



# 1.1 GHz Dual Modulus Prescaler

The MC12028A 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.

The MC12028B can be used with CMOS synthesizers requiring negative edges to trigger internal counters.

A Divide Ratio Control (SW) permits selection of a 32/33 or 64/65 divide ratio as desired.

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

**NOTE: The "B" Version Is Not Recommended for New Designs**

- 1.1 GHz Toggle Frequency
- MC12028A for Positive Edge Triggered Synthesizers
- 6.5 mA Maximum, -40 to 85°C, V<sub>CC</sub> = 5.5 Vdc
- Modulus Control Input Level Is Compatible With Standard CMOS and TTL
- Low-Power 4.0 mA Typical

## FUNCTIONAL TABLE

SW	MC	Divide Ratio
H	H	32
H	L	33
L	H	64
L	L	65

**NOTES:** 1. SW: H = V<sub>CC</sub>, 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<sub>CC</sub>, 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 <sub>CC</sub>	-0.5 to 7.0	Vdc
Operating Temperature Range	T <sub>A</sub>	-40 to 85	°C
Storage Temperature Range	T <sub>stg</sub>	-65 to 150	°C
Modulus Control Input, Pin 6	MC	-0.5 to 6.5	Vdc

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

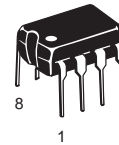
# MC12028A MC12028B

## MECL PLL COMPONENTS ÷32/33, ÷64/65 DUAL MODULUS PRESCALER

SEMICONDUCTOR  
TECHNICAL DATA

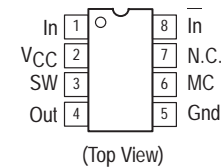


**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO-8)



**P SUFFIX**  
PLASTIC PACKAGE  
CASE 626

## PIN CONNECTIONS



## ORDERING INFORMATION

Device	Operating Temp Range	Package
MC12028AD	T <sub>A</sub> = -40° to 85°C	SO-8
MC12028AP		Plastic

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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)	$I_{CC}$	–	4.0	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 ( $C_L = 12$ pF; $R_L = 2.2$ k $\Omega$ )	$V_{out}$	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	$V_{in}$	100 400	– –	1500 1500	mVpp
Output Current ( $C_L = 12$ pF; $R_L = 2.2$ k $\Omega$ )	$I_O$	–	1.5	4.0	mA

Figure 1. Logic Diagram (MC12028A)

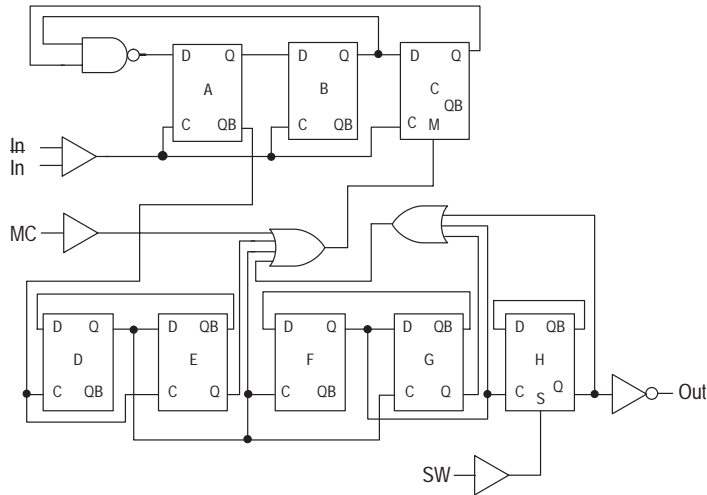


Figure 2. Modulus Setup Time

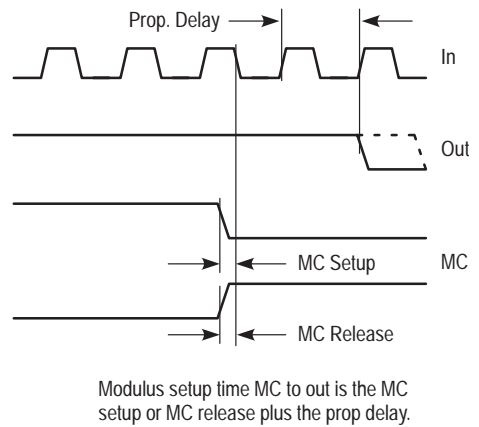
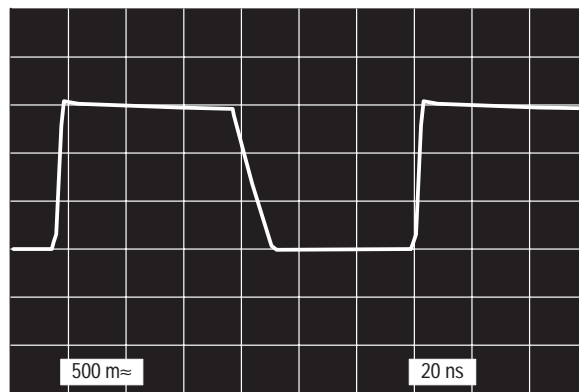


