



# 1.1 GHz Low-Voltage Dual Modulus Prescaler

The MC12022LVA 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 MC12022LVB can be used with CMOS synthesizers requiring negative edges to trigger internal counters.

A Divide Ratio Control (SW) permits selection of a 64/65 or 128/129 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
- Supply Voltage of 2.7 to 5.0 V
- Low-Power 4.0 mA Typical at  $V_{CC} = 2.7$  V
- Operating Temperature Range of  $-40$  to  $85^{\circ}\text{C}$
- Short Setup Time ( $t_{set}$ ) 16ns Maximum @ 1.1 GHz
- Modulus Control Input Level Is Compatible With Standard CMOS and TTL

## FUNCTIONAL TABLE

SW	MC	Divide Ratio
H	H	64
H	L	65
L	H	128
L	L	129

**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

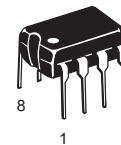
## MC12022LVA MC12022LVB

### MECL PLL COMPONENTS $\div 64/65, \div 128/129$ DUAL MODULUS PRESCALER

#### SEMICONDUCTOR TECHNICAL DATA

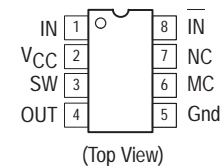


**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO-8)



**P SUFFIX**  
PLASTIC PACKAGE  
CASE 626

## PIN CONNECTIONS



## ORDERING INFORMATION

Device	Operating Temp Range	Package
MC12022LVAD	$T_A = -40^{\circ}$ to $+85^{\circ}\text{C}$	SO-8
MC12022LVAP		Plastic
MC12022LVBD		SO-8
MC12022LVBP		Plastic

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# MC123456 PC123[dviceno1]

## MAXIMUM RATINGS

Rating	Symbol	Value	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.

## ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 4.5 to 5.5 V; T<sub>A</sub> = -40°C to 85°C, unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Toggle Frequency (Sine Wave Input)	f <sub>t</sub>	0.1	1.4	1.1	GHz
Supply Current Output Unloaded (Pin 2)	I <sub>CC</sub>	-	4.7	6.5	mA
Supply Current Output Unloaded (Pin 2) at 5.0 Vdc	I <sub>CC</sub> H		5.8	8.0	mA
Modulus Control Input High (MC)	V <sub>IH1</sub>	2.0	-	V <sub>CC</sub>	V
Modulus Control Input Low (MC)	V <sub>IL1</sub>	-	-	0.8	V
Divide Ratio Control Input High (SW)	V <sub>IH2</sub>	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>	Vdc
Divide Ratio Control Input Low (SW)	V <sub>IL2</sub>	Open	Open	Open	-
Output Voltage Swing (C <sub>L</sub> = 12 pF; R <sub>L</sub> = 1.1 kΩ at 2.7 Vdc)	V <sub>out</sub>	0.8	1.0	-	V <sub>pp</sub>
Output Voltage Swing (C <sub>L</sub> = 12 pF; R <sub>L</sub> = 2.2 kΩ at 5.0 Vdc)	V <sub>out</sub>	1.0	1.6	-	V <sub>pp</sub>
Modulus Setup Time MC to Out	t <sub>set</sub>	-	11	16	ns
Input Voltage Sensitivity 250–1100 MHz 100–250 MHz	V <sub>in(min)</sub>	100 400	- -	1500 1500	mV <sub>pp</sub>
Output Current (C <sub>L</sub> = 12 pF; R <sub>L</sub> = 2.2 kΩ at 2.7 Vdc)	I <sub>O</sub>	-	1.2	4.0	mA
Output Current (C <sub>L</sub> = 12 pF; R <sub>L</sub> = 2.2 kΩ at 5.0 Vdc)	I <sub>O</sub>	-	1.2	4.0	mA

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# MC123456 PC123[dviceno1]

Figure 1. Logic Diagram (MC12022LVA)

