MOTOROLA

1.1 GHz Low-Voltage Dual Modulus Prescaler

MC12022LVA
MC12022LVB

MECL PLL COMPONENTS
÷64/65, ÷128/129
DUAL MODULUS PRESCALER

SEMICONDUCTOR TECHNICAL DATA

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.

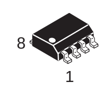
The MC12022LVB can be used with CMOS synthesizers requiring negative edges to trigger internal counters.

A Divide Ratio Control (SW) permits selection of a 64/65 or 128/129 divide ratio as desired.

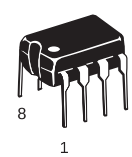
The Modulus Control (MC) selects the proper divide number after SW has been biased to select the desired divide ratio.

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°C
- Short Setup Time (t_{set}) 16ns Maximum @ 1.1 GHz
- Modulus Control Input Level Is Compatible With Standard CMOS and TTL



D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO–8)



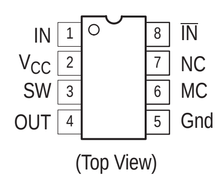
P SUFFIX
PLASTIC PACKAGE
CASE 626

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 grouunding this pin, but this is not recommended due to increased power soncumption.
2. MC: H = 2.0 V to V_{CC}, L = GND to 0.8 V.

PIN CONNECTIONS



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

ORDERING INFORMATION

Device	Operating Temp Range	Package
MC12022LVAD	T_A = – 40° to +85°C	SO–8
MC12022LVAP		Plastic
MC12022LVBD		SO–8
MC12022LVBP		Plastic

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°C 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)	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 kΩ at 2.7 Vdc)	V_{out}	0.8	1.0	–	V_{pp}
Output Voltage Swing (C_L = 12 pF; R_L = 2.2 kΩ 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 kΩ at 2.7 Vdc)	I_O	–	1.2	4.0	mA
Output Current (C_L = 12 pF; R_L = 2.2 kΩ at 5.0 Vdc)	I_O	–	1.2	4.0	mA

Figure 1. Logic Diagram (MC12022LVA)

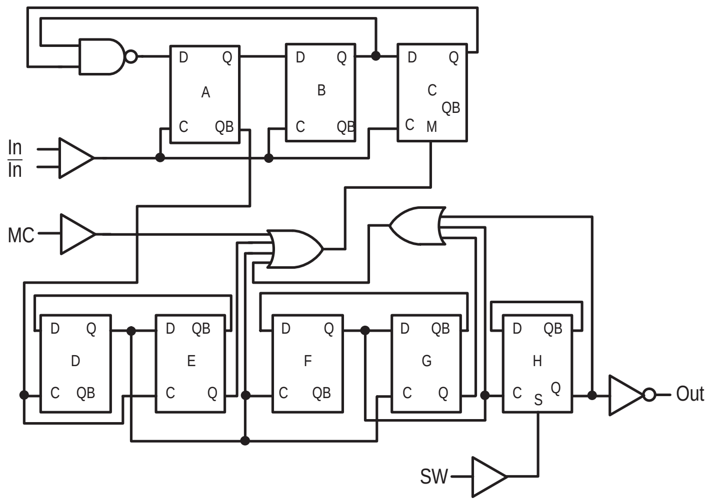
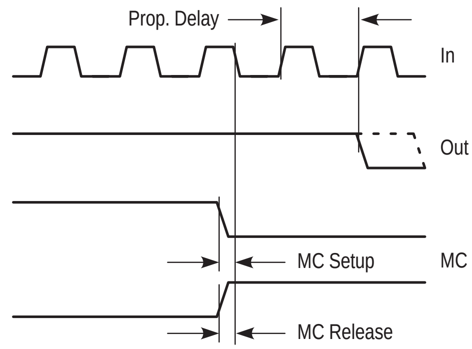
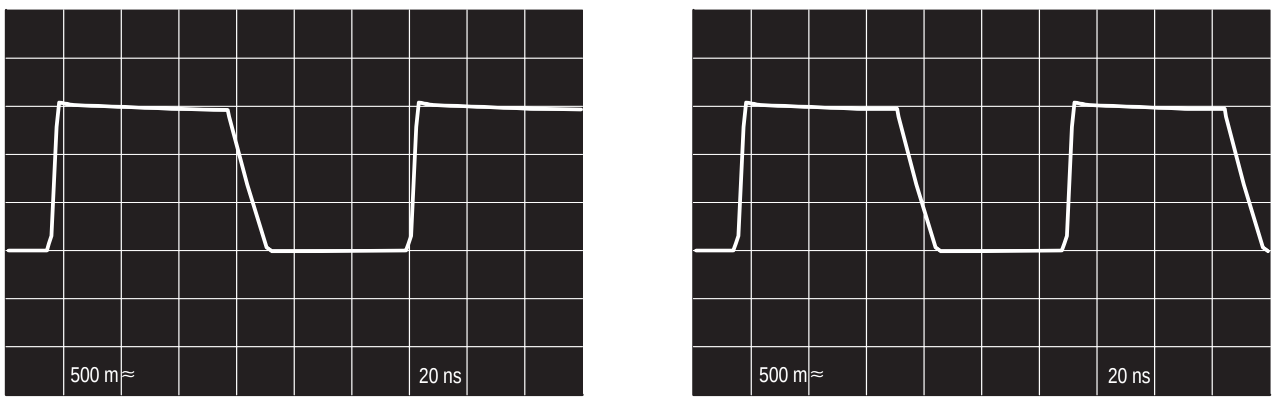


