


**MOTOROLA**

# Low Power Voltage Controlled Oscillator

The MC12148 requires an external parallel tank circuit consisting of the inductor (L) and capacitor (C). A varactor diode may be incorporated into the tank circuit to provide a voltage variable input for the oscillator (VCO). This device may also be used in many other applications requiring a fixed frequency clock.

The MC12148 is ideal in applications requiring a local oscillator. Systems include electronic test equipment and digital high-speed telecommunications.

The MC12148 is based on the VCO circuit topology of the MC1648. The MC12148 has been realized utilizing Motorola's MOSAIC III advanced bipolar process technology which results in a design which can operate at a much higher frequency than the MC1648 while utilizing half the current. Please consult with the MC1648 data sheet for additional background information.

The ECL output circuitry of the MC12148 is not a traditional open emitter output structure and instead has an on-chip termination resistor with a nominal value of 500 ohms. This facilitates direct ac-coupling of the output signal into a transmission line. Because of this output configuration, an external pull-down resistor is not required to provide the output with a dc current path. This output is intended to drive one ECL load. If the user needs to fanout the signal, an ECL buffer such as the MC10EL16 Line Receiver/Driver should be used.

**NOTE: The MC12148 is NOT useable as a crystal oscillator.**

- Typical Operating Frequency Up to 1100 MHz
- Low-Power 20 mA at 5.0 Vdc Power Supply
- 8-Pin SOIC Package
- Phase Noise -90 dBc/Hz at 25 kHz Typical

## MC12148

### LOW POWER VOLTAGE CONTROLLED OSCILLATOR

#### SEMICONDUCTOR TECHNICAL DATA

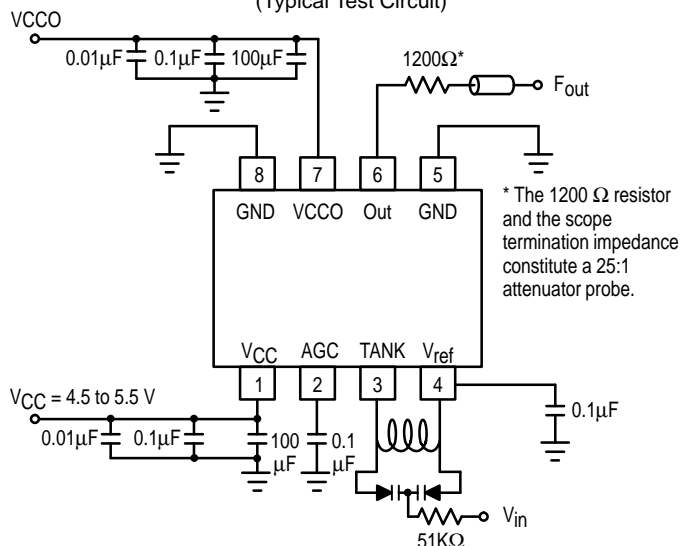


**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO-8)

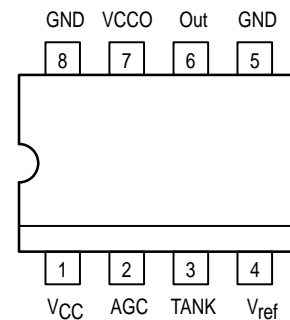


**SD SUFFIX**  
PLASTIC PACKAGE  
CASE 940  
(SSOP-8)

**BLOCK DIAGRAM**  
(Typical Test Circuit)



#### PIN CONNECTIONS



(Top View)

#### ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC12148D	$T_A = -40^\circ \text{ to } +85^\circ \text{C}$	SO-8
MC12148SD		SSOP-8

