

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

DESCRIPTION

DC2073A demo board features Linear Technology's SOT23 packaged silicon oscillators. The DC2073A demo board is available in eleven different options; DC2073A-A through DC2073A-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>

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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 , DC2073A-A	Resistor Programmable	17.225MHz ≤ f _{OSC} ≤ 170MHz, ±1.4% at V ⁺ = 2.7V and ±2.2% at V ⁺ = 5V
LTC1799 , DC2073A-B	Resistor Programmable	5kHz ≤ f _{OSC} ≤ 10MHz, ±1.5% at V ⁺ = 3V and ±1.5% at V ⁺ = 5V (Up to 20MHz)
LTC6900 , DC2073A-C	Resistor Programmable	5kHz ≤ f _{OSC} ≤ 10MHz, ±1.5% at V ⁺ = 3V and ±1.5% at V ⁺ = 5V (Up to 20MHz)
LTC6905-133 , DC2073A-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 , DC2073A-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 , DC2073A-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 , DC2073A-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 , DC2073A-H	Resistor Programmable	10kHz ≤ f _{OSC} ≤ 1MHz, ±0.5% at V ⁺ = 2.7V to 3.6V and ±0.7% at V ⁺ = 2.25V
LTC6907 , DC2073A-I	Resistor Programmable	400kHz ≤ f _{OSC} ≤ 4MHz, ±0.65% at V ⁺ = 3V to 3.6V
LTC6908-1 , DC2073A-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 , DC2073A-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 $5 \times f_{OSC}$. (For example, if $f_{OSC} = 100\text{MHz}$ then use a 500MHz oscilloscope).
3. A screwdriver to adjust the potentiometer.

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 DC2073A-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 (DC2073A-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 (DC2073A-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 DC2073A-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 DC2073A and connect an ohmmeter from POT (E6) to V^+ (DC2073A-A, -B, -C, -J or -K) or GND (DC2073A-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 DC2073A $RPOT + RSET1$ 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

