DEMO MANUAL DC2073A

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 5x f_{OSC}. (For example, if f_{OSC} = 100MHz 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

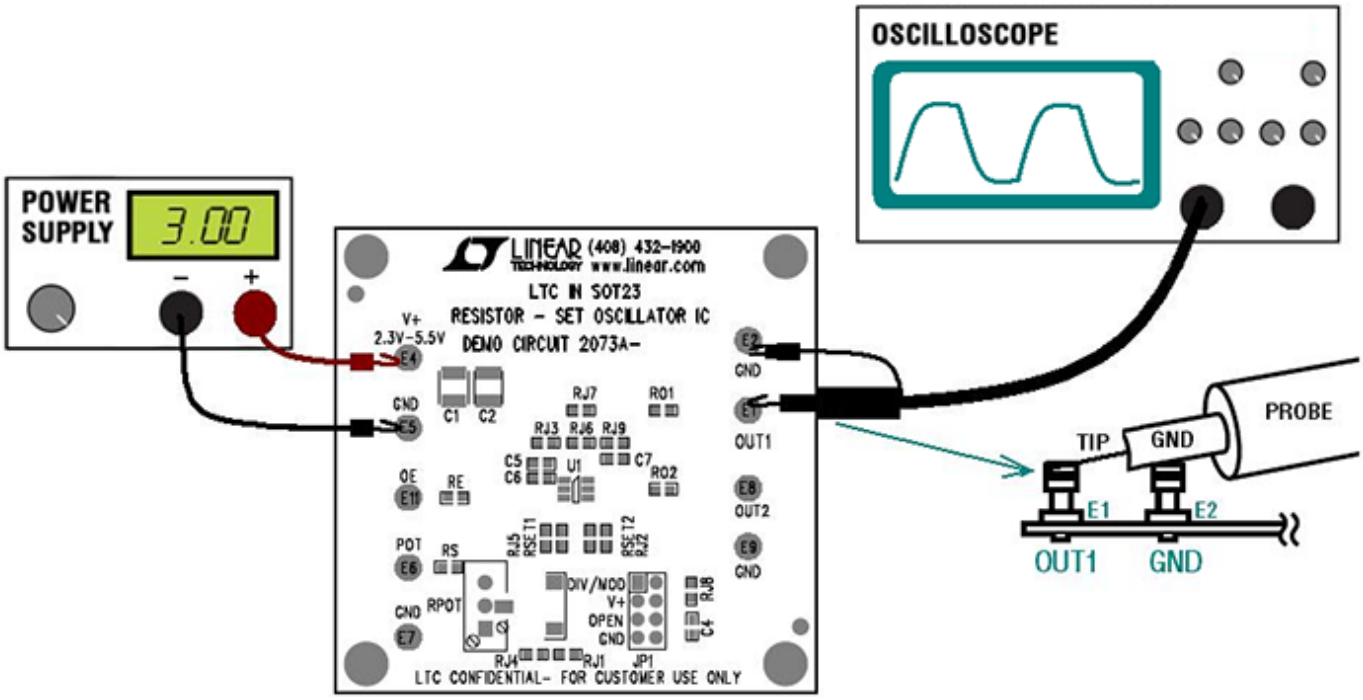


Figure 1. Test Setup

QUICK START PROCEDURE

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

LTC6905, DC2073A-A

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

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, DC2073A-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, DC2073A-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, DC2073A-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, DC2073A-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, DC2073A-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, DC2073A-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, DC2073A-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, DC2073A-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, DC2073A-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

