


**MOTOROLA**

# 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

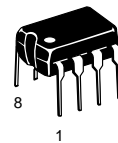
# MC12022LVA MC12022LVB

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

SEMICONDUCTOR  
TECHNICAL DATA

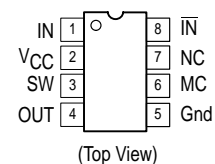


**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO-8)



**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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### MAXIMUM RATINGS

Rating	Symbol	Value	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.

### ELECTRICAL CHARACTERISTICS ( $V_{CC} = 4.5$ to $5.5$ V; $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ , 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)	$I_{CC}$	-	4.7	6.5	mA
Supply Current Output Unloaded (Pin 2) at 5.0 Vdc	$I_{CCH}$		5.8	8.0	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; $R_L = 1.1$ k $\Omega$ at 2.7 Vdc)	$V_{out}$	0.8	1.0	-	$V_{pp}$
Output Voltage Swing ( $C_L = 12$ pF; $R_L = 2.2$ k $\Omega$ at 5.0 Vdc)	$V_{out}$	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
Output Current ( $C_L = 12$ pF; $R_L = 2.2$ k $\Omega$ at 2.7 Vdc)	$I_O$	-	1.2	4.0	mA
Output Current ( $C_L = 12$ pF; $R_L = 2.2$ k $\Omega$ at 5.0 Vdc)	$I_O$	-	1.2	4.0	mA

# MC12022LVA MC12022LVB

Figure 1. Logic Diagram (MC12022LVA)

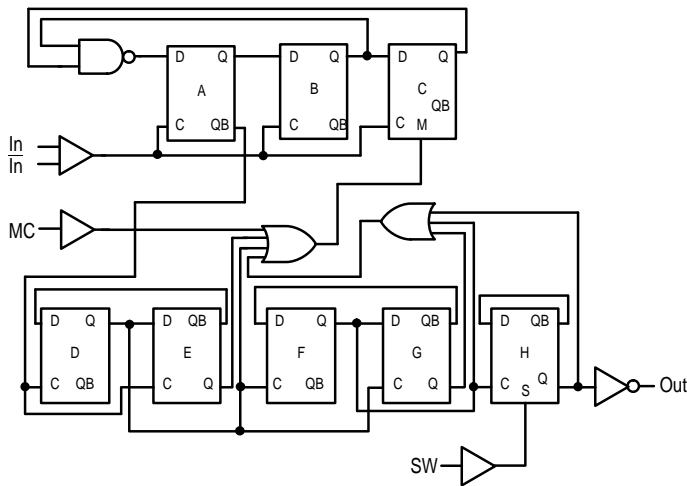


Figure 2. Modulus Setup Time

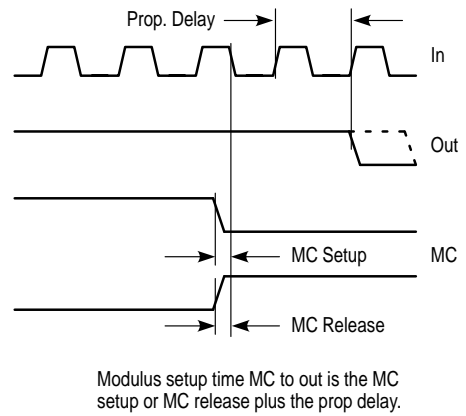
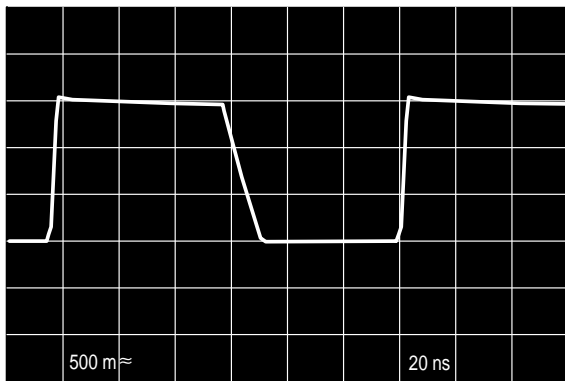
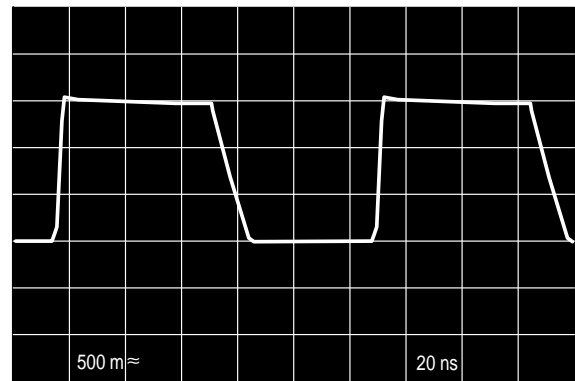


