msi

15 Hz to 64 kHz All Silicon Sine Source
Preliminary Data Sheet

MSLOSC

Description

The MSLOSC integrated circuit provides a programmable frequency low distortion (0.1%) sine wave output. The level is digitally programmable from 0 dB to -63 dB. Using switched-capacitor filters and dividers the frequency can be controlled from 15 Hz to 64 kHz with no external capacitors. The device can operate from 3.30V up to 5.5 VDC. The frequency accuracy of the MSLOSC is less than 0.01%. Temperature stability is better than discrete solutions using resistors, capacitors and op amps.

A 4 bit DAC is filtered with a programmable switched-capacitor filter followed by a continuous time programmable lowpass filter to reduce distortion to 0.1% (-60 dB) A synchronous serial input sets the desired frequency and level.

The MSLOSC is available in a 8 pin 0.15" SOIC.

Features

Up to 64 kHz operation
Provides Low Distortion Sinewave Output
Programmable level control down to -63 dB

Applications

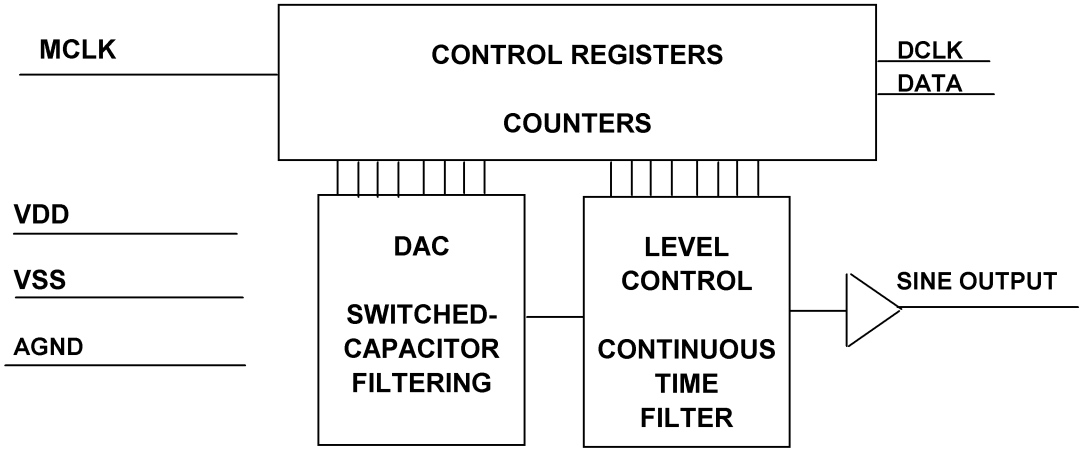
LO for Communication Modulation or Demodulation
Differential Clock for Data Acquisition
Programmable Sine Source
Portable Test Equipment

Absolute Maximum Ratings

Power Supply Voltage	+6V
Storage Temperature Range	-60 to +150° C
Operating Temperature Range	-40 to +85° C

Ordering Information

MSLOSCN	150 mils wide 8 pin SOIC



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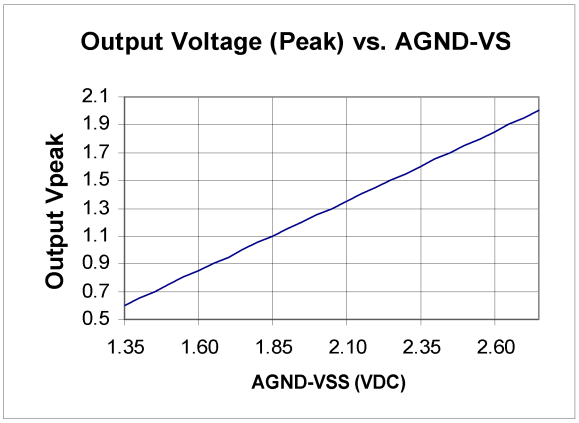
Electrical Characteristics