Figure 2. Modulus Setup Time



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

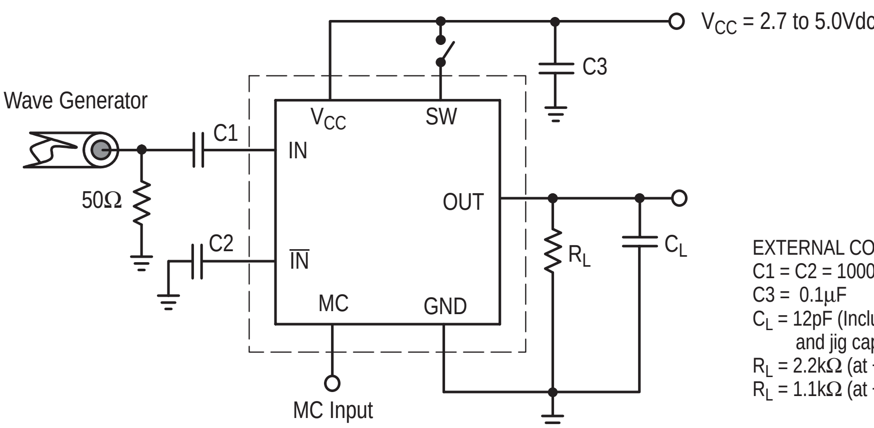
Figure 3. Typical Output Waveforms



(÷64, 500MHz Input Frequency, V_{CC} = 5.0V, T_A = 25°C, Output Loaded)

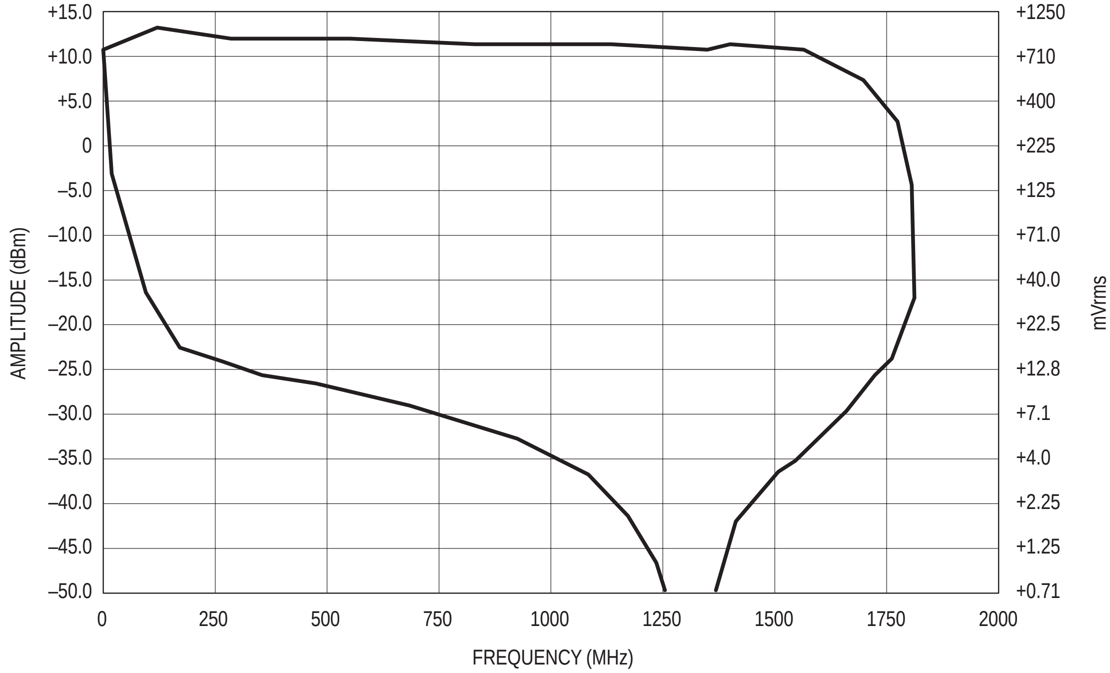
(÷128, 1.1GHz Input Frequency, V_{CC} = 5.0V, T_A = 25°C, Output Loaded)