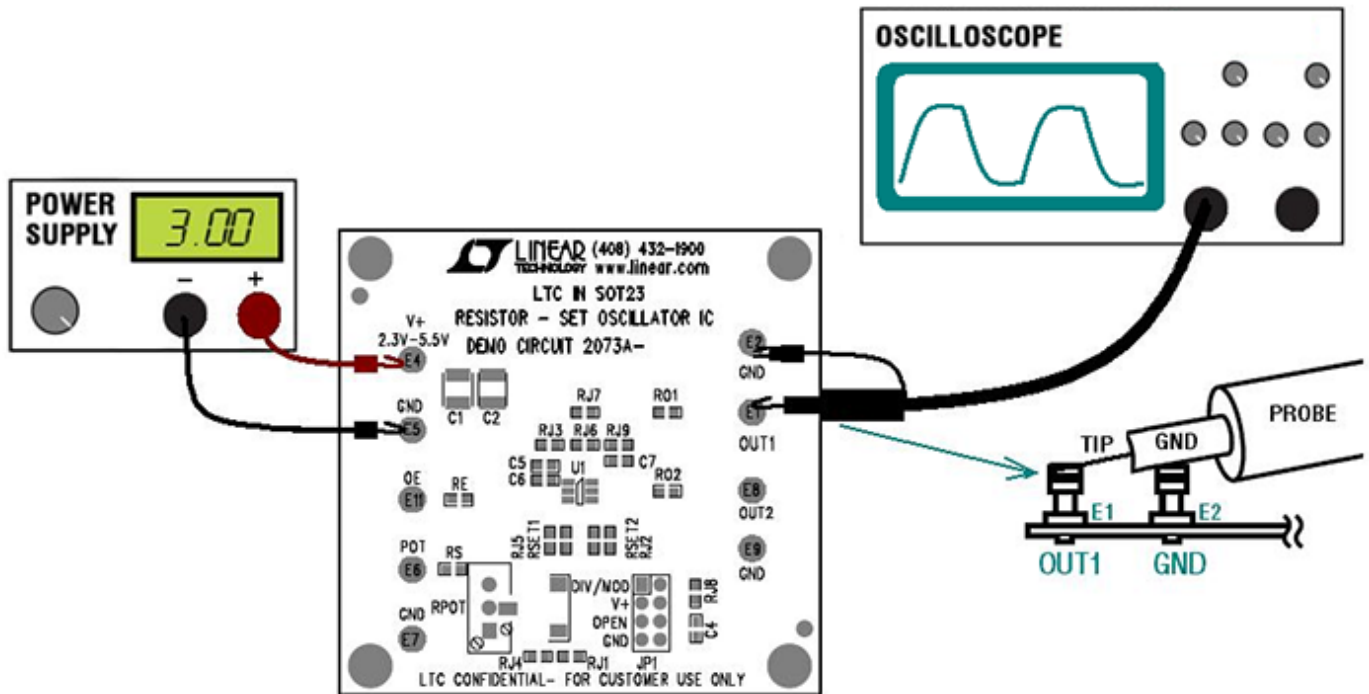


Figure 1. Test Setup

QUICK START PROCEDURE

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

LTC6905, DC2073A-A $f_{OSC} = \left(\frac{168.5\text{MHz} \cdot 10\text{k}\Omega}{R_{SET}} + 1.5\text{MHz} \right) \cdot \frac{1}{N}, R_{SET} = \frac{168.5\text{MHz} \cdot 10\text{k}\Omega}{N \cdot f_{OSC} - 1.5\text{MHz}}$ $N = 1$ (JP1 to V⁺), $68.9\text{MHz} \leq f_{OSC} \leq 170\text{MHz}$ $N = 2$ (JP1 to OPEN), $34.45\text{MHz} \leq f_{OSC} \leq 85\text{MHz}$ $N = 4$ (JP1 to GND), $7.225\text{MHz} \leq f_{OSC} \leq 42.5\text{MHz}$	LTC1799, DC2073A-B $f_{OSC} = \frac{10\text{MHz} \cdot 10\text{k}\Omega}{N \cdot R_{SET}}, R_{SET} = \frac{10\text{MHz} \cdot 10\text{k}\Omega}{f_{OSC} \cdot N}$ $N = 1$ (JP1 to GND), $500\text{kHz} \leq f_{OSC} \leq 20\text{MHz}$ $N = 10$ (JP1 to OPEN), $50\text{kHz} \leq f_{OSC} \leq 2\text{MHz}$ $N = 100$ (JP1 to V⁺), $5\text{kHz} \leq f_{OSC} \leq 200\text{kHz}$
LTC6900, DC1073A-C $f_{OSC} = \frac{10\text{MHz} \cdot 20\text{k}\Omega}{N \cdot R_{SET}}, R_{SET} = \frac{10\text{MHz} \cdot 20\text{k}\Omega}{f_{OSC} \cdot N}$ $N = 1$ (JP1 to GND), $500\text{kHz} \leq f_{OSC} \leq 20\text{MHz}$ $N = 10$ (JP1 to OPEN), $50\text{kHz} \leq f_{OSC} \leq 2\text{MHz}$ $N = 100$ (JP1 to V⁺), $5\text{kHz} \leq f_{OSC} \leq 200\text{kHz}$	LTC6905-133, DC2073A-D $f_{OSC} = \frac{133\text{MHz}}{N}$ $N = 1$ (JP1 to V⁺), $f_{OSC} = 133\text{MHz}$ $N = 2$ (JP1 to OPEN), $f_{OSC} = 66.7\text{MHz}$ $N = 4$ (JP1 to GND), $f_{OSC} = 33.5\text{MHz}$
LTC6905-10, DC2073A-E $f_{OSC} = \frac{100\text{MHz}}{N}$ $N = 1$ (JP1 to V⁺), $f_{OSC} = 100\text{MHz}$ $N = 2$ (JP1 to OPEN), $f_{OSC} = 50\text{MHz}$ $N = 4$ (JP1 to GND), $f_{OSC} = 25\text{MHz}$	LTC6905-96, DC2073A-F $f_{OSC} = \frac{96\text{MHz}}{N}$ $N = 1$ (JP1 to V⁺), $f_{OSC} = 96\text{MHz}$ $N = 2$ (JP1 to OPEN), $f_{OSC} = 48\text{MHz}$ $N = 4$ (JP1 to GND), $f_{OSC} = 24\text{MHz}$