(VDD = 5.0V, T = 25°C fclock=16.384 MHz R_L=5kΩ)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC Specifications						
Operating Voltage	VDD		3.3		5.5	V
Supply Current	IDD			2	3	mA
Digital Input Logic 0			0.0	0.5	1	VDC
Digital Input Logic 1			VDD-1	VDD-.5		VDC
AC Specifications						
Output Level	V_{OUT}	Gain Adjust =0x00 fo=1kHz		2.83		Vpp
Coarse Atten. Step Size			7.5	8	8.5	dB
Fine Attenuator Step Size			0.25	0.5	0,75	dB
Total Harmonic Distortion	THD	A weighted 1 kHz		0.1		%
Frequency Accuracy		fo=1kHz		0.01		%
Frequency Range			0.015		64	kHz
Amplitude/Frequency Settling Time		fo=1kHz		15		ms

The formula for calculating the output frequency is given by the equation below, where Do-7 is the decimal equivalent of the setting of bits D0-7 in the frequency range setting and the MCLK DIVIDER range 2^{0-11} is controlled by bits D8-D19. Only one bit is set for a given frequency setting for MCLK DIVIDER.

$$fo = \frac{MCLK}{2^{9} \bullet 2^{(0-11)}} \bullet \left(\frac{512}{257 + [D0-7]} \right)$$



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Pin Descriptions

1	DCLK	the data clock
2	EN	the enable function, voltage HI is enabled
3	AGND	this supply is midpoint between VDD and VSS, typically +2.5 V
4	OUT	the sinewave output
5	VSS	the most negative supply voltage, typically 0V
6	MCLK	the masterclock input
7	DATA	the data input
8	VDD	the most positive supply voltage, typically +5V

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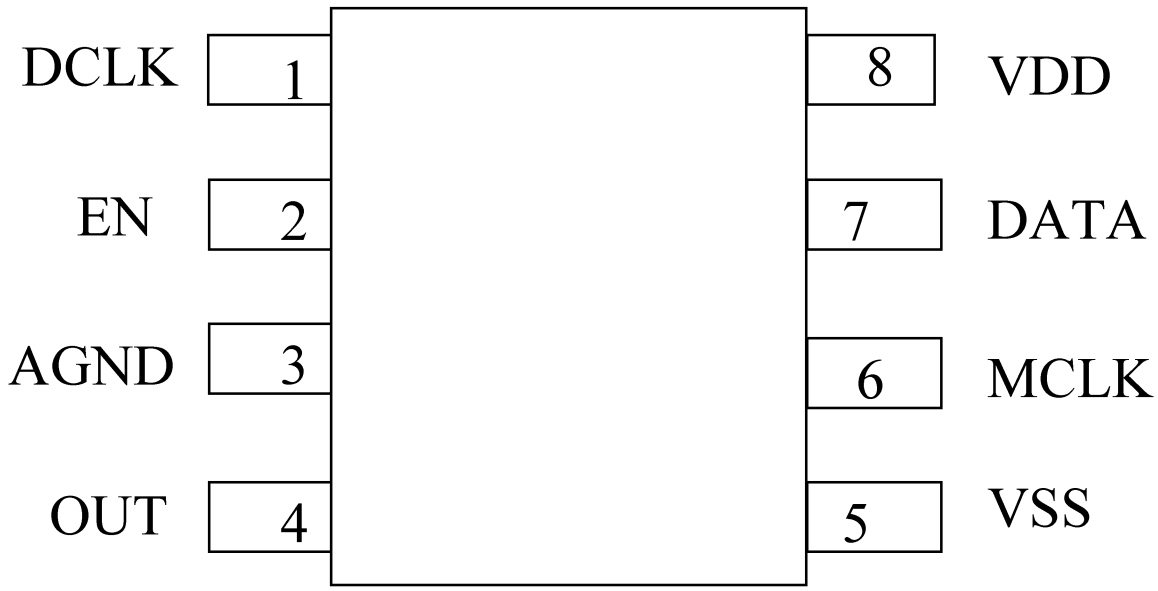

