LANSDALE Semiconductor, Inc.

ML12038
1.1 GHz Low Power Dual Modulus Prescaler

Legacy Device: *Motorola MC12038A*

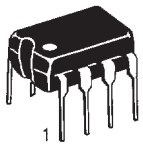
The ML12038 can be used with CMOS synthesizers requiring positive edges to trigger internal counters such as Lansdale's ML145xxx series in a PLL to provide tuning signals up to 1.1 GHz in programmable frequency steps.

A Divide Ratio Control (SW) permits selection of a 127/128 or 255/256 divide ratio as desired.

The Modulus Control (MC) selects the proper divide number after SW has been biased to select the desired divide ratio.

- 1.1 GHz Toggle Frequency
- Supply Voltage 4.5 to 5.5 V
- Low Power 4.8 mA Typical
- Operating Temperature Range T_A = –40° to +85°C
- Short Set Up Time (t_{set}) 16ns Maximum @ 1.1 GHz
- Modulus Control Input Level is Compatible With Standard CMOS and TTL
- On–Chip Output Termination

P DIP 8 = PP
PLASTIC PACKAGE
CASE 626–04



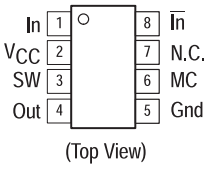
SO 8 = -5P
PLASTIC PACKAGE
CASE 751
(SO–8)

CROSS REFERENCE/ORDERING INFORMATION

PACKAGE	MOTOROLA	LANSDALE
P-DIP 8	ML12038AP	ML12038PP
SO 8	ML12038AD	ML12038-5P

Note: Lansdale lead free (**Pb**) product, as it becomes available, will be identified by a part number prefix change from **ML** to **MLE**.

PIN CONNECTIONS



(Top View)

FUNCTIONAL TABLE

SW	MC	Divide Ratio
H	H	**127**
H	L	**128**
L	H	**255**
L	L	**256**

NOTES: 1. SW: H = V_{CC}, L = Open. A logic L can also be applied by grounding this pin, but this is not recommended due to increased power consumption.
2. MC: H = 2.0 V to V_{CC}, L = Gnd to 0.8 V.

Design Criteria	Value	Unit
Internal Gate Count *	67	ea
Internal Gate Propagation Delay	200	ps
Internal Gate Power Dissipation	0.75	mW
Speed Power Product	0.15	pJ

NOTE: *Equivalent to a two–input NAND gate.

MAXIMUM RATINGS

Characteristic	Symbol	Range	Unit
Power Supply Voltage, Pin 2	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
Modulus Control Input, Pin 6	MC	–0.5 to 6.5	Vdc

ELECTRICAL CHARACTERISTICS (V_{CC} = 4.5 to 5.5 Vdc, T_A = –40 to 85°C, unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Toggle Frequency (Sine Wave)	f_t	0.1	1.4	1.1	GHz
Supply Current Output Unloaded (Pin 2) at 5.0 Vdc	I_{CC}	–	4.8	6.5	mA
Modulus Control Input High (MC)	V_{IH1}	2.0	–	V_{CC}	V
Modulus Control Input Low (MC)	V_{IL1}	–	–	0.8	V
Divide Ratio Control Input High (SW)	V_{IH2}	V_{CC}	V_{CC}	V_{CC}	Vdc
Divide Ratio Control Input Low (SW)	V_{IL2}	Open	Open	Open	–
Output Voltage Swing (C_L = 8.0 pF)	V_{out}	1.0	1.6	–	V_{pp}
Modulus Setup Time MC to Out	t_{SET}	–	11	16	ns
Input Voltage Sensitivity 250 to 1100 MHz 100–250 MHz	V_{in} (min)	100 400	–	1500 1500	mVpp

Figure 1. Logic Diagram (ML12038)