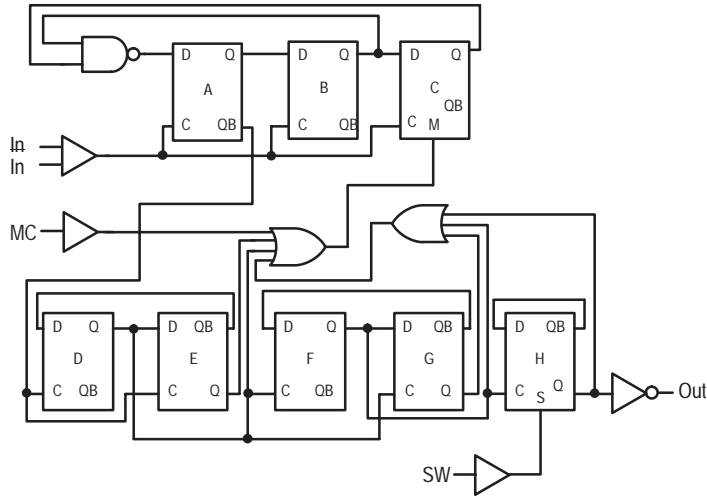


Figure 2. Modulus Setup Time

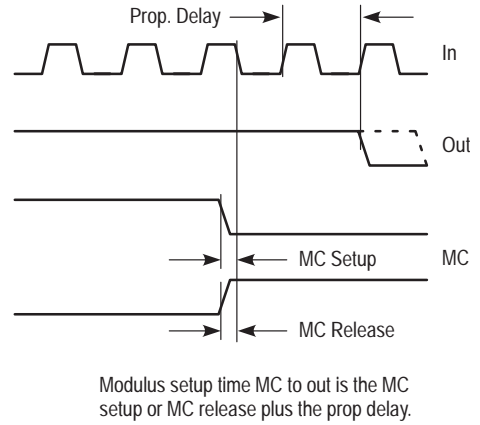
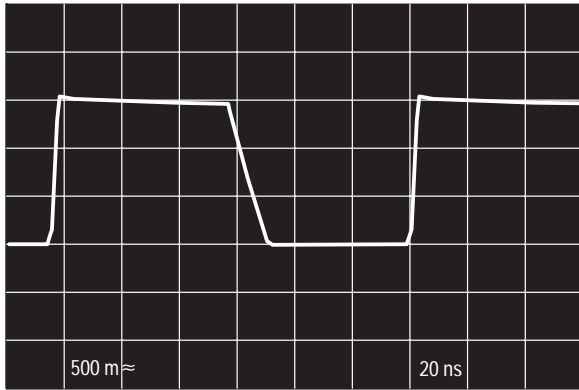
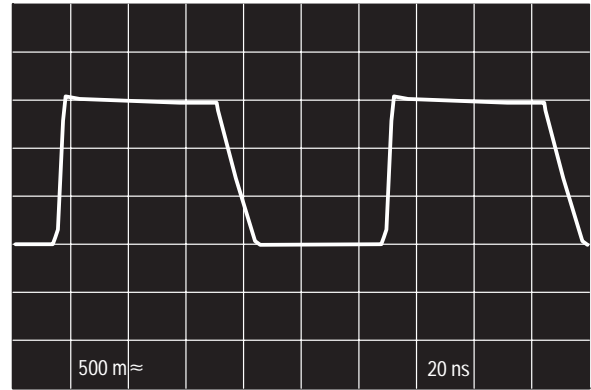


Figure 3. Typical Output Waveforms

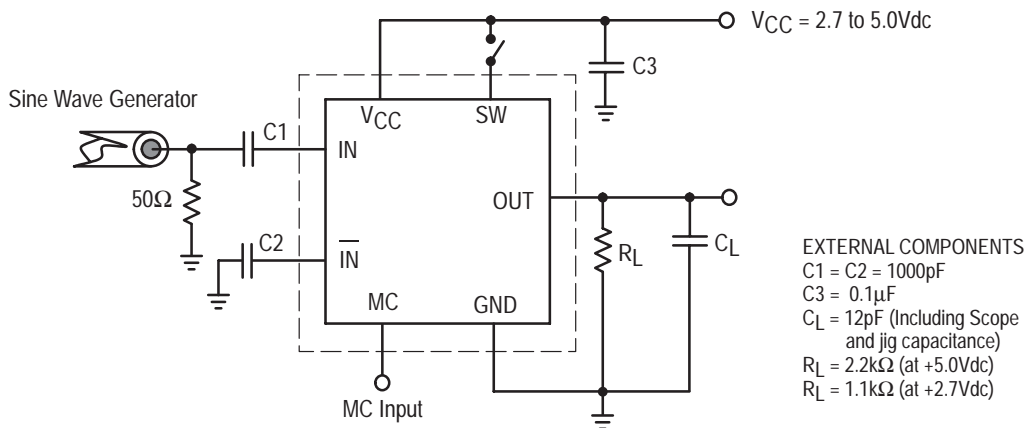


(±64, 500MHz Input Frequency,  $V_{CC} = 5.0V$ ,  $T_A = 25^\circ C$ , Output Loaded)