LTC6905-80, DC2073A-G $f_{OSC} = \frac{80\text{MHz}}{N}$ $N = 1$ (JP1 to V⁺), $f_{OSC} = 80\text{MHz}$ $N = 2$ (JP1 to OPEN), $f_{OSC} = 40\text{MHz}$ $N = 4$ (JP1 to GND), $f_{OSC} = 20\text{MHz}$	LTC6906, DC2073A-H $f_{OSC} = \frac{1\text{MHz} \cdot 100\text{k}\Omega}{N \cdot R_{SET}}, R_{SET} = \frac{1\text{MHz} \cdot 100\text{k}\Omega}{f_{OSC} \cdot N}$ $N = 1$ (JP1 to GND), $0.1\text{MHz} \leq f_{OSC} \leq 1\text{MHz}$ $N = 3$ (JP1 to OPEN), $33\text{kHz} \leq f_{OSC} \leq 333\text{kHz}$ $N = 10$ (JP1 to V⁺), $10\text{kHz} \leq f_{OSC} \leq 100\text{kHz}$
LTC6907, DC2073A-I $f_{OSC} = \frac{4\text{MHz} \cdot 50\text{k}\Omega}{N \cdot R_{SET}}, R_{SET} = \frac{4\text{MHz} \cdot 50\text{k}\Omega}{f_{OSC} \cdot N}$ $N = 1$ (JP1 to GND), $0.4\text{MHz} \leq f_{OSC} \leq 4\text{MHz}$ $N = 3$ (JP1 to OPEN), $133\text{kHz} \leq f_{OSC} \leq 1.33\text{MHz}$ $N = 10$ (JP1 to V⁺), $40\text{kHz} \leq f_{OSC} \leq 400\text{kHz}$	LTC6908-1, DC2073A-J Complementary Outputs (0°/180°) without Modulation: $250\text{kHz} \leq f_{OSC} \leq 5\text{MHz}$, (JP1 to DIV/MOD) $f_{OSC} = \frac{10\text{MHz} \cdot 10\text{k}\Omega}{N \cdot R_{SET}}, R_{SET} = \frac{10\text{MHz} \cdot 10\text{k}\Omega}{f_{OSC} \cdot N}$ Spread Spectrum Modulation Rate: (JP1 to GND), $f_{OSC}/16$ (JP1 to OPEN), $f_{OSC}/32$ (JP1 to V⁺), $f_{OSC}/64$
LTC6908-1, DC2073A-K Quadrature Outputs (0°/90°) without Modulation: $250\text{kHz} \leq f_{OSC} \leq 5\text{MHz}$, (JP1 to DIV/MOD) $f_{OSC} = \frac{10\text{MHz} \cdot 10\text{k}\Omega}{N \cdot R_{SET}}, R_{SET} = \frac{10\text{MHz} \cdot 10\text{k}\Omega}{f_{OSC} \cdot N}$ Spread Spectrum Modulation Rate: (JP1 to GND), $f_{OSC}/16$ (JP1 to OPEN), $f_{OSC}/32$ (JP1 to V⁺), $f_{OSC}/64$	

