MOTOROLA

1.1 GHz Low Power Dual Modulus Prescaler

MC12038A

The MC12038A can be used with CMOS synthesizers requiring positive edges to trigger internal counters such as Motorola's MC145XXX 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 of 4.5 to 5.5 V
- Low–Power 4.8 mA Typical
- Operating Temperature Range of –40 to 85°C
- Short Setup Time (t_{set}) 16ns Maximum @ 1.1 GHz
- Modulus Control Input Level Is Compatible With Standard CMOS and TTL
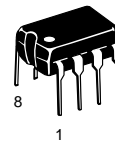- On–Chip Output Termination

MECL PLL COMPONENTS
$\div$127/128, $\div$255/256
DUAL MODULUS PRESCALER

SEMICONDUCTOR TECHNICAL DATA

D SUFFIX
PLASTIC PACKAGE
CASE 751
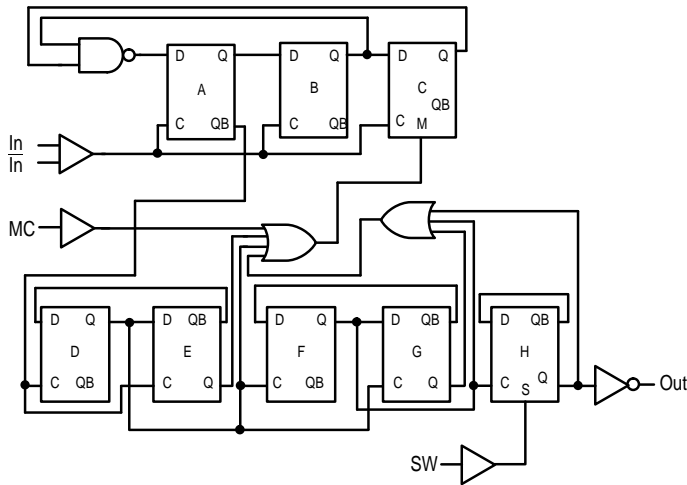(SO–8)

P SUFFIX
PLASTIC PACKAGE
CASE 626

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 GUIDE

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

NOTE: ESD data available upon request.

PIN CONNECTIONS

IN	1	8	$\overline{IN}$
V_{CC}	2	7	NC
SW	3	6	MC
OUT	4	5	Gnd

(Top View)

ORDERING INFORMATION

| Device	Operating Temperature Range	Package
MC12038AD	$T_A = -40°$ to +85°C	SO–8
MC12038AP		Plastic

Rev 2

MC12038A

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

| Characteristic	Symbol	Min	Typ	Max	Unit
Toggle Frequency (Sine Wave Input)	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 250–1100 MHz 100–250 MHz	$V_{in(min)}$	100 400	– –	1500 1500	mVpp

Figure 1. Logic Diagram (MC12038A)

Figure 2. Modulus Setup Time

Modulus setup time MC to out is the MC setup or MC release plus the prop delay.
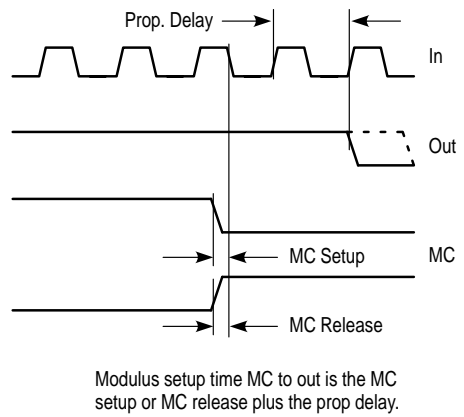
Figure 3. Typical Output Waveforms

500 m≈   20 ns
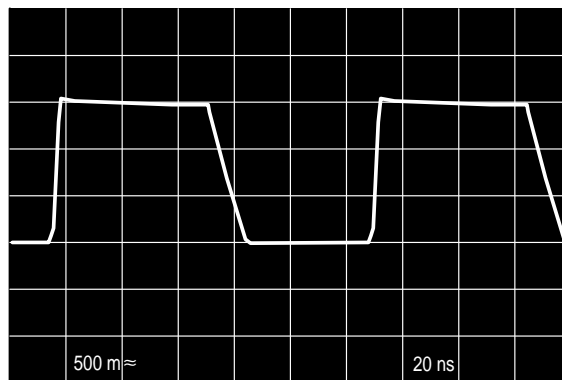
(÷128, 1.1 GHz Input Frequency, V_{CC} = 5.0 V, T_A = 25°C, Output Loaded)