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

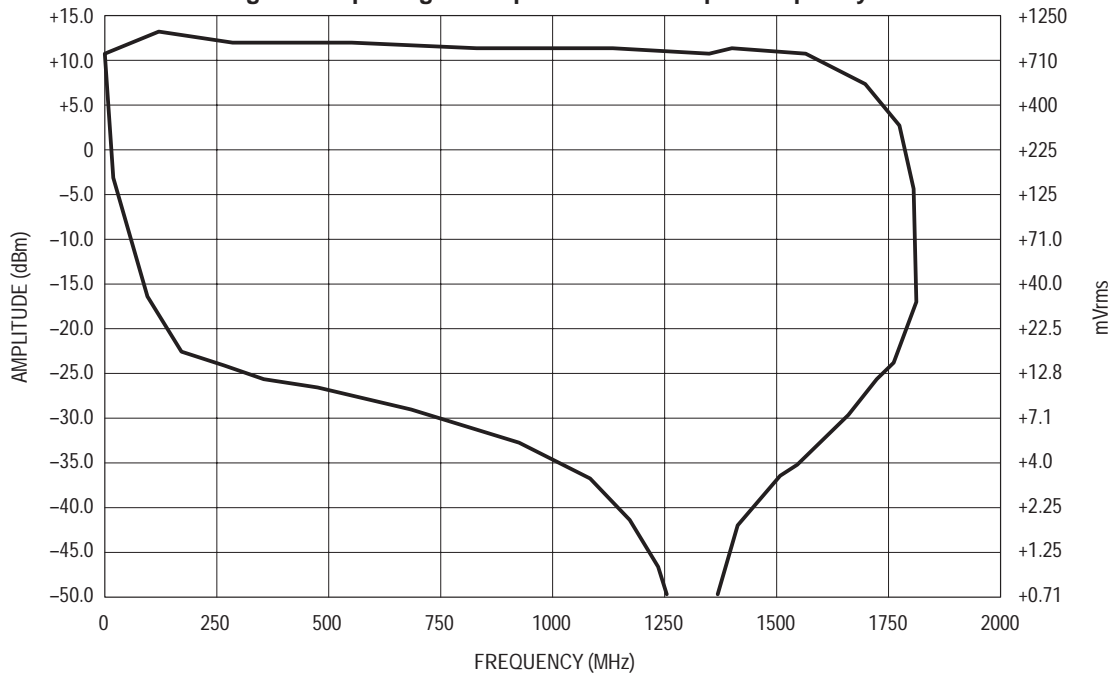
Figure 4. AC Test Circuit



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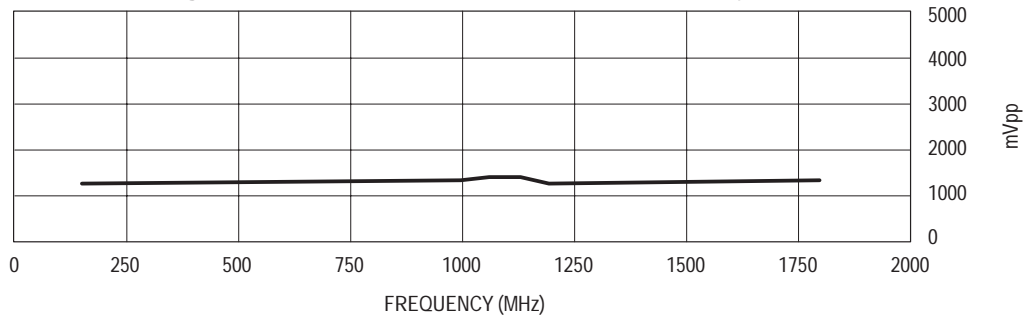
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Figure 5. Input Signal Amplitude versus Input Frequency



