Note: The ground lead of an oscilloscope probe has a series inductance that can generate a resonant circuit with the probe's capacitance. Probe resonance adds transient peaks and ringing on a high speed waveform. Reliable probing of the high frequency LTC6905 and LTC6905-XXX (with corresponding demo boards DC2073B-A, -D, -E, -F or -G), must use a very short connection of the oscilloscope probe ground to the board GND (see probe tip picture in Figure 1 Test Setup).

3. Set the JP1 jumper to the N divider position for the desired frequency shown on Table2.
4. Turn on supply.
5. The oscilloscope display shows a 3V squarewave (0V to 3V).

6. For the resistor-set ICs (DC2073B-A, -B, -C, -H, -I, -J or -K) turn the RPOT potentiometer for the desired frequency. (The frequency adjustment is very coarse when the potentiometer is turned near the fully clockwise or counter-clockwise position).

### Verify Oscillator Accuracy

The  $f_{OSC}$  accuracy of the resistor-set ICs (DC2073B-A, -B, -C, -H, -I, -J or -K), can be verified by setting RSET to the exact value from the  $f_{OSC}$  equation shown in Table 2. For the DC2073B-A, -B, -C, -J, -K,  $RSET = RPOT + RSET2$ . RSET1 and RSET2 are never installed on the same board. Connecting an ohmmeter across RPOT and RSET1 or RSET2 forces current into the IC set pin (Pin 3 or 4) and causes an error in the ohmmeter reading. The RS resistor is in series with RPOT and equal to RSET1 or RSET2 and the equivalent  $RSET = RPOT + RS$ .

### Procedure to Verify Oscillator Accuracy

- a. Calculate RSET for the desired frequency (RSET in Table 2).
- b. Remove the power supply leads from DC2073B and connect an ohmmeter from POT (E6) to  $V^+$  (DC2073B-A, -B, -C, -J or -K) or GND (DC2073B-H or -I).
- c. Adjust RPOT for the exact value of RSET needed.

Note: If the potentiometer is turned near the fully clockwise or counter-clockwise position the RPOT adjustment may be too coarse for setting an exact RSET value. In addition, for a frequency adjustment near the upper or lower  $f_{OSC}$  range, RSET may be greater or less than the default DC2073B  $RPOT + RSET1$  or  $RSET2$  value, in this case the RSET1 or RSET2 resistor must be removed and replaced with a lower or higher value.