MC12038A

Figure 4. AC Test Circuit

EXTERNAL COMPONENTS
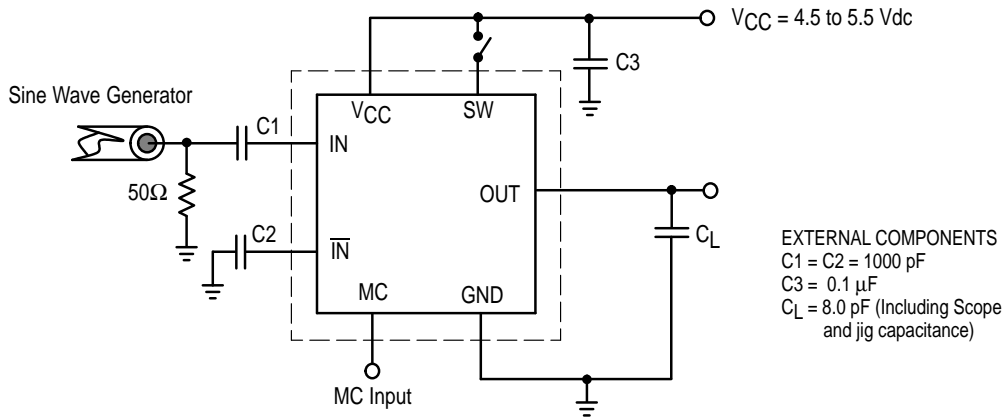C1 = C2 = 1000 pF
C3 = 0.1 μF
C_L = 8.0 pF (Including Scope and jig capacitance)

Figure 5. Input Signal Amplitude versus Input Frequency
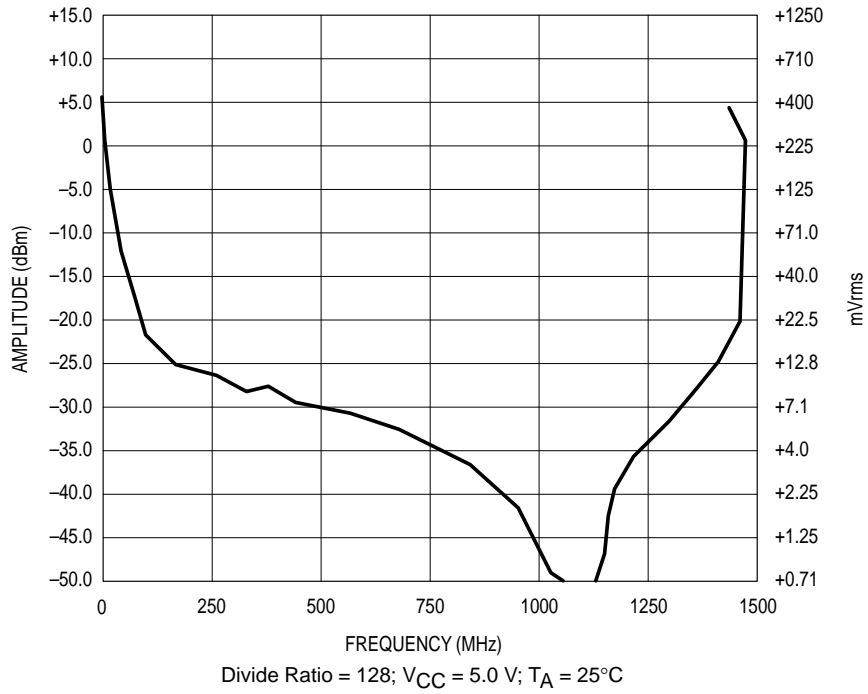