# MC12148

## MAXIMUM RATINGS

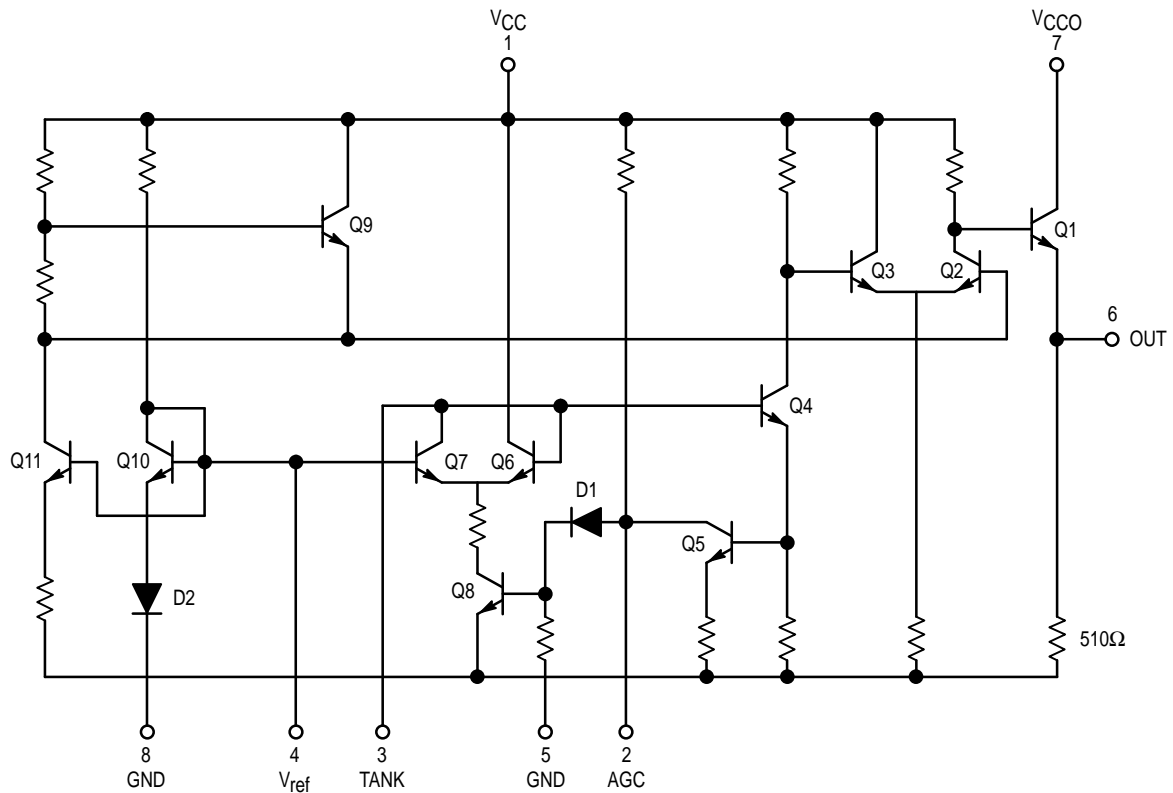
Parameter	Symbol	Value	Unit
Power Supply Voltage, Pins 1, 7	$V_{CC}$	−0.5 to 7.0	Vdc
Operating Temperature Range	$T_A$	−40 to 85	°C
Storage Temperature Range	$T_{stg}$	−65 to 150	°C