Figure 3. Typical Output Waveform



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Figure 4. AC Test Circuit

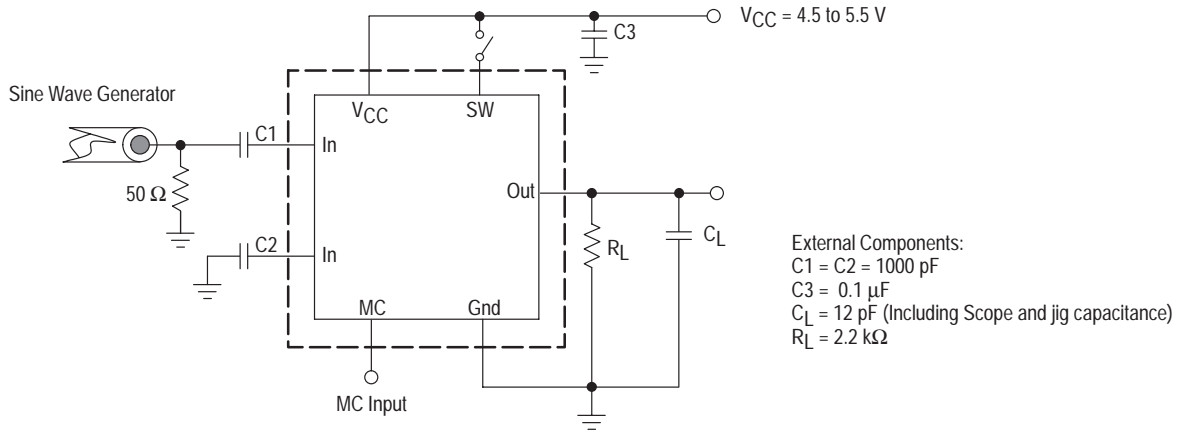
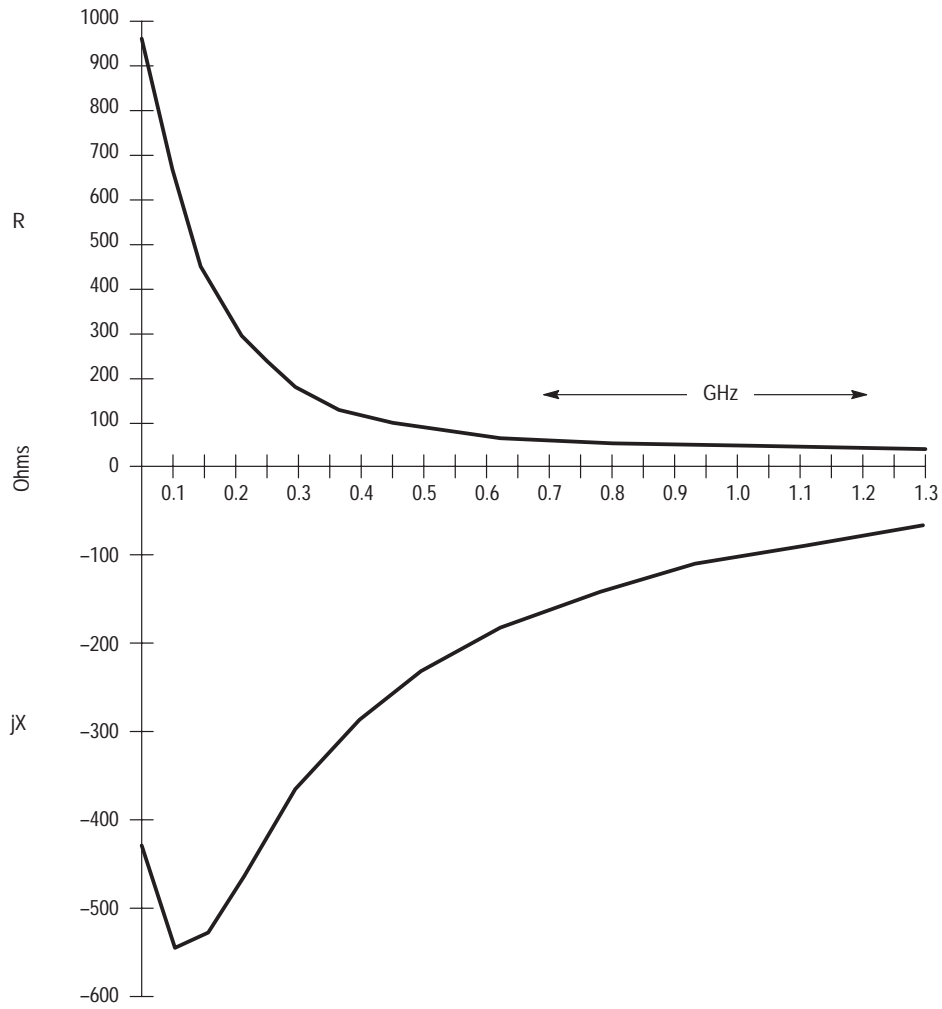