PARTS LIST

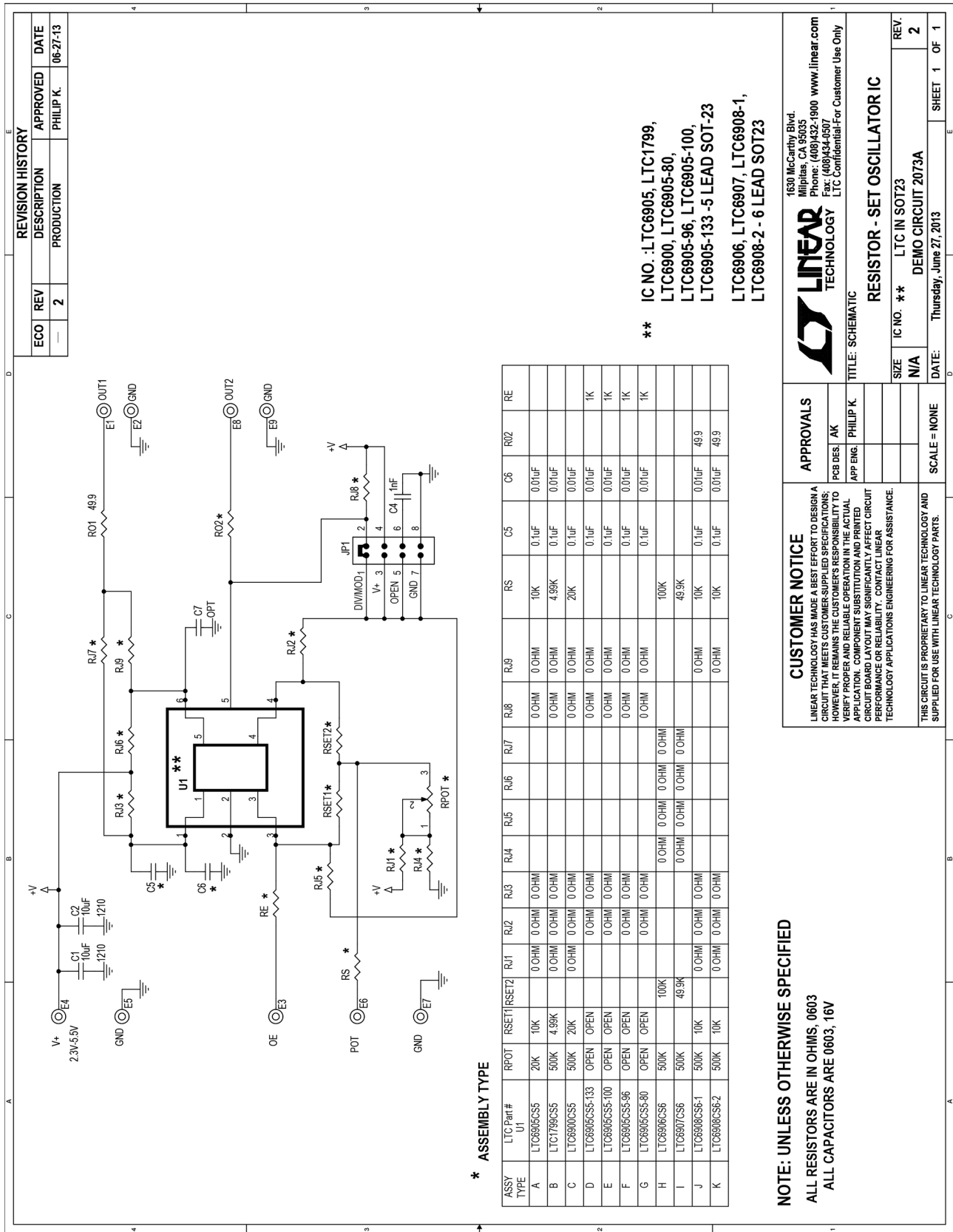
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
General				
1	2	C1,C2	Cap., Chip, X7R, 10µF, 10%, 16V, 1210	Murata, GRM32DR71C106KA01
2	1	C4	Cap., Chip, X7R, 1000pF, 10%, 16V, 0603	AVX, 0603YC102KAT
3	0	C7 OPT	Cap., 0603, OPT	
4	9	E1-E9	Testpoint, Turret, 0.064"	Mill-Max, 2308-2-00-80-00-00-07-0
5	1	R01	Res., Chip, 49.9Ω, 1%, 0603	Vishay, CRCW060349R9FKEA
6	1	JP1	Headers, Dbl. Row 2 x 4 2mm Ctrs	Samtec TMM-104-02-L-D
7	1	XJP1	Shunt	
8	4	(STAND-OFF)	Stand-Off, Nylon 0.5"	Keystone, 8833 (Snap On)
DC2073A-A				
1	1	RPOT	3/8" Square Multiturn Cermet Trimmer, 20k	Vishay, T93YA203KT20
2	2	RSET1, RS	Res., Chip, 10k, 1% 0603	Vishay, CRCW060310K0FKEA
3	5	RJ1, RJ2, RJ3, RJ8, RJ9	Res., Chip, 0Ω, 0603	Vishay, CRCW06030000Z0EA
4	1	C5	Cap., Chip, X7R, 0.1µF, 10%, 16V, 0603	AVX, 0603YC104KAT2A
5	1	C6	Cap., Chip, X7R, 0.01µF, 10%, 16V, 0603	AVX, 0603YC103KAT2A
6	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 5-Lead	Linear Tech., LTC6905CS5
DC2073A-B				
1	1	RPOT	3/8" Square Multiturn Cermet Trimmer, 500k	Vishay, T93YA504KT20
2	2	RSET1, RS	Res., Chip, 4.99k, 1% 0603	Vishay, CRCW06034K99FKEA
3	5	RJ1, RJ2, RJ3, RJ8, RJ9	Res., Chip, 0Ω, 0603	Vishay, CRCW06030000Z0EA
4	1	C5	Cap., Chip, X7R, 0.1µF, 10%, 16V, 0603	AVX, 0603YC104KAT2A