## QUICK START PROCEDURE

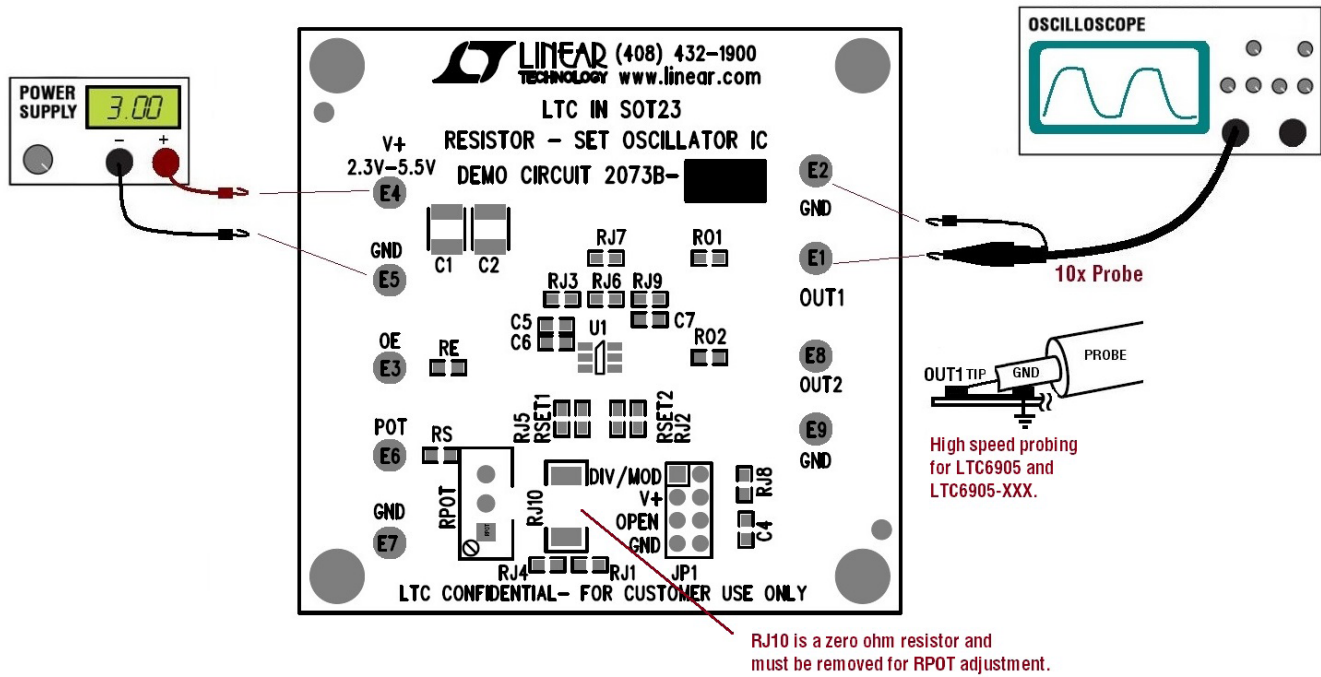


Figure 1. Test Setup

# DEMO MANUAL DC2073B

## QUICK START PROCEDURE

**Table 2.  $f_{OSC}$  Frequency and N Divider Setting**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LTC6905, DC2073B-A</b><br>$f_{OSC} = \left( \frac{168.5\text{MHz} \cdot 10\text{k}\Omega}{R_{SET}} + 1.5\text{MHz} \right) \cdot \frac{1}{N}, R_{SET} = \frac{168.5\text{MHz} \cdot 10\text{k}\Omega}{N \cdot f_{OSC} - 1.5\text{MHz}}$ <p>N = 1 (JP1 to V<sup>+</sup>), 68.9MHz ≤ <math>f_{OSC}</math> ≤ 170MHz<br/> N = 2 (JP1 to OPEN), 34.45MHz ≤ <math>f_{OSC}</math> ≤ 85MHz<br/> N = 4 (JP1 to GND), 7.225MHz ≤ <math>f_{OSC}</math> ≤ 42.5MHz</p>                             | <b>LTC1799, DC2073B-B</b><br>$f_{OSC} = \frac{10\text{MHz}}{N} \cdot \frac{10\text{k}\Omega}{R_{SET}}, R_{SET} = \frac{10\text{MHz}}{f_{OSC}} \cdot \frac{10\text{k}\Omega}{N}$ <p>N = 1 (JP1 to GND), 500kHz ≤ <math>f_{OSC}</math> ≤ 20MHz<br/> N = 10 (JP1 to OPEN), 50kHz ≤ <math>f_{OSC}</math> ≤ 2MHz<br/> N = 100 (JP1 to V<sup>+</sup>), 5kHz ≤ <math>f_{OSC}</math> ≤ 200kHz</p>                                                                                                    |
| <b>LTC6900, DC1073A-C</b><br>$f_{OSC} = \frac{10\text{MHz}}{N} \cdot \frac{20\text{k}\Omega}{R_{SET}}, R_{SET} = \frac{10\text{MHz}}{f_{OSC}} \cdot \frac{20\text{k}\Omega}{N}$ <p>N = 1 (JP1 to GND), 500kHz ≤ <math>f_{OSC}</math> ≤ 20MHz<br/> N = 10 (JP1 to OPEN), 50kHz ≤ <math>f_{OSC}</math> ≤ 2MHz<br/> N = 100 (JP1 to V<sup>+</sup>), 5kHz ≤ <math>f_{OSC}</math> ≤ 200kHz</p>                                                                                                | <b>LTC6905-133, DC2073B-D</b><br>$f_{OSC} = \frac{133\text{MHz}}{N}$ <p>N = 1 (JP1 to V<sup>+</sup>), <math>f_{OSC}</math> = 133MHz<br/> N = 2 (JP1 to OPEN), <math>f_{OSC}</math> = 66.7MHz<br/> N = 4 (JP1 to GND), <math>f_{OSC}</math> = 33.5MHz</p>                                                                                                                                                                                                                                     |
| <b>LTC6905-10, DC2073B-E</b><br>$f_{OSC} = \frac{100\text{MHz}}{N}$ <p>N = 1 (JP1 to V<sup>+</sup>), <math>f_{OSC}</math> = 100MHz<br/> N = 2 (JP1 to OPEN), <math>f_{OSC}</math> = 50MHz<br/> N = 4 (JP1 to GND), <math>f_{OSC}</math> = 25MHz</p>                                                                                                                                                                                                                                      | <b>LTC6905-96, DC2073B-F</b><br>$f_{OSC} = \frac{96\text{MHz}}{N}$ <p>N = 1 (JP1 to V<sup>+</sup>), <math>f_{OSC}</math> = 96MHz<br/> N = 2 (JP1 to OPEN), <math>f_{OSC}</math> = 48MHz<br/> N = 4 (JP1 to GND), <math>f_{OSC}</math> = 24MHz</p>                                                                                                                                                                                                                                            |
