

**MOTOROLA**

# 1.1 GHz Low Power Dual Modulus Prescaler

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

**NOT RECOMMENDED FOR NEW DESIGN  
DEVICE TO BE PHASED OUT.  
No replacement available.**

## 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.

# MC12038A

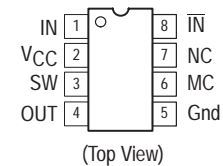
## MECL PLL COMPONENTS ÷127/128, ÷255/256 DUAL MODULUS PRESCALER

### SEMICONDUCTOR TECHNICAL DATA



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

## PIN CONNECTIONS



## ORDERING INFORMATION

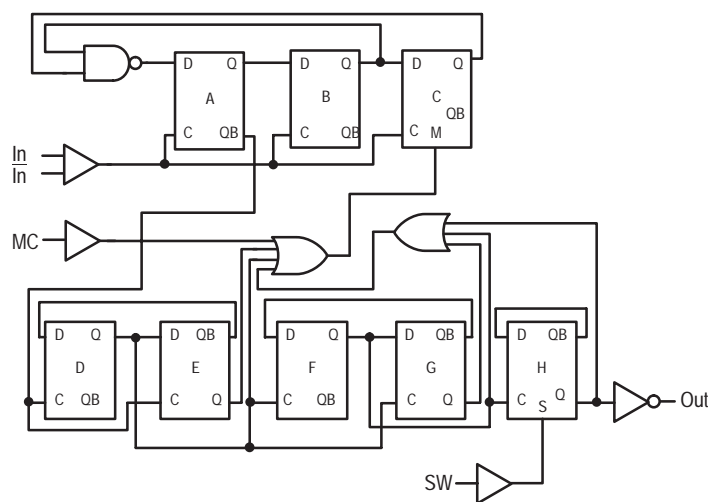
Device	Operating Temperature Range	Package
MC12038AD	$T_A = -40$ to $85^\circ\text{C}$	SO-8

# MC12038A

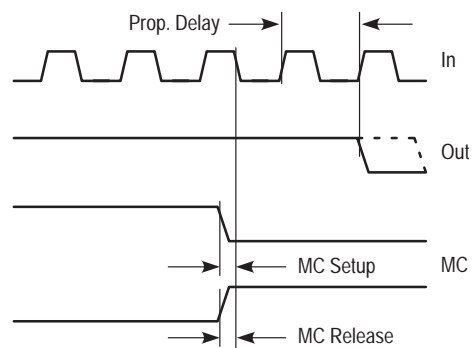
**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 4.5$  to  $5.5V$ ;  $T_A = -40$  to  $85^\circ C$ , unless otherwise noted.)

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)**

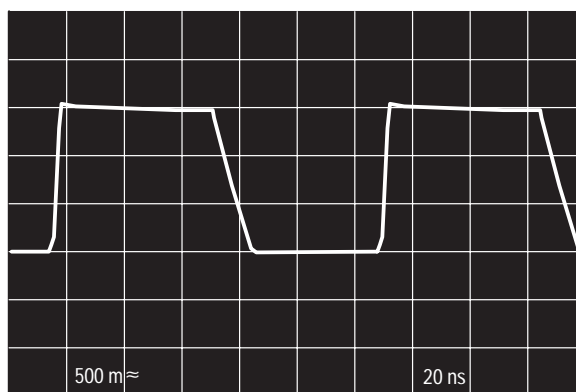


**Figure 2. Modulus Setup Time**



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

**Figure 3. Typical Output Waveforms**



( $\pm 128$ , 1.1 GHz Input Frequency,  $V_{CC} = 5.0$  V,  $T_A = 25^\circ C$ , Output Loaded)