Figure 3. Typical Output Waveforms

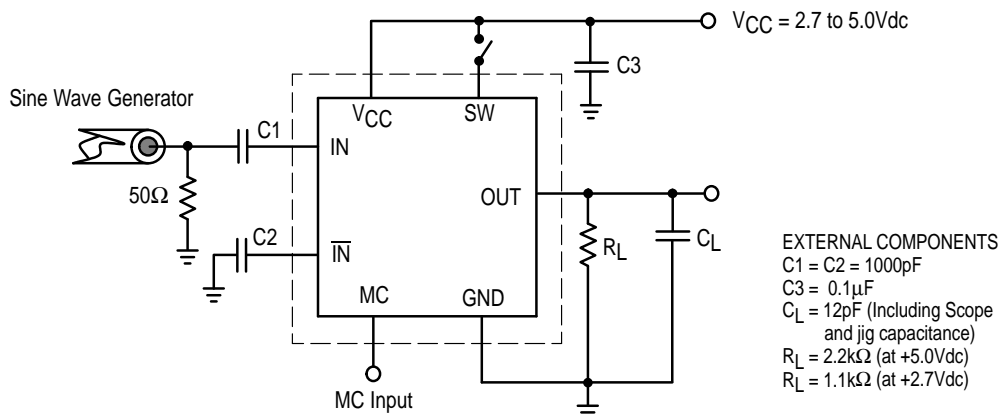


(±64, 500MHz Input Frequency,  $V_{CC} = 5.0V$ ,  $T_A = 25^\circ C$ , Output Loaded)



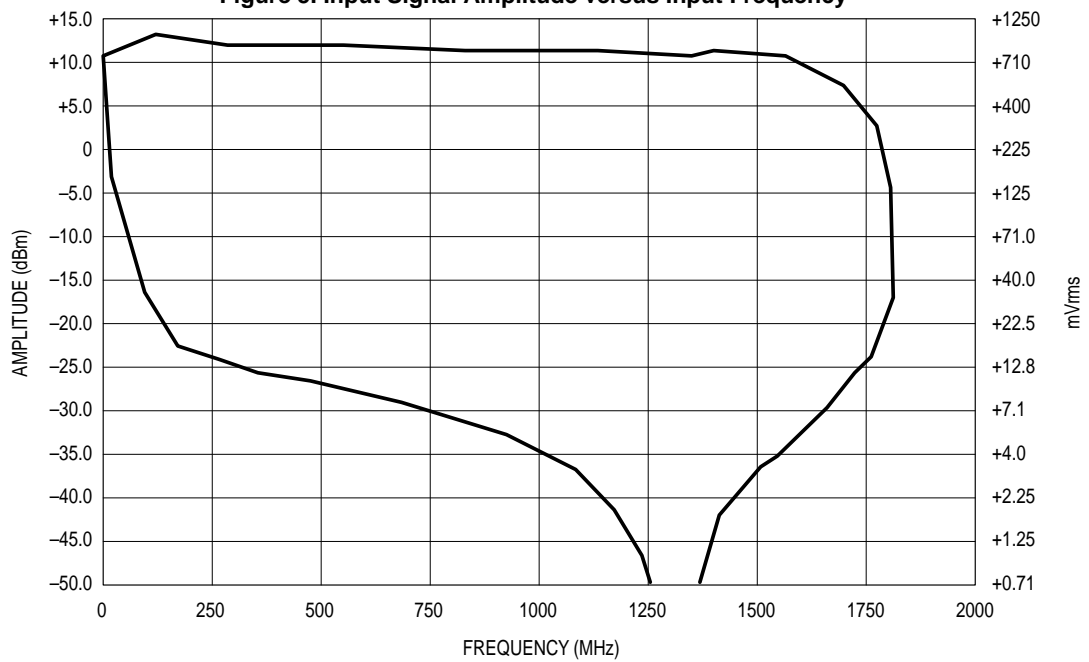
(±128, 1.1GHz Input Frequency,  $V_{CC} = 5.0V$ ,  $T_A = 25^\circ C$ , Output Loaded)