Figure 1: Pin Out

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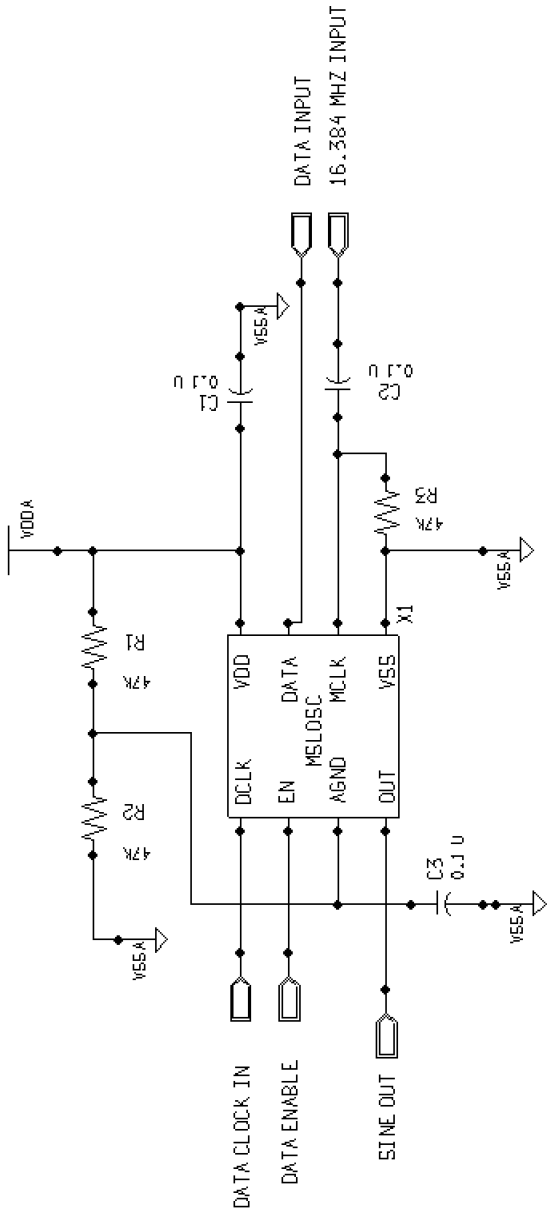

Figure 2: Typical Application Schematic

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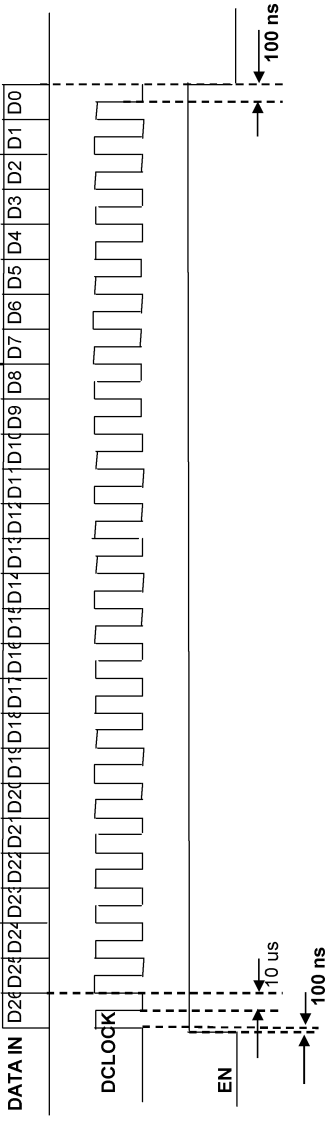