Divide Ratio = 128; V<sub>CC</sub> = 5.0 V; T<sub>A</sub> = 25°C

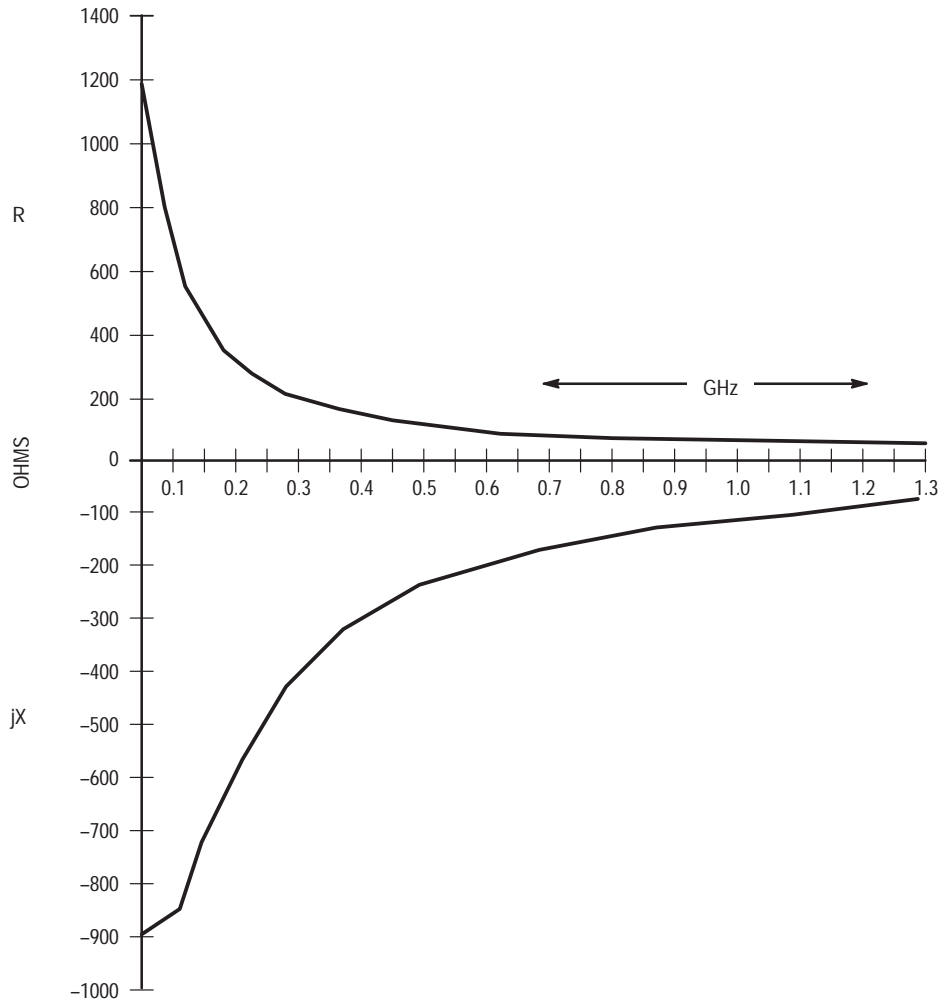
Figure 6. Output Amplitude versus Input Frequency



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Figure 7. Typical Input Impedance versus Input Frequency

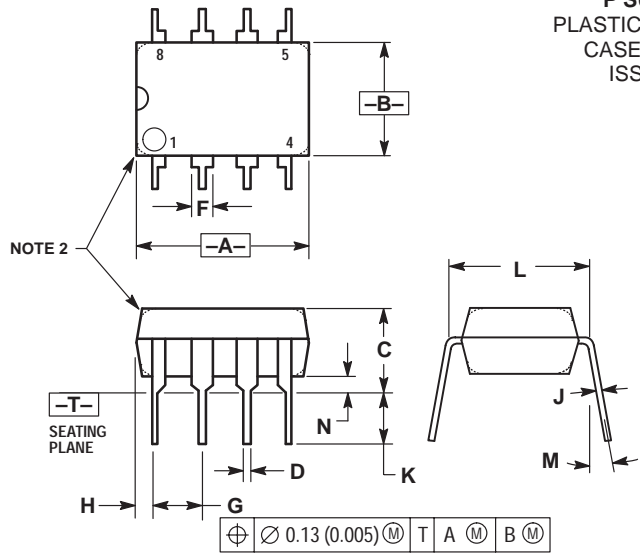


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OUTLINE DIMENSIONS

**P SUFFIX**  
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CASE 626-05  
ISSUE K

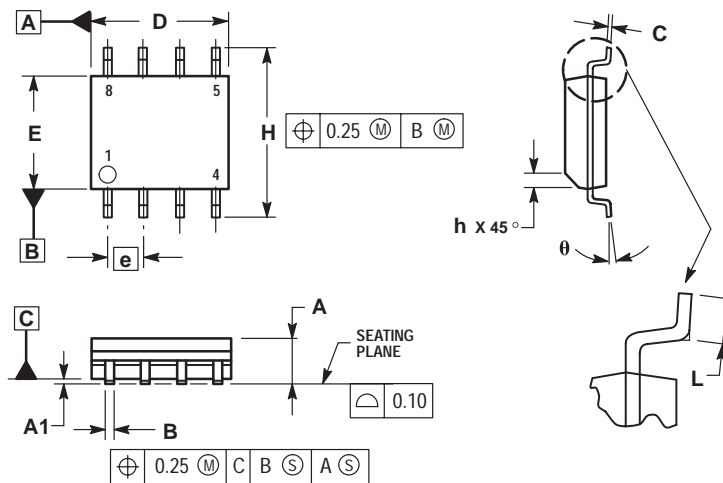


NOTES:

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

**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°

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