# MC12038A

Figure 4. AC Test Circuit

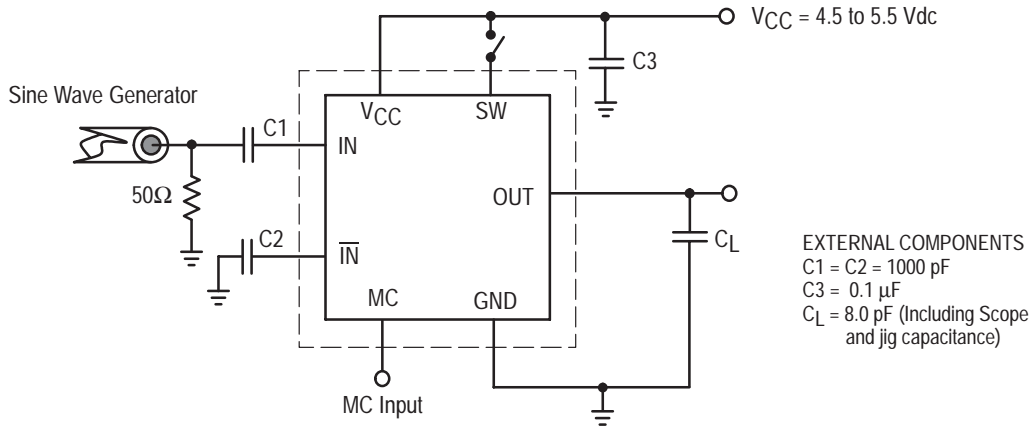
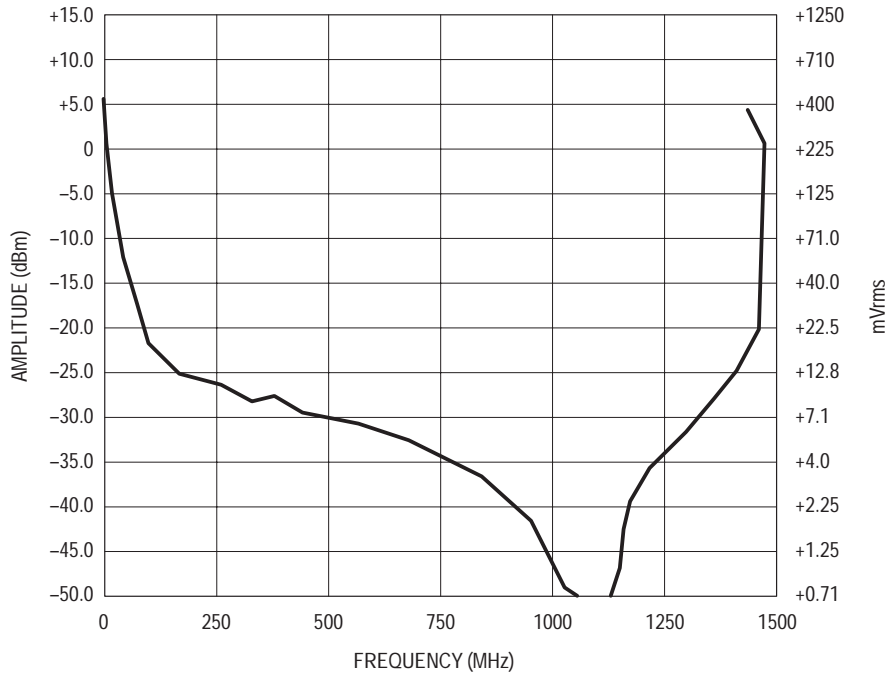
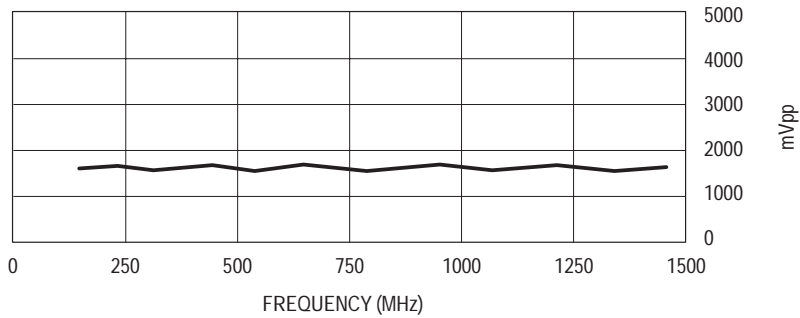


Figure 5. Input Signal Amplitude versus Input Frequency



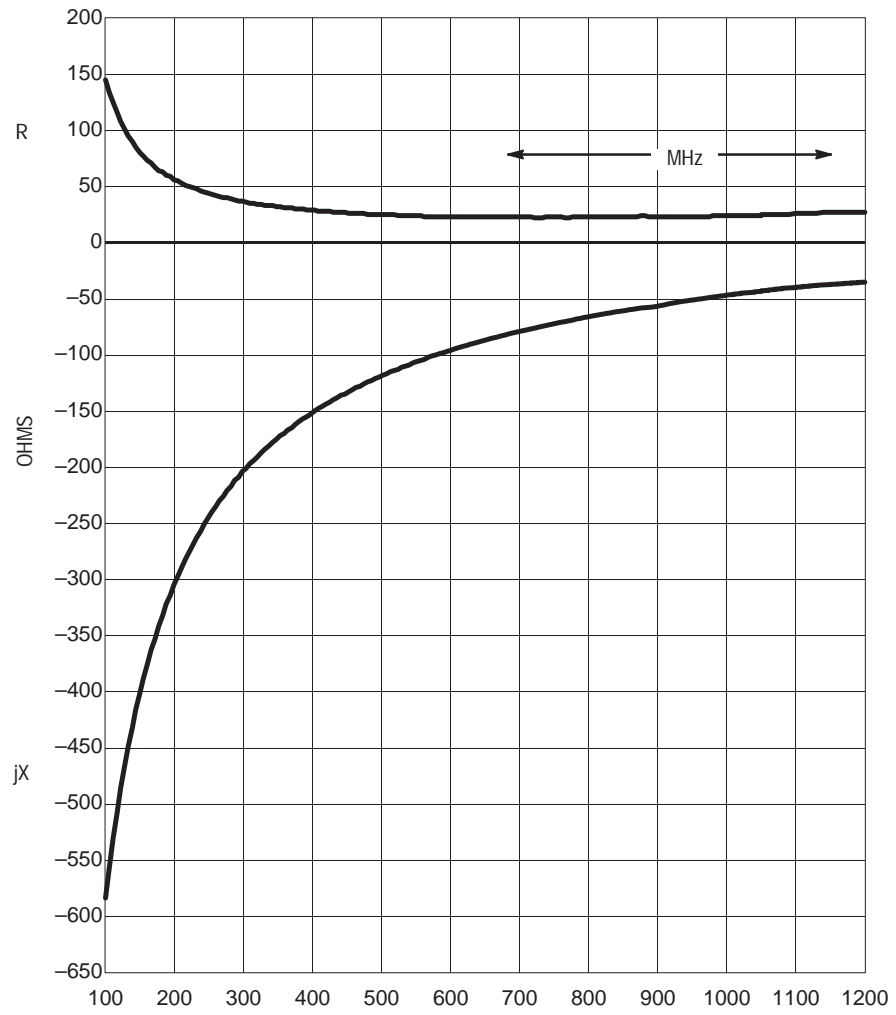
Divide Ratio = 128;  $V_{CC} = 5.0$  V;  $T_A = 25^\circ\text{C}$