Figure 3: MSLOSC Timing Diagram

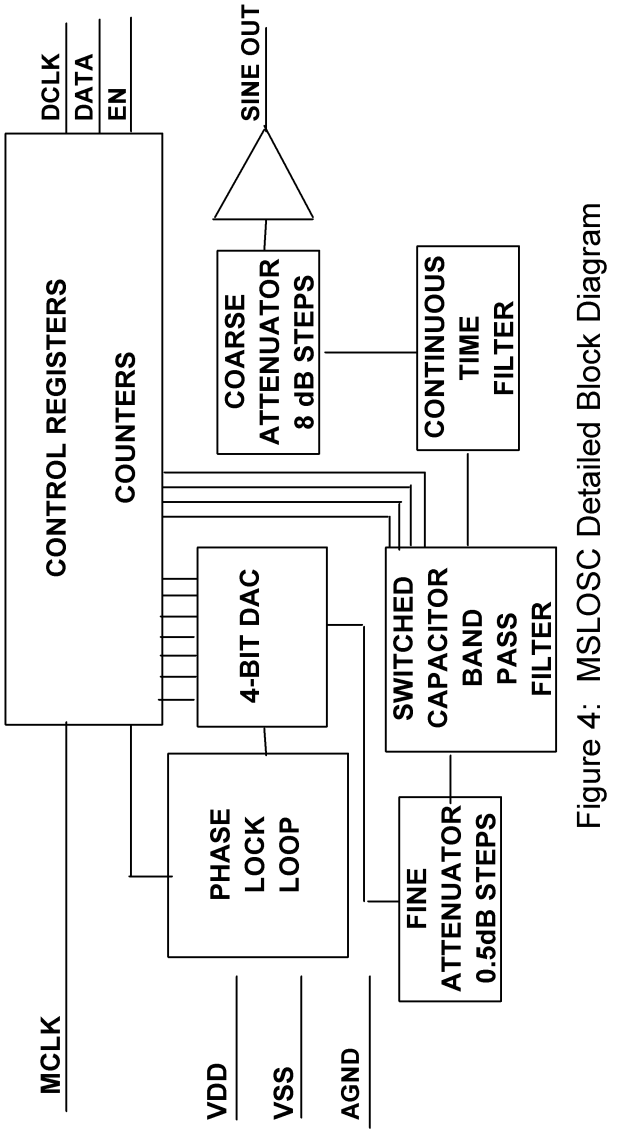

Figure 4: MSLOSC Detailed Block Diagram

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MCLK Divider Control

D19	D18	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Fo (Hz)
1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	15.63
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31.13
0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	31.25
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62.26
0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	62.50
0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	124.51
0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	125.00
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	249.03
0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	250.49
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	498.05
0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	500.00
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	996.11
0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1000.00
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1992.22
0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	2000.00
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3984.44
0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	4000.00
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7968.87
0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	8000.00
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	15937.74
0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	16000.00
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	31875.49
0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	32000.00
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	63750.97

Fractional Frequency Control

D7	D6	D5	D4	D3	D2	D1	D0	FACTOR	D7	D6	D5	D4	D3	D2	D1	D0	FACTOR
1	1	1	1	1	1	1	0	1.0020	0	0	1	1	0	0	0	0	1.6787
1	1	1	1	1	1	0	0	1.0059	0	0	1	0	0	0	0	0	1.7716
1	1	1	1	1	0	0	0	1.0139	0	0	0	1	1	1	1	1	1.7778
1	1	1	1	0	0	0	0	1.0302	0	0	0	1	1	1	1	0	1.7840
1	1	1	0	0	0	0	0	1.0644	0	0	0	1	1	1	0	0	1.7965
1	1	0	0	0	0	0	0	1.1403	0	0	0	1	1	0	0	0	1.8221
1	0	0	0	0	0	0	0	1.3299	0	0	0	1	0	0	0	0	1.8755
0	1	1	1	1	1	1	1	1.3333	0	0	0	0	1	1	1	1	1.8824
0	1	1	1	1	1	1	0	1.3368	0	0	0	0	1	1	1	0	1.8893
0	1	1	1	1	1	0	0	1.3438	0	0	0	0	1	1	0	0	1.9033
0	1	1	1	1	0	0	0	1.3581	0	0	0	0	1	0	0	0	1.9321
0	1	1	1	0	0	0	0	1.3875	0	0	0	0	0	1	1	1	1.9394
0	1	1	0	0	0	0	0	1.4504	0	0	0	0	0	1	1	0	1.9468
0	1	0	0	0	0	0	0	1.5950	0	0	0	0	0	1	0	1	1.9542
0	0	1	1	1	1	1	1	1.6000	0	0	0	0	0	1	0	0	1.9617
0	0	1	1	1	1	1	0	1.6050	0	0	0	0	0	0	1	1	1.9692
0	0	1	1	1	1	0	0	1.6151	0	0	0	0	0	0	1	0	1.9768
0	0	1	1	1	0	0	0	1.6358	0	0	0	0	0	0	0	1	1.9845