**NOTE:** ESD data available upon request.

## ELECTRICAL CHARACTERISTICS ( $V_{CC} = 5.0$ V; $T_A = -40$ to $85^\circ\text{C}$ , unless otherwise noted.)

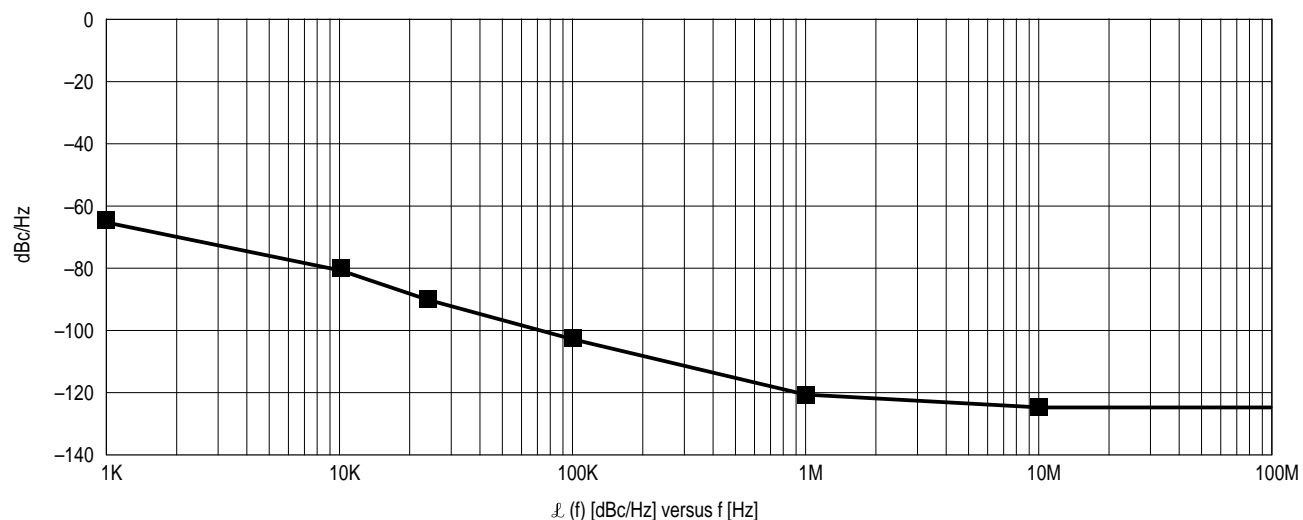
Characteristic	Symbol	Min	Typ	Max	Unit
Supply Current	$I_{CC}$	–	19	25	mA
Output Level HIGH (1.0 M $\Omega$ Impedance)	$V_{OH}$	3.95	4.17	4.61	V
Output Level LOW (1.0 M $\Omega$ Impedance)	$V_{OL}$	3.04	3.41	3.60	V
CSR @ 25 kHz Offset, 1.0 Hz BW	$L(f)$	–	−90	–	dBc/Hz
CSR @ 1.0 MHz Offset, 1.0 Hz BW	$L(f)$	–	−120	–	dBc/Hz
SNR (Signal to Noise Ratio from Carrier)	SNR	–	40	–	dB
Frequency Stability	Supply Drift	Fsts	–	3.6	KHz/mV
	Thermal Drift	Fstt	–	0.1	KHz/°C
Second Harmonic (from Carrier)	H2	–	−25	–	dBc

Figure 1. Circuit Schematic



# MC12148

**Figure 2. Typical Evaluation Results**  
(CSR MC12148 5.0 Vdc;  $V_{CC}$  @ 25°C; 930 MHz CW)



## Tank Component Suppliers

Below are suppliers who manufacture tuning varactors and inductors which can be used to build an external tank circuit. Motorola has used these varactors and inductors for evaluation purposes, however, there are other vendors who manufacture similar products.

### Coilcraft Inductors A01T thru A05T

Coilcraft—Coilcraft, Inc.  
1102 Silver Lake Rd.  
Gary, Illinois 60013  
708-639-6400

### Alpha Tuning Diodes DVH6730 Series

Alpha Semiconductor Devices Division  
20 Sylvan Road  
Woburn, MA 01801  
617-935-5150

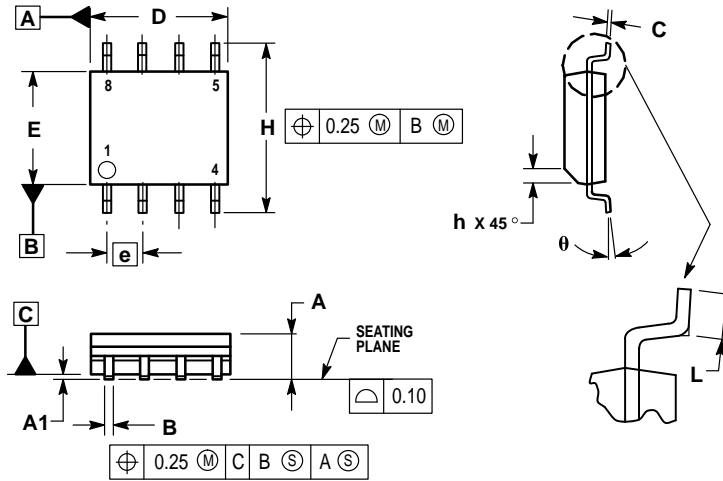
### Loral Tuning Varactors GC1500 Series