| <b>LTC6905-80, DC2073B-G</b><br>$f_{OSC} = \frac{80\text{MHz}}{N}$ <p>N = 1 (JP1 to V<sup>+</sup>), <math>f_{OSC}</math> = 80MHz<br/> N = 2 (JP1 to OPEN), <math>f_{OSC}</math> = 40MHz<br/> N = 4 (JP1 to GND), <math>f_{OSC}</math> = 20MHz</p>                                                                                                                                                                                                                                        | <b>LTC6906, DC2073B-H</b><br>$f_{OSC} = \frac{1\text{MHz}}{N} \cdot \frac{100\text{k}\Omega}{R_{SET}}, R_{SET} = \frac{1\text{MHz}}{f_{OSC}} \cdot \frac{100\text{k}\Omega}{N}$ <p>N = 1 (JP1 to GND), 0.1MHz ≤ <math>f_{OSC}</math> ≤ 1MHz<br/> N = 3 (JP1 to OPEN), 33kHz ≤ <math>f_{OSC}</math> ≤ 333kHz<br/> N = 10 (JP1 to V<sup>+</sup>), 10kHz ≤ <math>f_{OSC}</math> ≤ 100kHz</p>                                                                                                    |
| <b>LTC6907, DC2073B-I</b><br>$f_{OSC} = \frac{4\text{MHz}}{N} \cdot \frac{50\text{k}\Omega}{R_{SET}}, R_{SET} = \frac{4\text{MHz}}{f_{OSC}} \cdot \frac{50\text{k}\Omega}{N}$ <p>N = 1 (JP1 to GND), 0.4MHz ≤ <math>f_{OSC}</math> ≤ 4MHz<br/> N = 3 (JP1 to OPEN), 133kHz ≤ <math>f_{OSC}</math> ≤ 1.33MHz<br/> N = 10 (JP1 to V<sup>+</sup>), 40kHz ≤ <math>f_{OSC}</math> ≤ 400kHz</p>                                                                                                | <b>LTC6908-1, DC2073B-J</b><br><p>Complementary Outputs (0°/180°) without Modulation:<br/> 250kHz ≤ <math>f_{OSC}</math> ≤ 5MHz, (JP1 to DIV/MOD)</p> $f_{OSC} = \frac{10\text{MHz}}{N} \cdot \frac{10\text{k}\Omega}{R_{SET}}, R_{SET} = \frac{10\text{MHz}}{f_{OSC}} \cdot \frac{10\text{k}\Omega}{N}$ <p>Spread Spectrum Modulation Rate:<br/> (JP1 to GND), <math>f_{OSC}/16</math><br/> (JP1 to OPEN), <math>f_{OSC}/32</math><br/> (JP1 to V<sup>+</sup>), <math>f_{OSC}/64</math></p> |
| <b>LTC6908-1, DC2073B-K</b><br><p>Quadrature Outputs (0°/90°) without Modulation:<br/> 250kHz ≤ <math>f_{OSC}</math> ≤ 5MHz, (JP1 to DIV/MOD)</p> $f_{OSC} = \frac{10\text{MHz}}{N} \cdot \frac{10\text{k}\Omega}{R_{SET}}, R_{SET} = \frac{10\text{MHz}}{f_{OSC}} \cdot \frac{10\text{k}\Omega}{N}$ <p>Spread Spectrum Modulation Rate:<br/> (JP1 to GND), <math>f_{OSC}/16</math><br/> (JP1 to OPEN), <math>f_{OSC}/32</math><br/> (JP1 to V<sup>+</sup>), <math>f_{OSC}/64</math></p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



# DEMO MANUAL DC2073B

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