

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 $T_A = 25^\circ\text{C}$

PART NUMBER, BOARD ASSEMBLY	FREQUENCY PROGRAM METHOD	DESCRIPTION
LTC®6905 , DC2073A-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 $V^+ = 5\text{V}$
LTC1799 , DC2073A-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)
LTC6900 , DC2073A-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)
LTC6905-133 , DC2073A-D	Three Fixed Frequencies Set by Three-State Input	$f_{\text{OSC}} = 133\text{MHz}$, 66.7MHz and 33.5MHz , $\pm 1.0\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ Typical at $V^+ = 5\text{V}$
LTC6905-100 , DC2073A-E	Three Fixed Frequencies Set by Three-State Input	$f_{\text{OSC}} = 100\text{MHz}$, 50MHz and 25MHz , $\pm 1.0\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ Typical at $V^+ = 5\text{V}$
LTC6905-96 , DC2073A-F	Three Fixed Frequencies Set by Three-State Input	$f_{\text{OSC}} = 96\text{MHz}$, 48MHz and 24MHz , $\pm 1.0\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ Typical at $V^+ = 5\text{V}$
LTC6905-80 , DC2073A-G	Three Fixed Frequencies Set by Three-State Input	$f_{\text{OSC}} = 80\text{MHz}$, 40MHz and 20MHz , $\pm 1.0\%$ at $V^+ = 3\text{V}$ and $\pm 1.5\%$ typical at $V^+ = 5\text{V}$
LTC6906 , DC2073A-H	Resistor Programmable	$10\text{kHz} \leq f_{\text{OSC}} \leq 1\text{MHz}$, $\pm 0.5\%$ at $V^+ = 2.7\text{V}$ to 3.6V and $\pm 0.7\%$ at $V^+ = 2.25\text{V}$
LTC6907 , DC2073A-I	Resistor Programmable	$400\text{kHz} \leq f_{\text{OSC}} \leq 4\text{MHz}$, $\pm 0.65\%$ at $V^+ = 3\text{V}$ to 3.6V
LTC6908-1 , DC2073A-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 $V^+ = 5\text{V}$
LTC6908-2 , DC2073A-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.

