# DEMO MANUAL DC2073B

## 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**



**Table 1. Resistor-Set Oscillator ICs and Maximum Frequency Error at $T_A$ = 25°C**

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

## QUICK START PROCEDURE

**Test Equipment:**

1. A single 3V power supply.
2. An oscilloscope with a bandwidth of at least 5x $f_{OSC}$. (For example, if $f_{OSC}$ = 100MHz 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 (>100k), 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

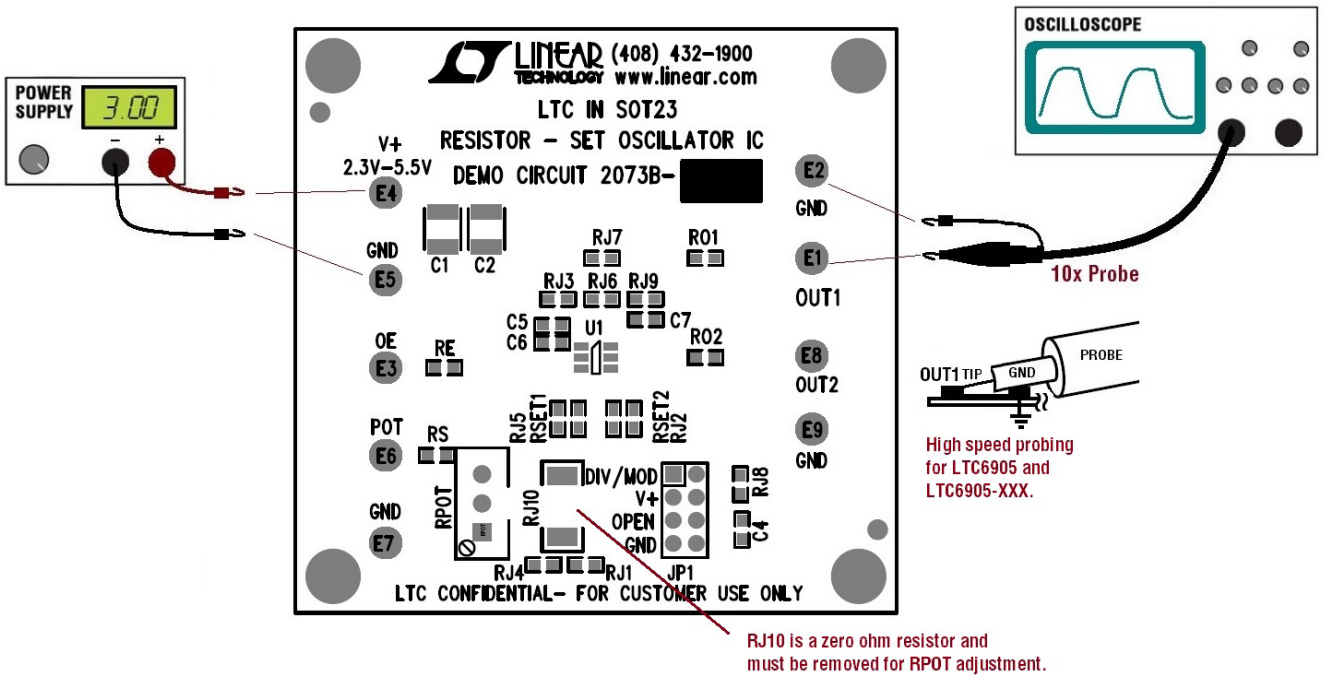


**Figure 1. Test Setup**

## QUICK START PROCEDURE

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

**LTC6905, DC2073B-A**

$$f_{OSC} = \left(\frac{168.5MHz \bullet 10k\Omega}{R_{SET}} + 1.5MHZ\right) \bullet \frac{1}{N},\ R_{SET} = \frac{168.5MHz \bullet 10k\Omega}{N \bullet f_{OSC} - 1.5MHz}$$

N = 1 (JP1 to V+), 68.9MHz ≤ $f_{OSC}$ ≤ 170MHz
N = 2 (JP1 to OPEN), 34.45MHz ≤ $f_{OSC}$ ≤ 85MHz
N = 4 (JP1 to GND), 7.225MHz ≤ $f_{OSC}$ ≤ 42.5MHz

**LTC1799, DC2073B-B**

$$f_{OSC} = \frac{10MHz}{N} \bullet \frac{10k\Omega}{R_{SET}},\ R_{SET} = \frac{10MHz}{f_{OSC}} \bullet \frac{10k\Omega}{N}$$

N = 1 (JP1 to GND), 500kHz ≤ $f_{OSC}$ ≤ 20MHz
N = 10 (JP1 to OPEN), 50kHz ≤ $f_{OSC}$ ≤ 2MHz
N = 100 (JP1 to V+), 5kHz ≤ $f_{OSC}$ ≤ 200kHz