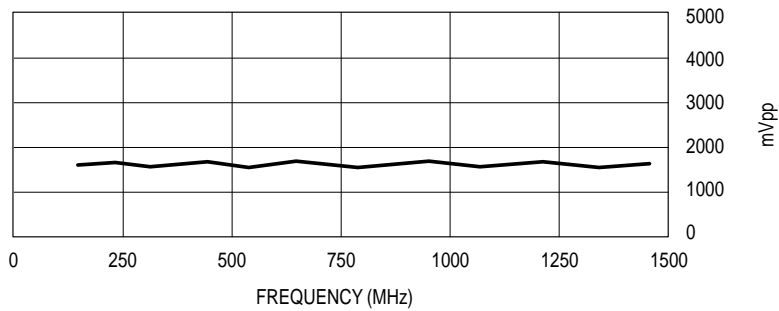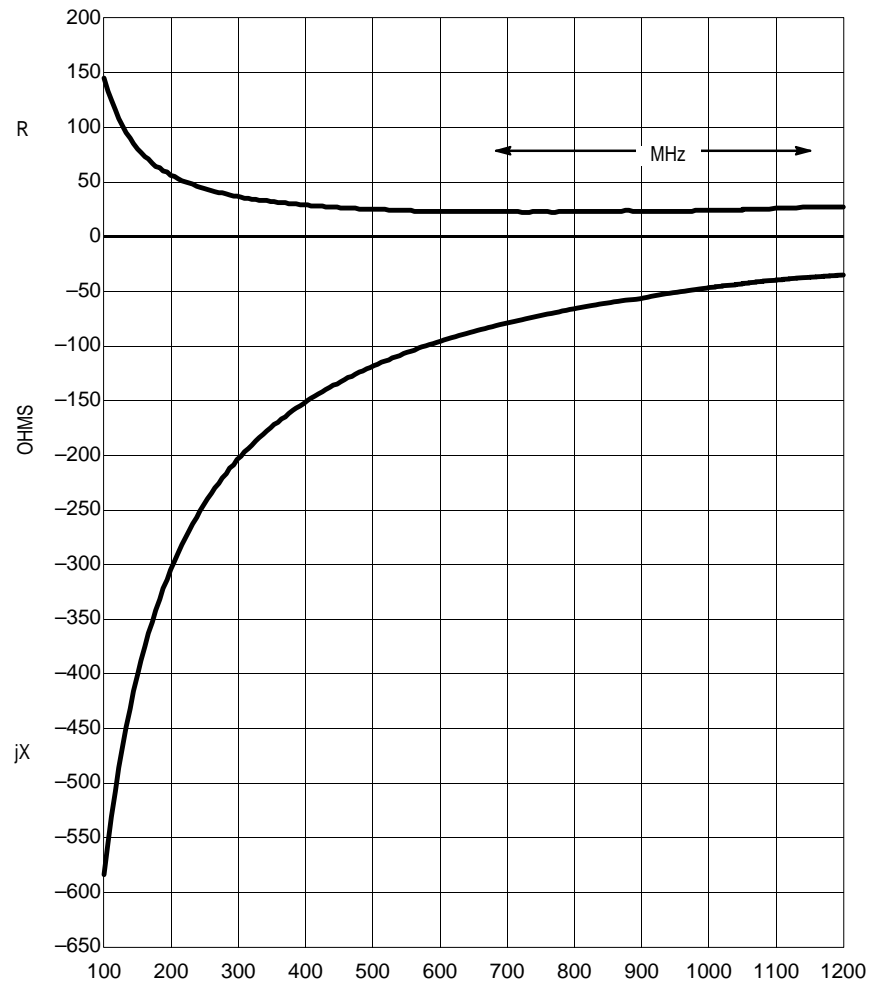Divide Ratio = 128; V_{CC} = 5.0 V; T_A = 25°C

Figure 6. Output Amplitude versus Input Frequency

MC12038A
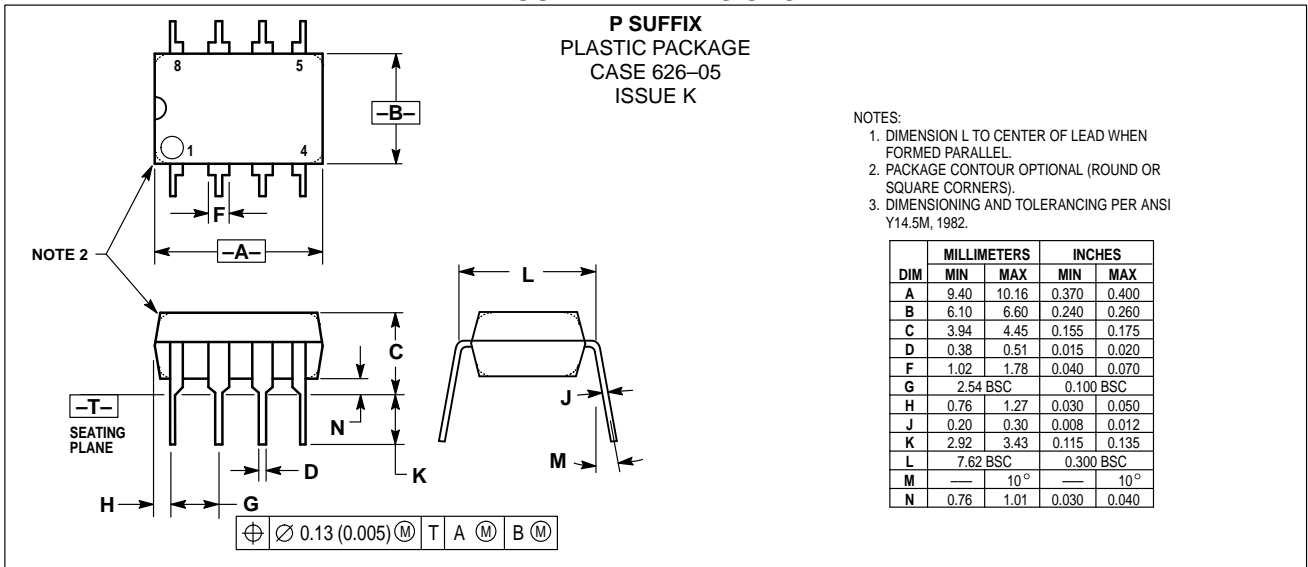
Figure 7. Typical Input Impedance versus Input Frequency