5	1	C6	Cap., Chip, X7R, 0.01µF, 10%, 16V, 0603	AVX, 0603YC103KAT2A
6	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 5-Lead	Linear Tech., LTC1799CS5
DC2073A-C				
1	1	RPOT	3/8" Square Multiturn Cermet Trimmer, 500k	Vishay, T93YA504KT20
2	2	RSET1, RS	Res., Chip, 20K, 1% 0603	Vishay, CRCW060320K0FKEA
3	5	RJ1, RJ2, RJ3, RJ8, RJ9	Res., Chip, 0Ω, 0603	Vishay, CRCW06030000Z0EA
4	1	C5	Cap., Chip, X7R, 0.1µF, 10%, 16V, 0603	AVX, 0603YC104KAT2A
5	1	C6	Cap., Chip, X7R, 0.01µF, 10%, 16V, 0603	AVX, 0603YC103KAT2A
6	1	U1	Resistor set SOT-23 Oscillator, SOT23, 5-Lead	Linear Tech., LTC6900CS5
DC2073A-D				
1	4	RJ2, RJ3, RJ8, RJ9	Res., Chip, 0Ω, 0603	VISHAY, CRCW06030000Z0EA
2	1	RE	Res., Chip, 1k, 1% 0603	VISHAY, CRCW06031K0FKEA
3	1	C5	Cap., Chip, X7R, 0.1µF, 10%, 16V, 0603	AVX, 0603YC104KAT2A
4	1	C6	Cap., Chip, X7R, 0.01µF, 10%, 16V, 0603	AVX, 0603YC103KAT2A
5	1	U1	Resistor set SOT-23 Oscillator, SOT23, 5-Lead	Linear Tech., LTC6905CS5-133
DC2073A-E				
1	4	RJ2, RJ3, RJ8, RJ9	Res., Chip, 0Ω, 0603	Vishay, CRCW06030000Z0EA
2	1	RE	Res., Chip, 1k, 1% 0603	Vishay, CRCW06031K0FKEA
3	1	C5	Cap., Chip, X7R, 0.1µF, 10%, 16V, 0603	AVX, 0603YC104KAT2A
4	1	C6	Cap., Chip, X7R, 0.01µF, 10%, 16V, 0603	AVX, 0603YC103KAT2A
5	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 5-Lead	Linear Tech., LTC6905CS5-100