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

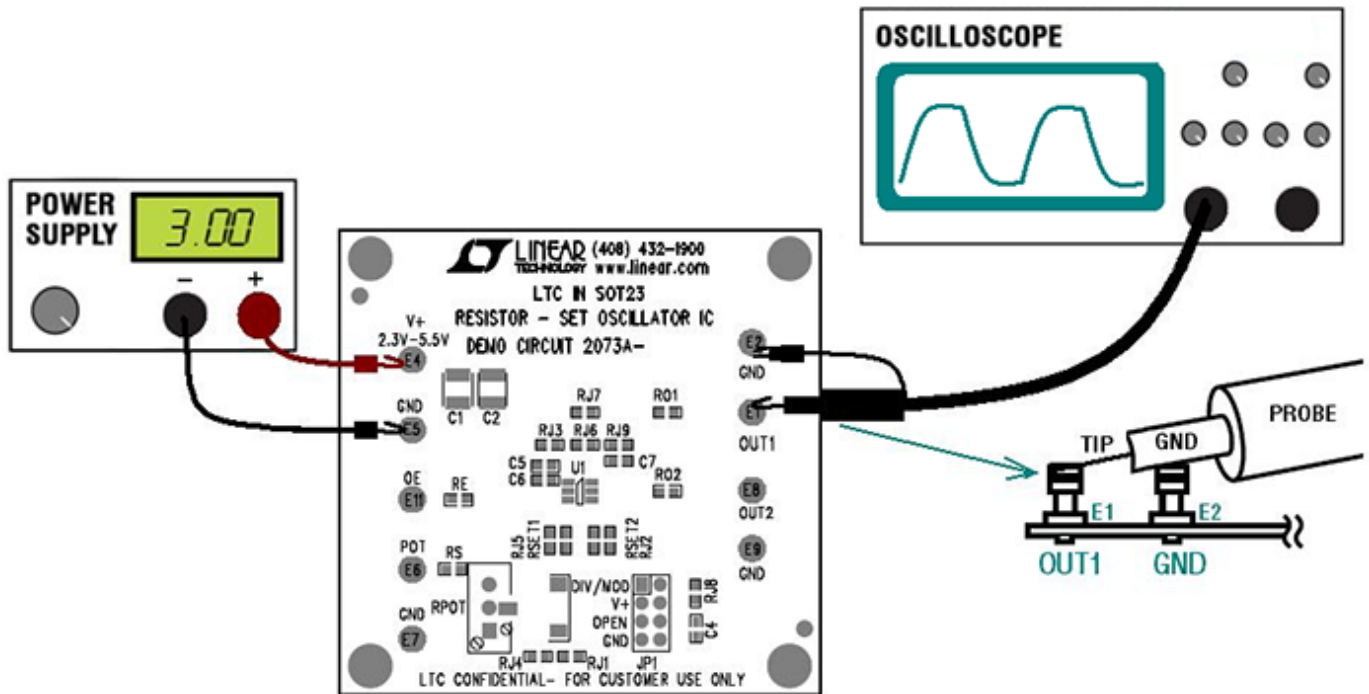


Figure 1. Test Setup

DEMO MANUAL DC2073A

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

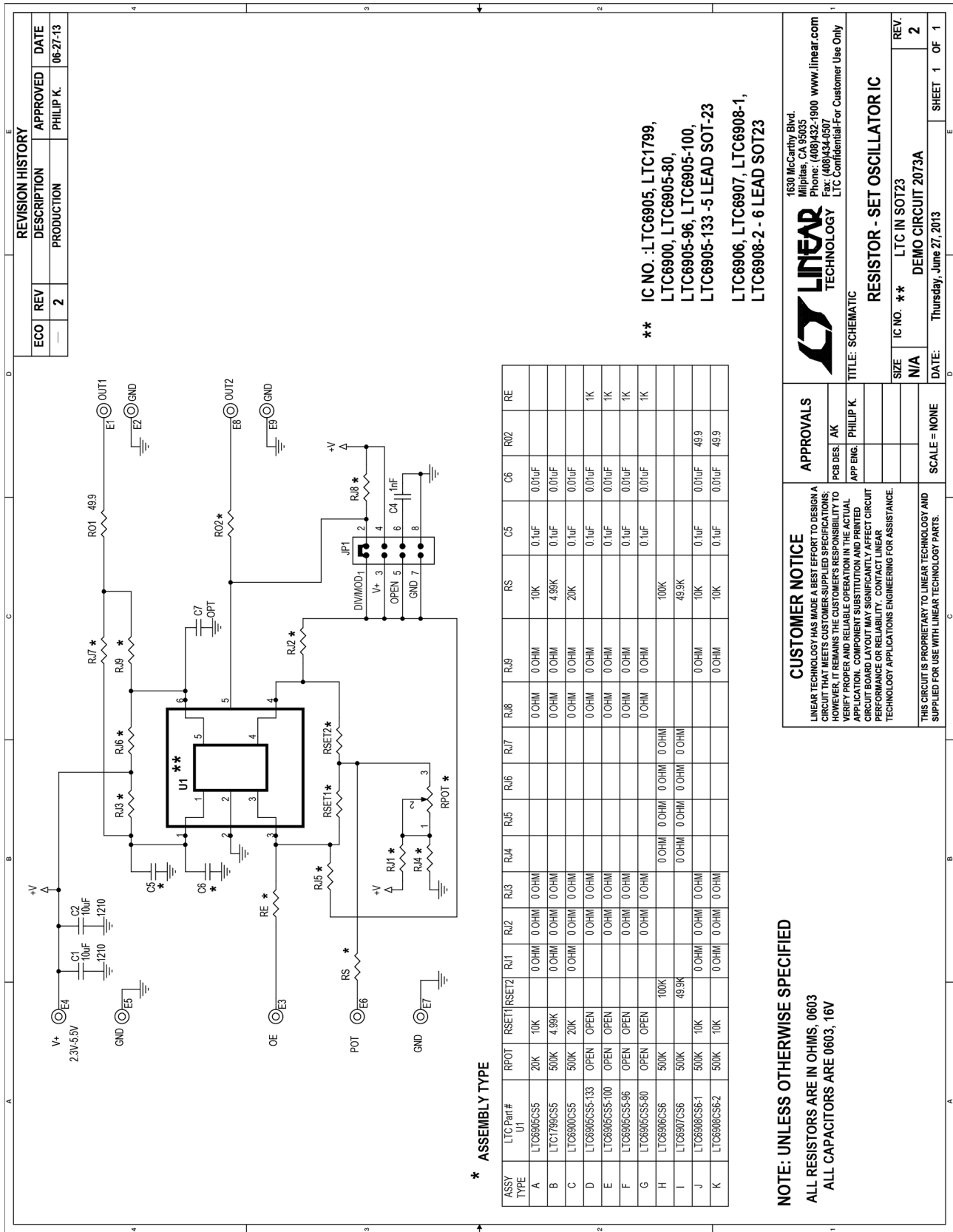
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
General				
1	2	C1,C2	Cap., Chip, X7R, 10µF, 10%, 16V, 1210	Murata, GRM32DR71C106KA01
2	1	C4	Cap., Chip, X7R, 1000pF, 10%, 16V, 0603	AVX, 0603YC102KAT
3	0	C7 OPT	Cap., 0603, OPT	
4	9	E1-E9	Testpoint, Turret, 0.064"	Mill-Max, 2308-2-00-80-00-00-07-0
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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 LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO DESIGN, BUILD, TEST, AND VALIDATE THE CIRCUIT FOR ALL APPLICATIONS. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

APPROVALS

PCB DES.	AK
APP. ENG.	PHILIP K.

RESISTOR - SET OSCILLATOR IC

IC NO.	REV.
LTC IN SOT23	2

DATE: Thursday, June 27, 2013
SHEET 1 **OF** 1

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DEMO MANUAL DC2073A

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Please read the DEMO BOARD manual prior to handling the product. Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

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