OUTLINE DIMENSIONS
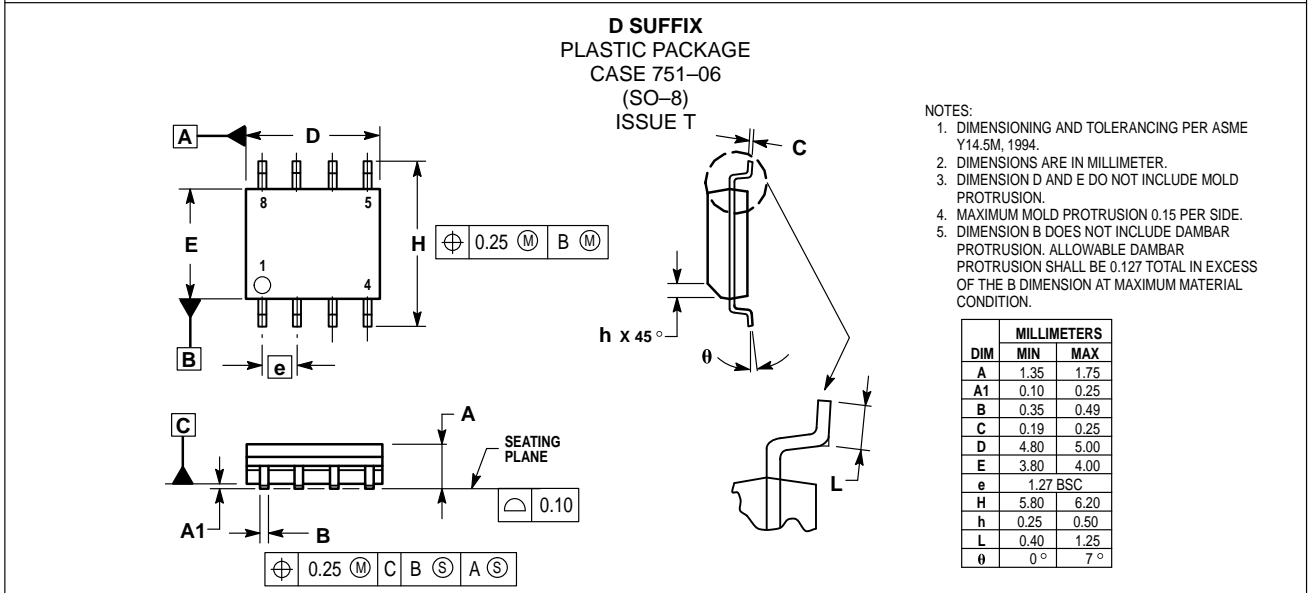
P SUFFIX
PLASTIC PACKAGE
CASE 626–05
ISSUE K

NOTE 2

NOTES:
1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS		INCHES	
	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	1.78	0.040	0.070
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	0.76	1.01	0.030	0.040

⊕ ⌀ 0.13 (0.005) Ⓜ T A Ⓜ B Ⓜ

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

⊕ 0.25 Ⓜ B Ⓜ

h X 45°

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.

DIM	MILLIMETERS	
	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°

SEATING PLANE

⌂ 0.10

⊕ 0.25 Ⓜ C B Ⓢ A Ⓢ

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