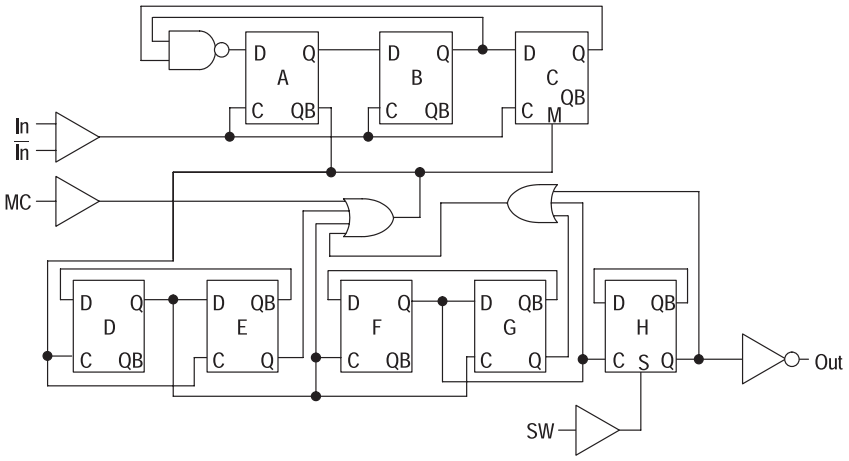
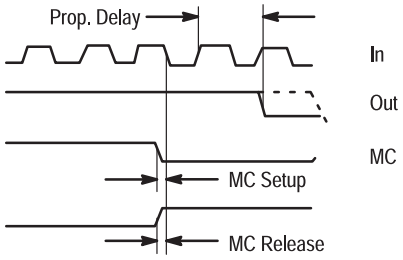
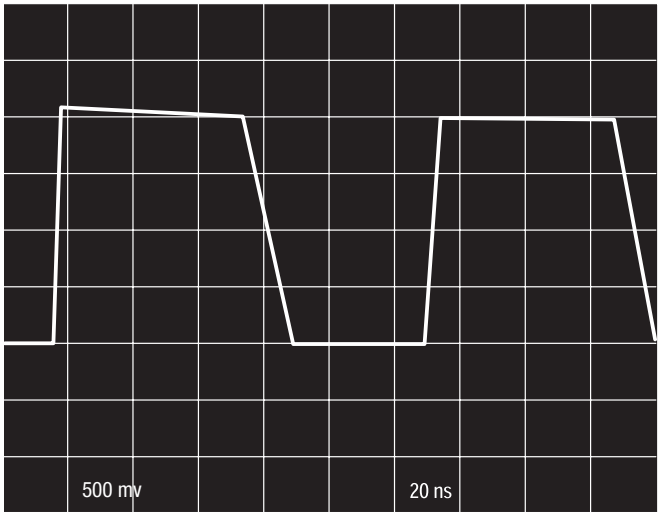


Figure 2. Modulus Setup Time



Modulus setup time MC to out is the MC setup or MC release plus the prop. delay.

Figure 3. Typical Output Waveform



(÷128, 1.1 Ghz Input Frequency, V_{CC} = 5.0 V, T_A = 25°C output Loaded)

Figure 4. AC Test Circuit

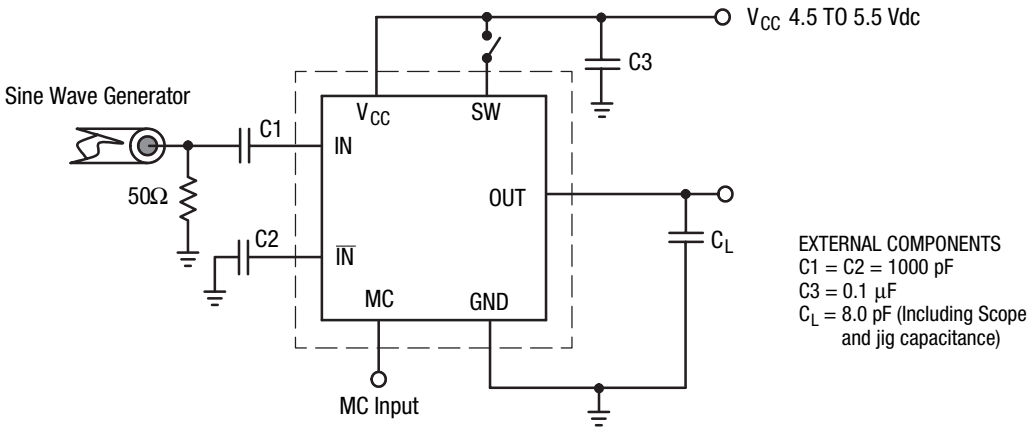
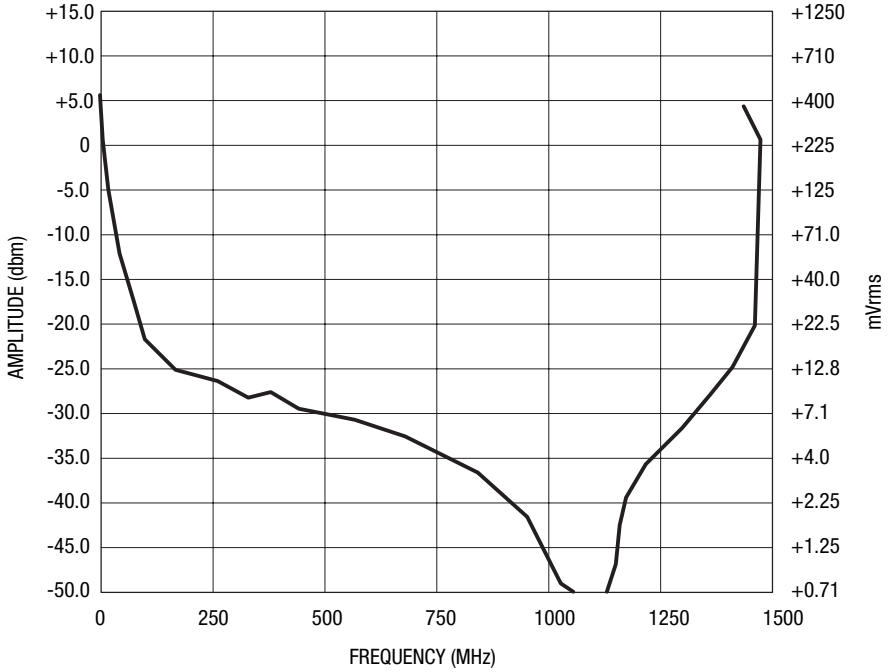