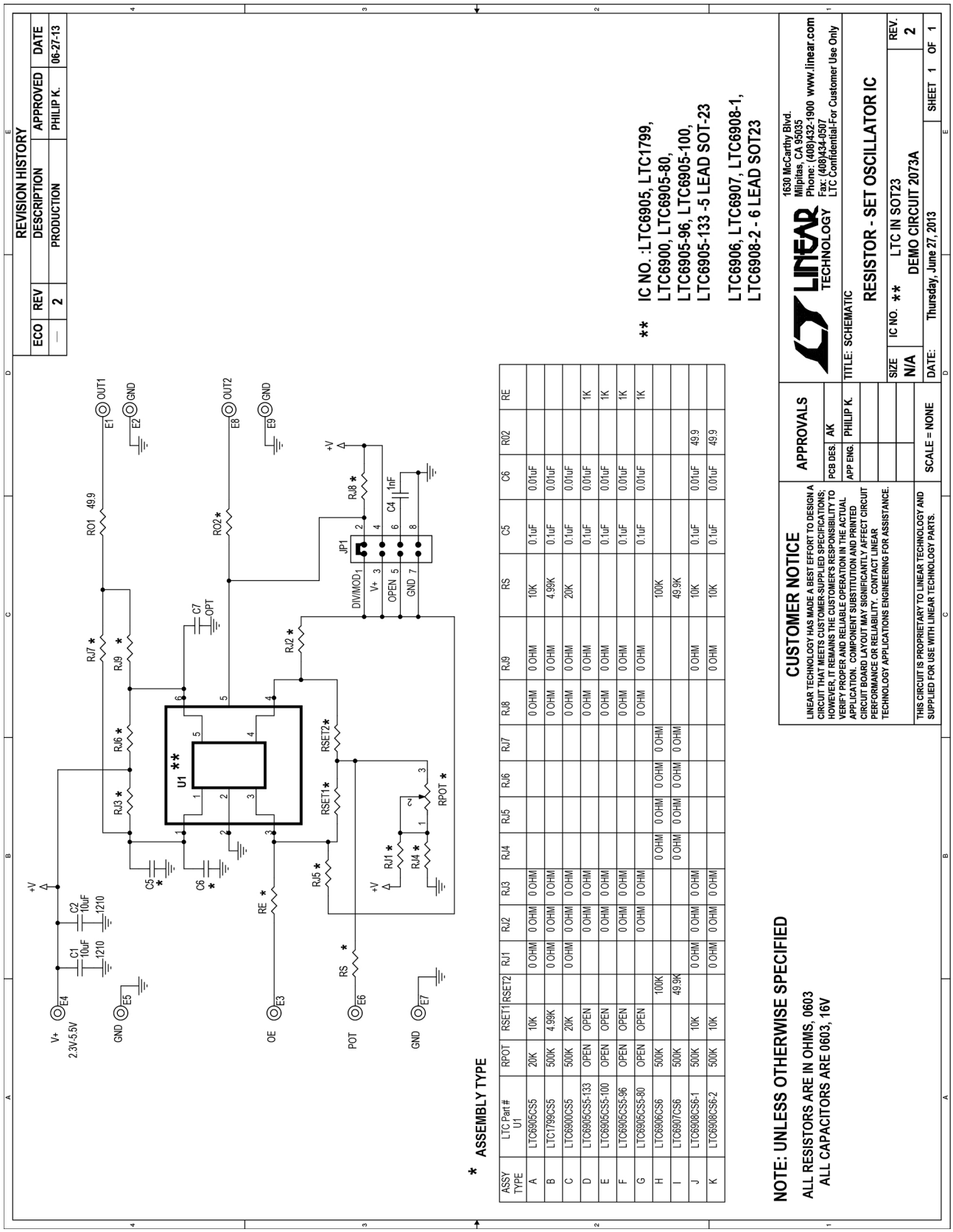
PARTS LIST

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

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
DC2073A-F				
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., LTC6905CS5-96
DC2073A-G				
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., LTC6905CS5-80
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, 0Ω, 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, 0Ω, 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, 0Ω, 0603	Vishay, CRCW06030000Z0EA
4	1	R02	Res., Chip, 49.9k, 1%, 0603	Vishay, CRCW060349R9FKEA
5	1	C5	Cap., Chip, X7R, 0.1µF, 10%, 16V, 0603	AVX, 0603YC104JAT2A
6	1	C6	Cap., Chip, X7R, 0.01µF, 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, 0Ω, 0603	Vishay, CRCW06030000Z0EA
4	1	R02	Res., Chip, 49.9k, 1%, 0603	Vishay, CRCW060349R9FKEA
5	1	C5	Cap., Chip, X7R, 0.1µF, 10%, 16V, 0603	AVX, 0603YC104KAT2A
6	1	C6	Cap., Chip, X7R, 0.01µF, 10%, 16V, 0603	AVX, 0603YC103KAT2A
7	1	U1	Resistor Set SOT-23 Oscillator, SOT23, 6-Lead	Linear Tech., LTC6908CS6-2

SCHEMATIC DIAGRAM



ASSY TYPE	LTC Part # U1	RPOT	RSET1	RSET2	RJ1	RJ2	RJ3	RJ4	RJ5	RJ6	RJ7	RJ8	RJ9	RS	C5	C6	R02	RE
A	LTC6905CS5	20K	10K		0 OHM	0 OHM	0 OHM					0 OHM	0 OHM	10K	0.1uF	0.01uF		
B	LTC1799CS5	500K	4.99K		0 OHM	0 OHM	0 OHM					0 OHM	0 OHM	4.99K	0.1uF	0.01uF		
C	LTC6900CS5	500K	20K		0 OHM	0 OHM	0 OHM					0 OHM	0 OHM	20K	0.1uF	0.01uF		
D	LTC6905CS5-133	OPEN	OPEN			0 OHM	0 OHM					0 OHM	0 OHM		0.1uF	0.01uF		1K
E	LTC6905CS5-100	OPEN	OPEN			0 OHM	0 OHM					0 OHM	0 OHM		0.1uF	0.01uF		1K
F	LTC6905CS5-96	OPEN	OPEN			0 OHM	0 OHM					0 OHM	0 OHM		0.1uF	0.01uF		1K
G	LTC6905CS5-80	OPEN	OPEN			0 OHM	0 OHM					0 OHM	0 OHM		0.1uF	0.01uF		1K
H	LTC6906CS6	500K		100K				0 OHM	0 OHM	0 OHM	0 OHM			100K				
I	LTC6907CS6	500K		49.9K				0 OHM	0 OHM	0 OHM	0 OHM			49.9K				
J	LTC6908CS6-1	500K	10K		0 OHM	0 OHM	0 OHM						0 OHM	10K	0.1uF	0.01uF	49.9	
K	LTC6908CS6-2	500K	10K		0 OHM	0 OHM	0 OHM						0 OHM	10K	0.1uF	0.01uF	49.9	

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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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