Loral  
16 Maple Road  
Chelmsford, Massachusetts 01824  
508-256-8101 or 508-256-4113

\* At 1.1 GHz, use a Coilcraft A01T Springair coil at 2.5 nH and a Loral Varactor 3.0 to 8.0 pF at  $V_{IN} = 1.0$  to 5.0 V.

## OUTLINE DIMENSIONS

**D SUFFIX**  
**PLASTIC PACKAGE**  
CASE 751-06  
(SO-8)  
ISSUE T

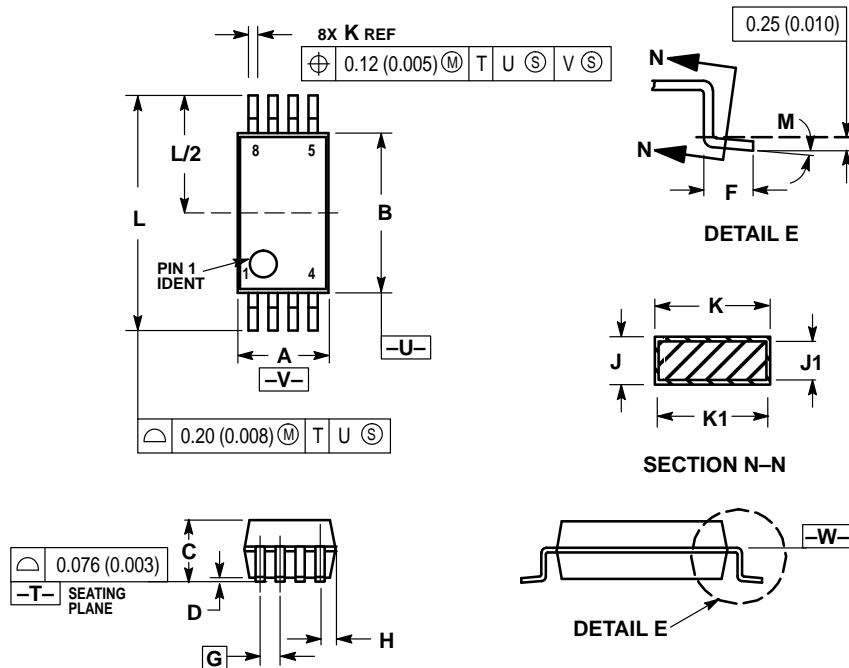


## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETER.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

MILLIMETERS		
DIM	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.35	0.49
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.25
θ	0°	7°


**SD SUFFIX**  
**PLASTIC PACKAGE**  
CASE 940-03  
(SSOP-8)  
ISSUE B



## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF K DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR INTRUSION SHALL NOT REDUCE DIMENSION K BY MORE THAN 0.07 (0.002) AT LEAST MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.87	3.13	0.113	0.123
B	5.20	5.38	0.205	0.212
C	1.73	1.99	0.068	0.078
D	0.05	0.21	0.002	0.008
F	0.63	0.95	0.024	0.037
G	0.65 BSC		0.026 BSC	
H	0.44	0.60	0.017	0.023
J	0.09	0.20	0.003	0.008
J1	0.09	0.16	0.003	0.006
K	0.25	0.38	0.010	0.015
K1	0.25	0.33	0.010	0.013
L	7.65	7.90	0.301	0.311
M	0°	8°	0°	8°

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