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Bitmap for Commonly Used Frequencies

D19	D18	D17	D16	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Fo (Hz)
1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	15.63
1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	16.00
1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	20.00
1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	25.00
0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	32.00
0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	50.00
0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	64.00
0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	100.00
0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	149.88
0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	200.00
0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	250.00
0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	1	1	1	1	320.00
0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1	1	1	1	500.00
0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	1	1	1	640.00
0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1000.00
0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	1501.47
0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2000.00
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	1	2497.56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	3200.00
0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0	0	1	4995.12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	6400.00
0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	0	1	9990.24
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	15003.66
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	19980.49
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	1	24975.61
0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1	1	32000.00
0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	49951.22
0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1	1	49951.22
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	63750.97

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Bitmap for Coarse/Fine Attenuator Control (Bits D26-D20)

D26	D25	D24	D23	D22	D21	D20	ATTEN
0	0	0	0	0	0	0	0.00
0	0	0	0	0	0	1	-0.50
0	0	0	0	0	1	0	-1.00
0	0	0	0	0	1	1	-1.50
0	0	0	0	1	0	0	-2.00
0	0	0	0	1	0	1	-2.50
0	0	0	0	1	1	0	-3.00
0	0	0	0	1	1	1	-3.50
0	0	0	1	0	0	0	-4.00
0	0	0	1	0	0	1	-4.50
0	0	0	1	0	1	0	-5.00
0	0	0	1	0	1	1	-5.50
0	0	0	1	1	0	0	-6.00
0	0	0	1	1	0	1	-6.50
0	0	0	1	1	1	0	-7.00
0	0	0	1	1	1	1	-7.50
0	0	1	0	0	0	0	-8.00
0	0	1	0	0	0	1	-8.50
0	0	1	0	0	1	1	-9.50
0	0	1	0	0	1	0	-9.00
0	0	1	0	1	0	0	-10.00
0	0	1	0	1	0	1	-10.50
0	0	1	0	1	1	0	-11.00
0	0	1	0	1	1	1	-11.50
0	0	1	1	0	0	0	-12.00
0	0	1	1	0	0	1	-12.50
0	0	1	1	0	1	0	-13.00
0	0	1	1	0	1	1	-13.50
0	0	1	1	1	0	0	-14.00
0	0	1	1	1	0	1	-14.50
0	0	1	1	1	1	0	-15.00
0	0	1	1	1	1	1	-15.50
0	1	0	0	0	0	0	-16.00
0	1	0	0	0	0	1	-16.50
0	1	0	0	0	1	0	-17.00
0	1	0	0	0	1	1	-17.50
0	1	0	0	1	0	0	-18.00
0	1	0	0	1	0	1	-18.50
0	1	0	0	1	1	0	-19.00
0	1	0	0	1	1	1	-19.50
0	1	0	1	0	0	0	-20.00
0	1	0	1	0	0	1	-20.50
0	1	0	1	0	1	0	-21.00
0	1	0	1	0	1	1	-21.50
0	1	0	1	1	0	0	-22.00
0	1	0	1	1	0	1	-22.50
0	1	0	1	1	1	0	-23.00
0	1	0	1	1	1	1	-23.50
0	1	1	0	0	0	0	-24.00
0	1	1	0	0	0	1	-24.50
0	1	1	0	0	1	0	-25.00
0	1	1	0	0	1	1	-25.50
0	1	1	0	1	0	0	-26.00
0	1	1	0	1	0	1	-26.50
0	1	1	0	1	1	0	-27.00
0	1	1	0	1	1	1	-27.50
0	1	1	1	0	0	0	-28.00
0	1	1	1	0	0	1	-28.50
0	1	1	1	0	1	0	-29.00
0	1	1	1	0	1	1	-29.50
0	1	1	1	1	0	0	-30.00
0	1	1	1	1	0	1	-30.50
0	1	1	1	1	1	0	-31.00
0	1	1	1	1	1	1	-31.50
1	0	0	0	0	0	0	-32.00
1	0	0	0	0	0	1	-32.50
1	0	0	0	0	1	0	-33.00
1	0	0	0	0	1	1	-33.50
1	0	0	0	1	0	0	-34.00
1	0	0	0	1	0	1	-34.50
1	0	0	0	1	1	0	-35.00
1	0	0	0	1	1	1	-35.50
1	0	0	1	0	0	0	-36.00
1	0	0	1	0	0	1	-36.50
1	0	0	1	0	1	0	-37.00
1	0	0	1	0	1	1	-37.50
1	0	0	1	1	0	0	-38.00
1	0	0	1	1	0	1	-38.50
1	0	0	1	1	1	0	-39.00
1	0	0	1	1	1	1	-39.50
1	0	1	0	0	0	0	-40.00
1	0	1	0	0	0	1	-40.50