Figure 4. AC Test Circuit



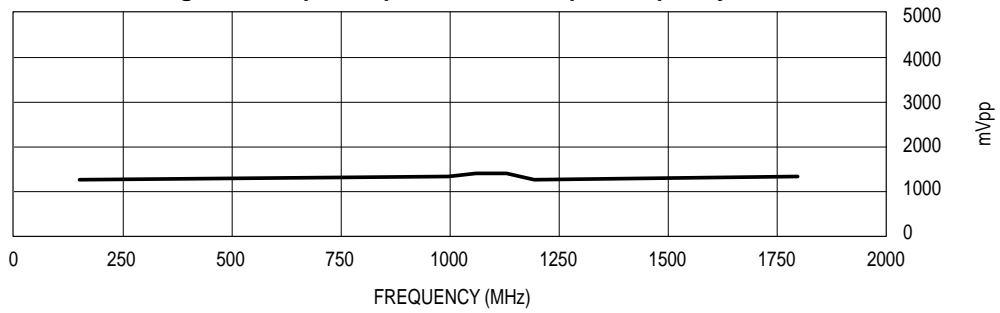
# MC12022LVA MC12022LVB

## Figure 5. Input Signal Amplitude versus Input Frequency



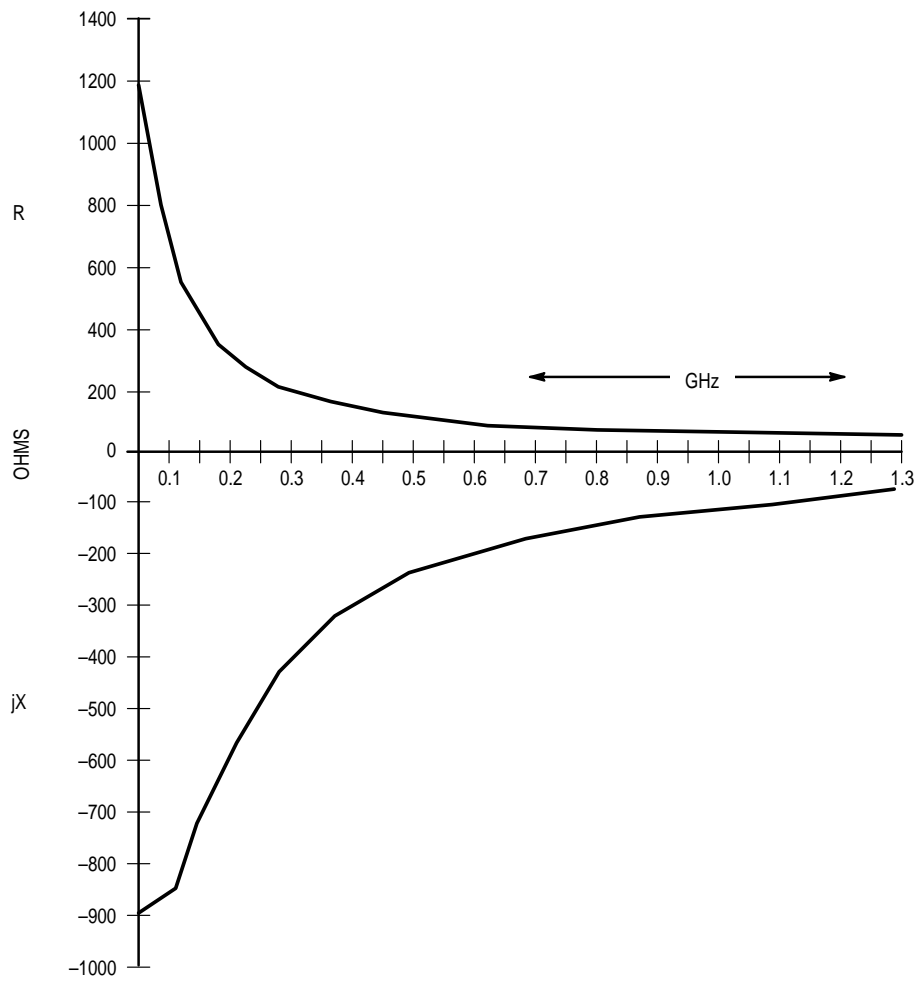
Divide Ratio = 128;  $V_{CC} = 5.0\text{ V}$ ;  $T_A = 25^\circ\text{C}$