**LTC6900, DC1073A-C**

$$f_{OSC} = \frac{10MHz}{N} \bullet \frac{20k\Omega}{R_{SET}},\ R_{SET} = \frac{10MHz}{f_{OSC}} \bullet \frac{20k\Omega}{N}$$

N = 1 (JP1 to GND), 500kHz ≤ $f_{OSC}$ ≤ 20MHz
N = 10 (JP1 to OPEN), 50kHz ≤ $f_{OSC}$ ≤ 2MHz
N = 100 (JP1 to V+), 5kHz ≤ $f_{OSC}$ ≤ 200kHz

**LTC6905-133, DC2073B-D**

$$f_{OSC} = \frac{133MHz}{N}$$

N = 1 (JP1 to V+), $f_{OSC}$ = 133MHz
N = 2 (JP1 to OPEN), $f_{OSC}$ = 66.7MHz
N = 4 (JP1 to GND), $f_{OSC}$ = 33.5MHz

**LTC6905-10, DC2073B-E**

$$f_{OSC} = \frac{100MHz}{N}$$

N = 1 (JP1 to V+), $f_{OSC}$ = 100MHz
N = 2 (JP1 to OPEN), $f_{OSC}$ = 50MHz
N = 4 (JP1 to GND), $f_{OSC}$ = 25MHz

**LTC6905-96, DC2073B-F**

$$f_{OSC} = \frac{96MHz}{N}$$

N = 1 (JP1 to V+), $f_{OSC}$ = 96MHz
N = 2 (JP1 to OPEN), $f_{OSC}$ = 48MHz
N = 4 (JP1 to GND), $f_{OSC}$ = 24MHz

**LTC6905-80, DC2073B-G**

$$f_{OSC} = \frac{80MHz}{N}$$

N = 1 (JP1 to V+), $f_{OSC}$ = 80MHz
N = 2 (JP1 to OPEN), $f_{OSC}$ = 40MHz
N = 4 (JP1 to GND), $f_{OSC}$ = 20MHz

**LTC6906, DC2073B-H**

$$f_{OSC} = \frac{1MHz}{N} \bullet \frac{100k\Omega}{R_{SET}},\ R_{SET} = \frac{1MHz}{f_{OSC}} \bullet \frac{100k\Omega}{N}$$

N = 1 (JP1 to GND), 0.1MHz ≤ $f_{OSC}$ ≤ 1MHz
N = 3 (JP1 to OPEN), 33kHz ≤ $f_{OSC}$ ≤ 333kHz
N = 10 (JP1 to V+), 10kHz ≤ $f_{OSC}$ ≤ 100kHz

**LTC6907, DC2073B-I**

$$f_{OSC} = \frac{4MHz}{N} \bullet \frac{50k\Omega}{R_{SET}},\ R_{SET} = \frac{4MHz}{f_{OSC}} \bullet \frac{50k\Omega}{N}$$

N = 1 (JP1 to GND), 0.4MHz ≤ $f_{OSC}$ ≤ 4MHz
N = 3 (JP1 to OPEN), 133kHz ≤ $f_{OSC}$ ≤ 1.33MHz
N = 10 (JP1 to V+), 40kHz ≤ $f_{OSC}$ ≤ 400kHz

**LTC6908-1, DC2073B-J**

Complementary Outputs (0°/180°) without Modulation:
250kHz ≤ $f_{OSC}$ ≤ 5MHz, (JP1 to DIV/MOD)

$$f_{OSC} = \frac{10MHz}{N} \bullet \frac{10k\Omega}{R_{SET}},\ R_{SET} = \frac{10MHz}{f_{OSC}} \bullet \frac{10k\Omega}{N}$$

Spread Spectrum Modulation Rate:

(JP1 to GND), $f_{OSC}$/16
(JP1 to OPEN), $f_{OSC}$/32
(JP1 to V+), $f_{OSC}$/64

**LTC6908-1, DC2073B-K**

Quadrature Outputs (0°/90°) without Modulation:
250kHz ≤ $f_{OSC}$ ≤ 5MHz, (JP1 to DIV/MOD)

$$f_{OSC} = \frac{10MHz}{N} \bullet \frac{10k\Omega}{R_{SET}},\ R_{SET} = \frac{10MHz}{f_{OSC}} \bullet \frac{10k\Omega}{N}$$

Spread Spectrum Modulation Rate:

(JP1 to GND), $f_{OSC}$/16
(JP1 to OPEN), $f_{OSC}$/32
(JP1 to V+), $f_{OSC}$/64

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