Figure 5. Input Signal Amplitude versus Input Frequency



Divide Ratio = 128; V_{CC} = 5.0 V; T_A = 25°C

Figure 6. Output Amplitude versus Input Frequency

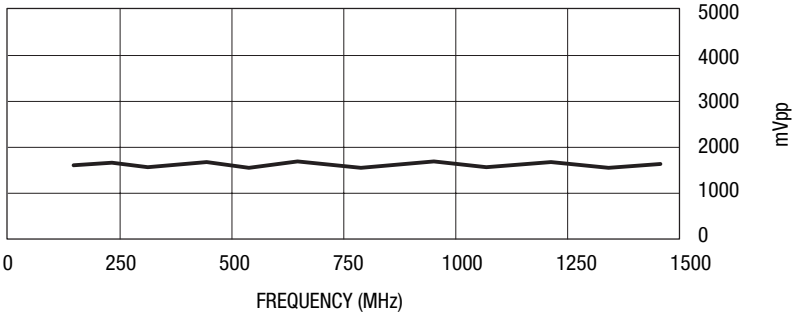
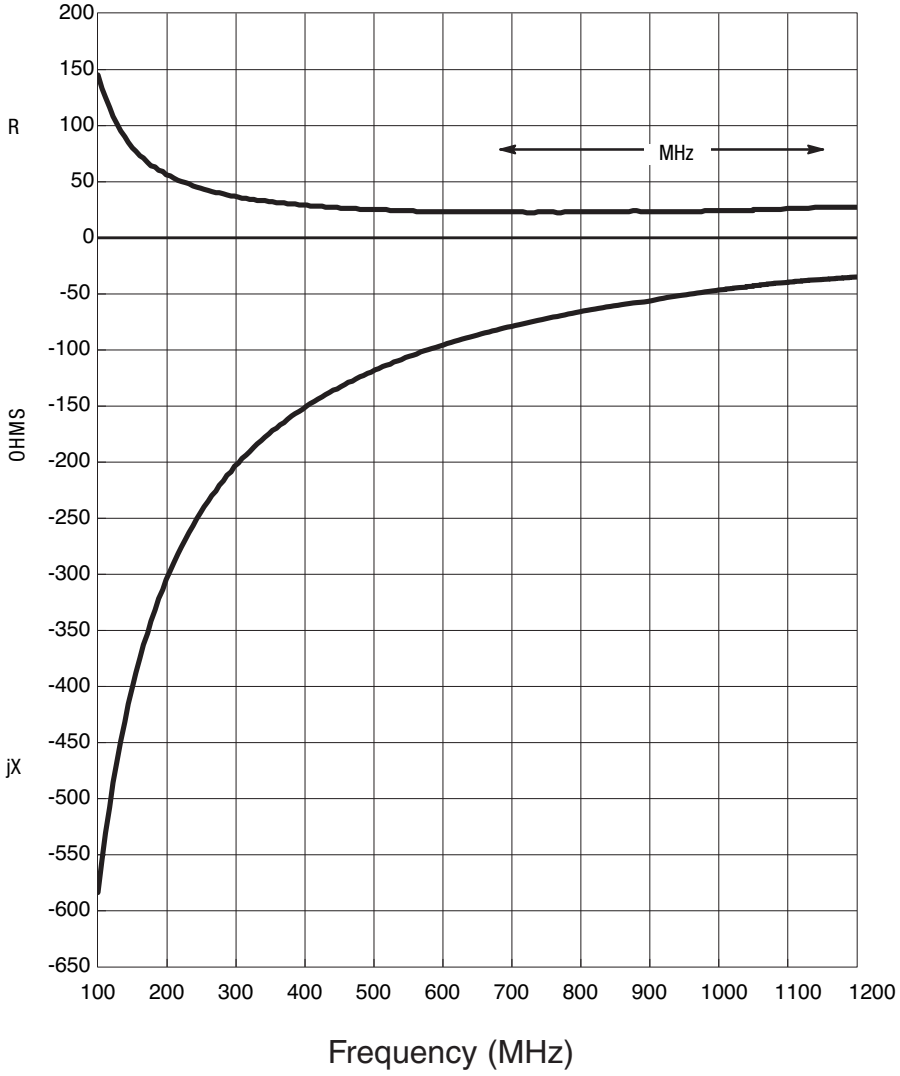
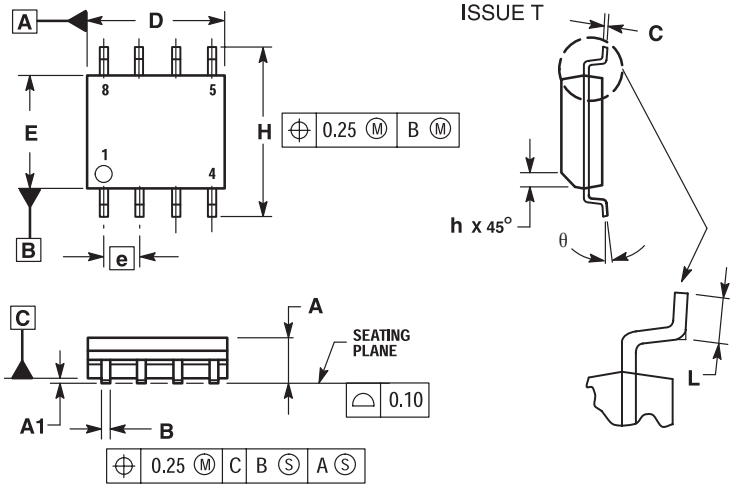


Figure 7. Typical Input Impedance versus Input Frequency



OUTLINE DIMENSIONS

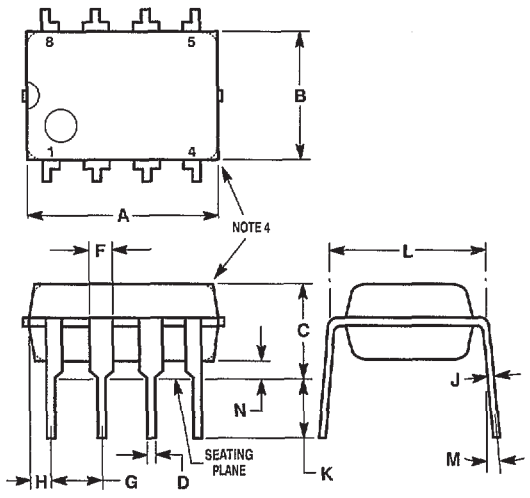
SO–8 = -5P
PLASTIC PACKAGE
(ML12038-5P)
CASE 751–06
(SO–8)
ISSUE T



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°

P DIP 8 = PP
PLASTIC PACKAGE
(ML12038PP)
CASE 626-04



NOTES:
1. LEAD POSITIONAL TOLERANCE:
   ϕ 0.13 (0.005) M T A M B M
2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
3. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
4. DIMENSIONS A AND B ARE DATUMS.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.52	0.040	0.060
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	—	10°	—	10°
N	0.51	0.76	0.020	0.030