## Figure 6. Output Amplitude versus Input Frequency



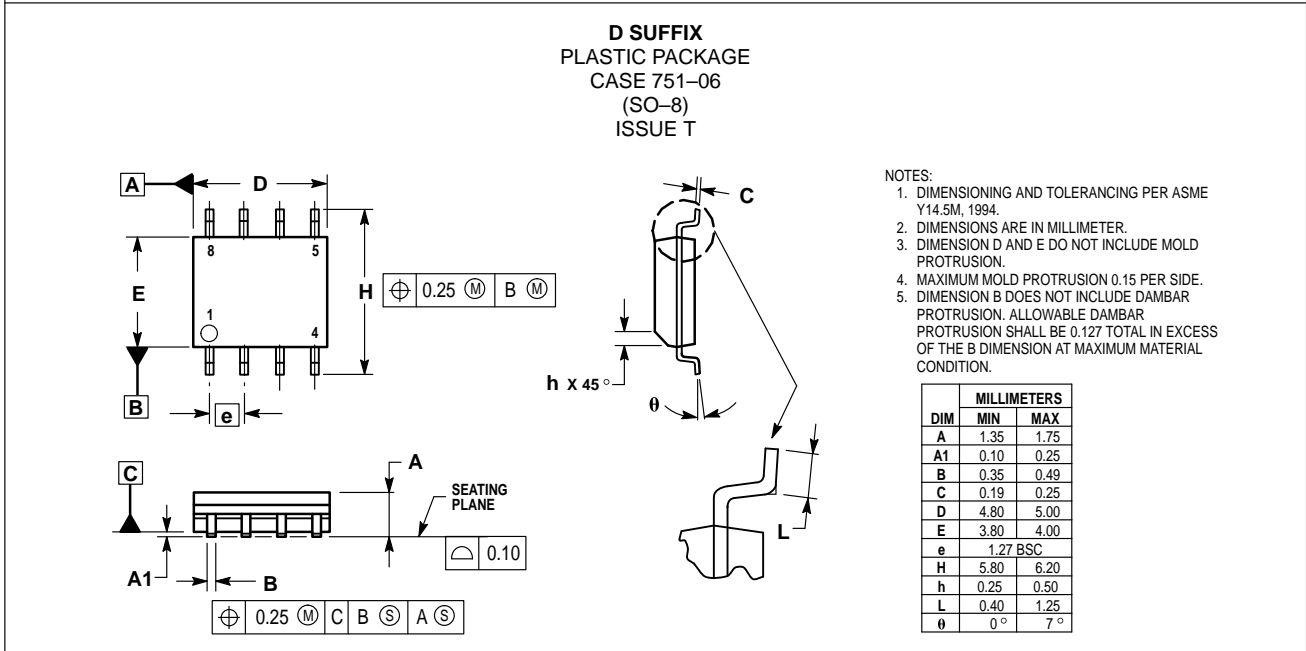
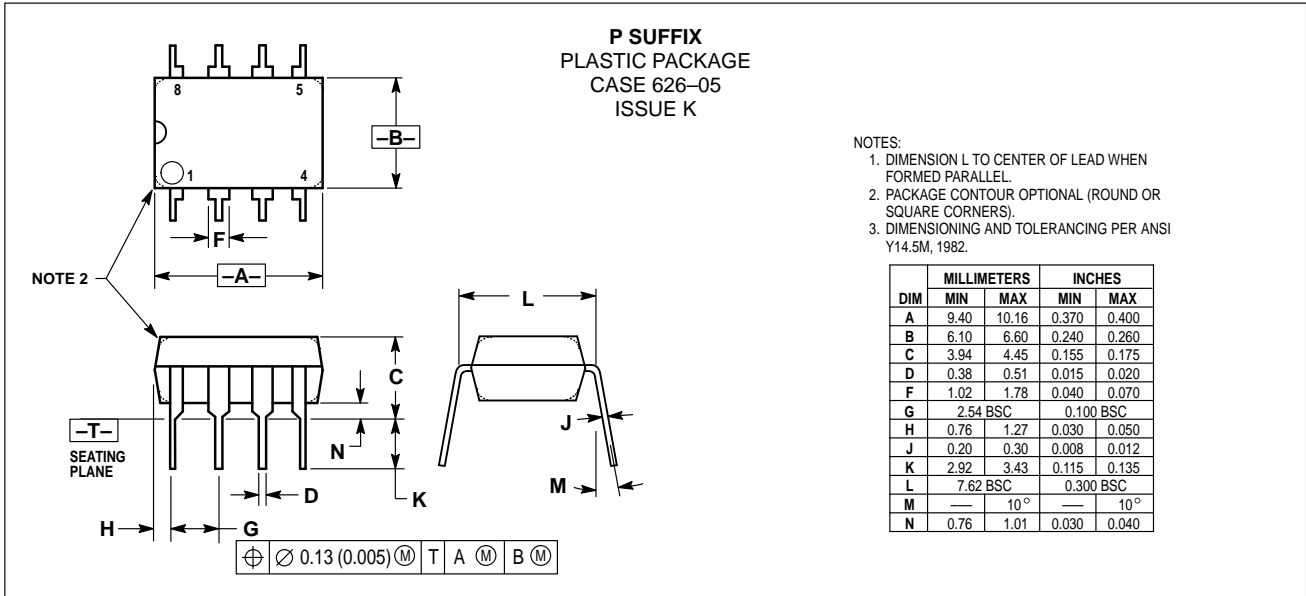
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Figure 7. Typical Input Impedance versus Input Frequency




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## OUTLINE DIMENSIONS



## MC12022LVA MC12022LVB

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