DEMO MANUAL DC2073A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
DC2073A-F				
1	4	RJ2, RJ3, RJ8, RJ9	Res., Chip, 0 Ω , 0603	Vishay, CRCW06030000Z0EA
2	1	RE	Res., Chip, 1k, 1% 0603	Vishay, CRCW06031K0FKEA
3	1	C5	Cap., Chip, X7R, 0.1 μ F, 10%, 16V, 0603	AVX, 0603YC104KAT2A
4	1	C6	Cap., Chip, X7R, 0.01 μ F, 10%, 16V, 0603	AVX, 0603YC103KAT2A
5	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 5-Lead	Linear Tech., LTC6905CS5-96
DC2073A-G				
1	4	RJ2, RJ3, RJ8, RJ9	Res., Chip, 0 Ω , 0603	Vishay, CRCW06030000Z0EA
2	1	RE	Res., Chip, 1k, 1% 0603	Vishay, CRCW06031K0FKEA
3	1	C5	Cap., Chip, X7R, 0.1 μ F, 10%, 16V, 0603	AVX, 0603YC104KAT2A
4	1	C6	Cap., Chip, X7R, 0.01 μ F, 10%, 16V, 0603	AVX, 0603YC103KAT2A
5	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 5-Lead	Linear Tech., LTC6905CS5-80
DC2073A-H				
1	1	RPOT	3/8" Square Multiturn Cermet Trimmer, 500k	Vishay, T93YA504KT20
2	2	RSET2, RS	Res., Chip, 100k, 1% 0603	Vishay, CRCW0603100KFKEA
3	4	RJ4, RJ5, RJ6, RJ7	Res., Chip, 0 Ω , 0603	Vishay, CRCW06030000Z0EA
4	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 6-Lead	Linear Tech., LTC6906CS6
DC2073A-I				
2	1	RPOT	3/8" Square Multiturn Cermet Trimmer, 500k	Vishay, T93YA504KT20
3	2	RSET2, RS	Res., Chip, 49.9k, 1% 0603	Vishay, CRCW060349K9FKEA
4	4	RJ4, RJ5, RJ6, RJ7	Res., Chip, 0 Ω , 0603	Vishay, CRCW06030000Z0EA
5	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 6-Lead	Linear Tech., LTC6907CS6
DC2073A-J				
1	1	RPOT	3/8" Square Multiturn Cermet Trimmer, 500k	Vishay, T93YA504KT20
2	2	RSET1, RS	Res., Chip, 10k, 1% 0603	Vishay, CRCW060310K0FKEA
3	4	RJ1, RJ2, RJ3, RJ9	Res., Chip, 0 Ω , 0603	Vishay, CRCW06030000Z0EA
4	1	R02	Res., Chip, 49.9k, 1%, 0603	Vishay, CRCW060349R9FKEA
5	1	C5	Cap., Chip, X7R, 0.1 μ F, 10%, 16V, 0603	AVX, 0603YC104JAT2A
6	1	C6	Cap., Chip, X7R, 0.01 μ F, 10%, 16V, 0603	AVX, 0603YC103KAT2A
7	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 6-Lead	Linear Tech., LTC6908CS6-1
DC2073A-K				
1	1	RPOT	3/8" Square Multiturn Cermet Trimmer, 500k	Vishay, T93YA504KT20
2	2	RSET1, RS	Res., Chip, 10K, 1% 0603	Vishay, CRCW060310K00FKEA
3	4	RJ1, RJ2, RJ3, RJ9	Res., Chip, 0 Ω , 0603	Vishay, CRCW06030000Z0EA
4	1	R02	Res., Chip, 49.9k, 1%, 0603	Vishay, CRCW060349R9FKEA
5	1	C5	Cap., Chip, X7R, 0.1 μ F, 10%, 16V, 0603	AVX, 0603YC104KAT2A
6	1	C6	Cap., Chip, X7R, 0.01 μ F, 10%, 16V, 0603	AVX, 0603YC103KAT2A
7	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 6-Lead	Linear Tech., LTC6908CS6-2

SCHEMATIC DIAGRAM



NOTE: UNLESS OTHERWISE SPECIFIED
ALL RESISTORS ARE IN OHMS, 0603
ALL CAPACITORS ARE 0603, 16V

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		APP. ENG.	PHILIP K.
		TITLE: SCHEMATIC	
		RESISTOR - SET OSCILLATOR IC	
SIZE	N/A	IC NO.	**
REV.	2	LTC IN SOT23	
DATE:	Thursday, June 27, 2013	DEMO CIRCUIT 2073A	
SHEET	1	OF	1

DEMO MANUAL DC2073A

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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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dc2073af

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