Figure 5. Typical Input Impedance versus Input Frequency

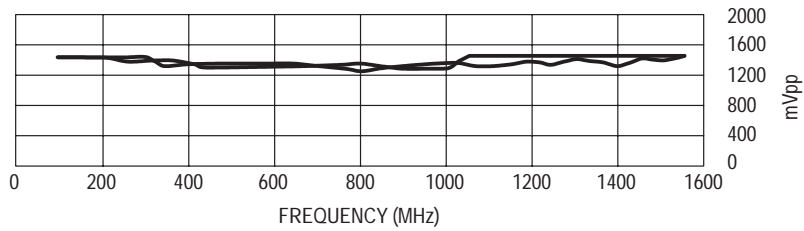
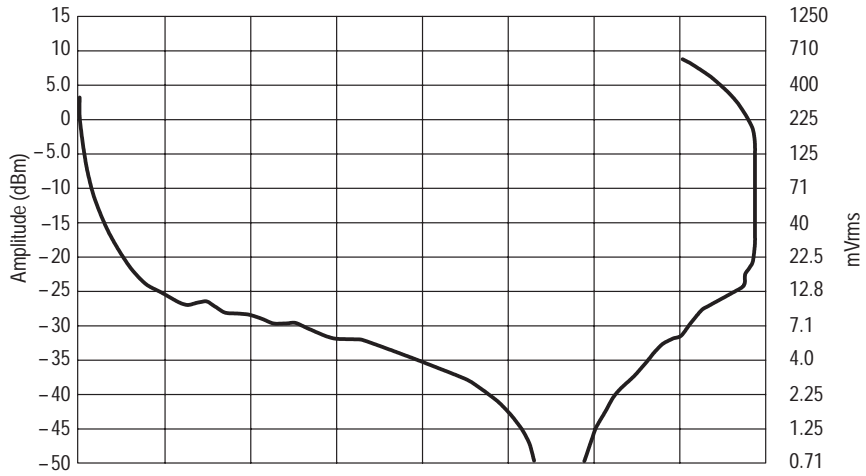


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## Figure 6. Input Signal Amplitude versus Input Frequency



Divide Ratio = 32

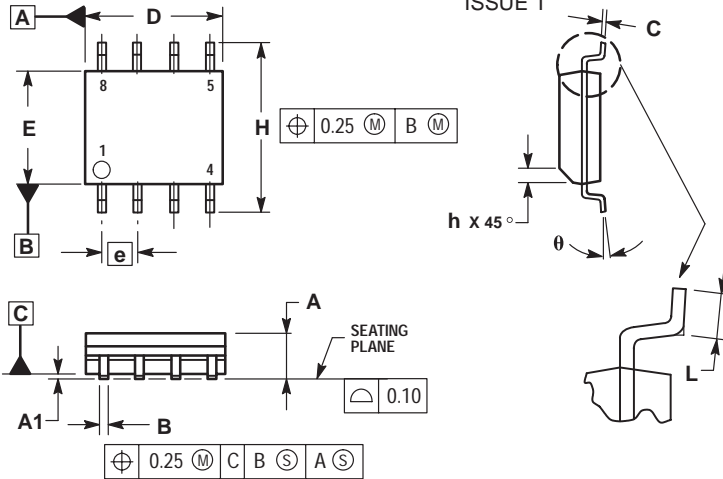
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## OUTLINE DIMENSIONS

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

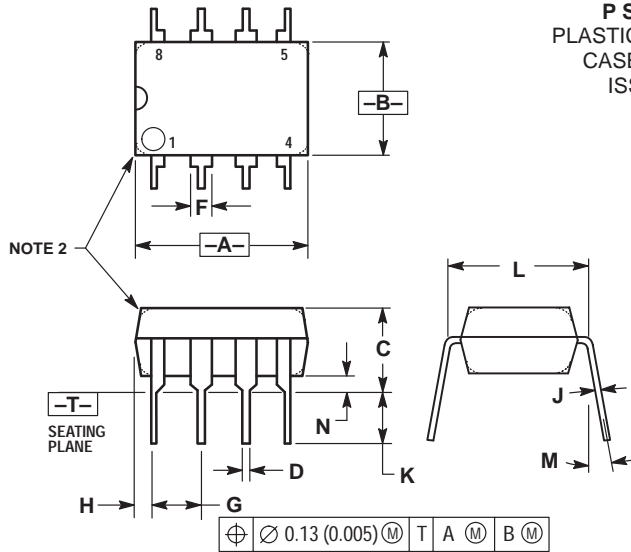


NOTES:

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.

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
$\theta$	0°	7°

### P SUFFIX PLASTIC PACKAGE CASE 626-05 ISSUE K



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

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