Figure 6. Output Amplitude versus Input Frequency



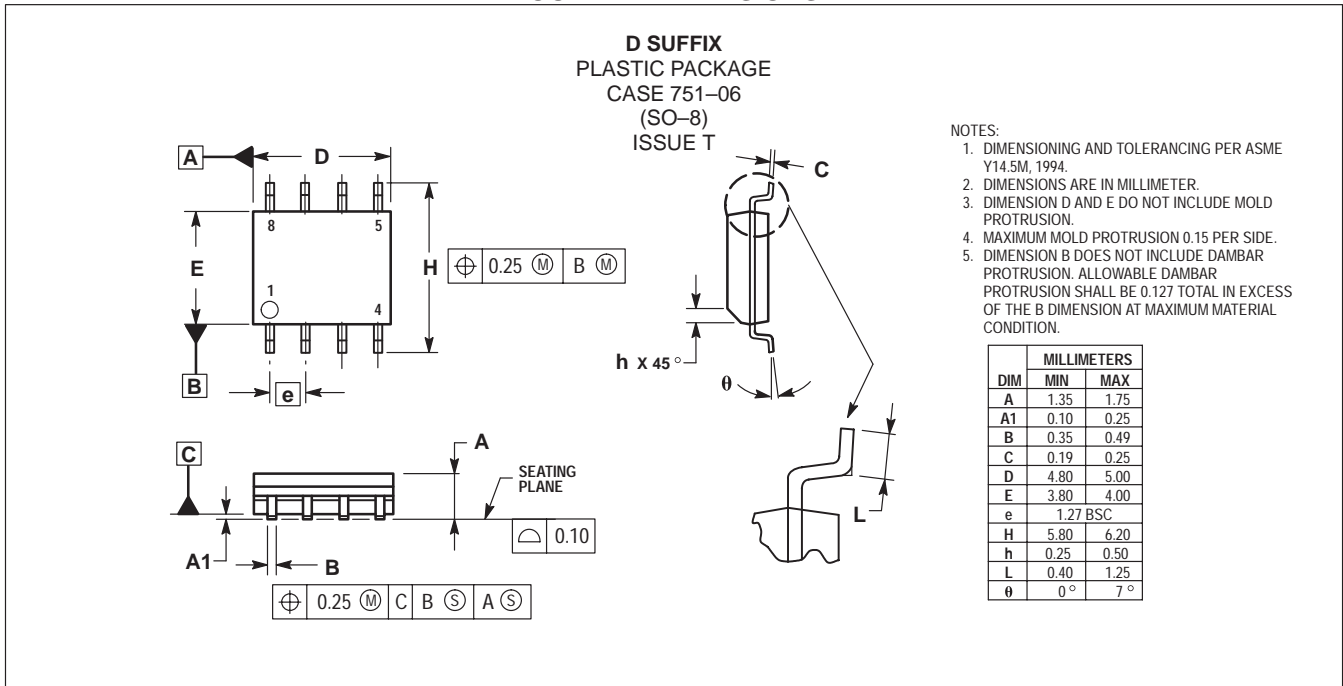
# MC12038A

Figure 7. Typical Input Impedance versus Input Frequency



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## OUTLINE DIMENSIONS



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**JAPAN:** Motorola Japan Ltd.; SPD, Strategic Planning Office, 141,  
 4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan. 81-3-5487-8488

**Customer Focus Center: 1-800-521-6274**

**Mfax™:** RMFAX0@email.sps.mot.com – TOUCHTONE 1-602-244-6609  
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 2, Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.  
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