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Notes

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Notes

MSL0SC

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STANDARD PRODUCTS	
MSGEQ5A	Five Band Graphic Equalizer
MSGEQ7	Seven Band Graphic Equalizer
MSHFS1-6	Selectable High Frequency LP/BP Filter
MSFS1-6	Selectable Lowpass/Bandpass Filter
MSCAHF	Selectable High Frequency Active Lowpass/Bandpass Filter
MSU1F1-4, MSU2F1	Resistor Programmable Universal Active Filter
MSU1HF1-4, MSU2HF1	High Frequency Resistor Programmable Universal Active Filter
MSELP	Switched Capacitor Elliptic Lowpass Filter with Op Amps
MSNBLP	Switched Capacitor Butterworth Lowpass Filter
MSLE/B/C5L/M	Switched Capacitor General Purpose Lowpass Filter
MS2LFS	Dual Selectable Low Voltage Lowpass/Bandpass Filter
MSLFS	Selectable Low Voltage Lowpass/Bandpass Filter
MSHN1-6	Selectable High Pass/Notch Filter
MSRAAF	Resistor Programmable Active Audio Filter
MSRAHF	Resistor Programmable Active High Frequency Filter
MSDET	Tone Detector
MSEPAF	Electrically Programmable Active Filter
MSCBT	Communications Baseband Transceiver
MSLV14	14 MHz Video Lowpass Filter
MSSPSI	Smart Programmable Sensor Interface
MSCPSI	Computer Programmable Sensor Interface

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MSL05C

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Adeptronics
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Madison, Alabama 35758
Telephone: 256-772-1922
Facsimile: 256-772-0323

In northern Illinois and eastern Wisconsin contact:

M & S Sales Inc.
187 Old Sutton Road
Barrington Hills, Illinois 60010
Telephone: 847-426-8155
Facsimile: 847-426-8120

In Arizona, Utah, Colorado, Montana, Wyoming, Idaho, New Mexico and southern Nevada contact:

Nelco Electronix
6970 S. Holly Circle, #205
Centennial, CO 80112
Telephone: 720-493-9630
Facsimile: 720-493-9631

In Indiana, Kentucky, Ohio, Michigan, and western Pennsylvania contact:

CCR Electronics, Inc.
8425 Woodfield Crossing Blvd
Suite 100
Indianapolis, Indiana 46240-2495
Telephone: 317-469-4855

In Taiwan contact:

Maxtek Technology Co., Ltd.
5F, No. 13-20, Sec. 6, Min Chian E Road, Nei Hu
Taipei, 114 R.O.C.
Telephone: 886-2-2794-6060
Facsimile: 886-2-2879-8922

In Hong Kong and the People's Republic of China contact:

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2L, Cooke Street/F
G/F, Hung Hom
Kowloon Bay, Hong Kong
Telephone: 852-2303-1290
Facsimile: 852-2900-3616

In Korea contact:

H. B. Corp.
#1409, Seocho World Officetel,
1355-3, Seocho-Dong, Seocho-Ku,
Seoul, Korea 137-070
Telephone: (02)3472-3450
Facsimile: (02)3472-3458

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Facsimile: 09-764-4801

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High Wycombe
Bucks HP12 3AJ
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Facsimile: 00-44-1494-470499

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Behringerstrasse 13
D 63814 Mainaschaff
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Telephone: 49 6021 79710
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