Figure 4. AC Test Circuit



EXTERNAL COMPONENTS
C1 = C2 = 1000pF
C3 = 0.1µF
C_L = 12pF (Including Scope and jig capacitance)
R_L = 2.2kΩ (at +5.0Vdc)
R_L = 1.1kΩ (at +2.7Vdc)

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

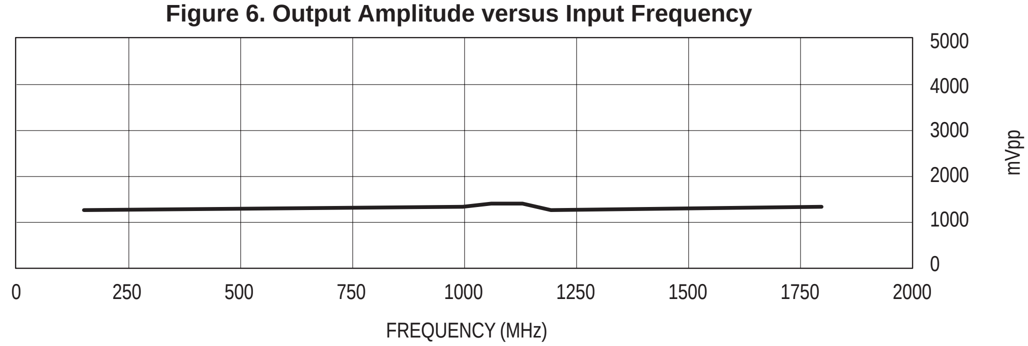
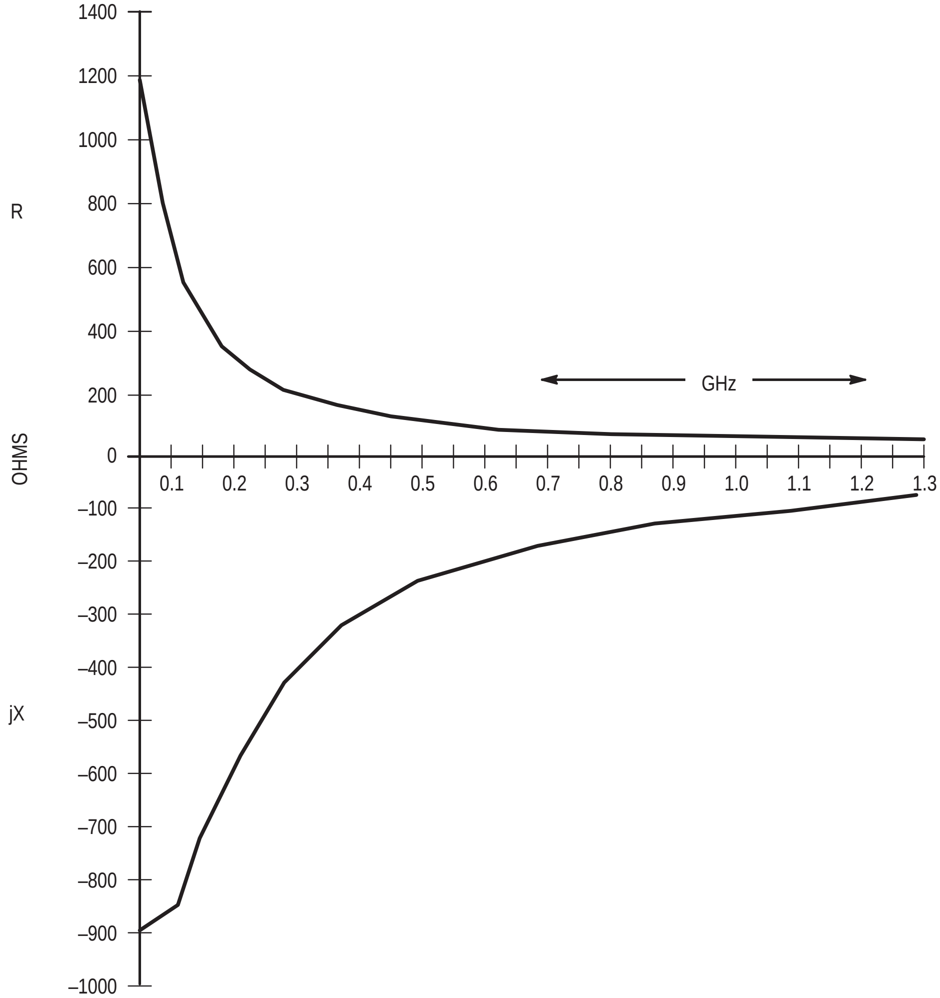
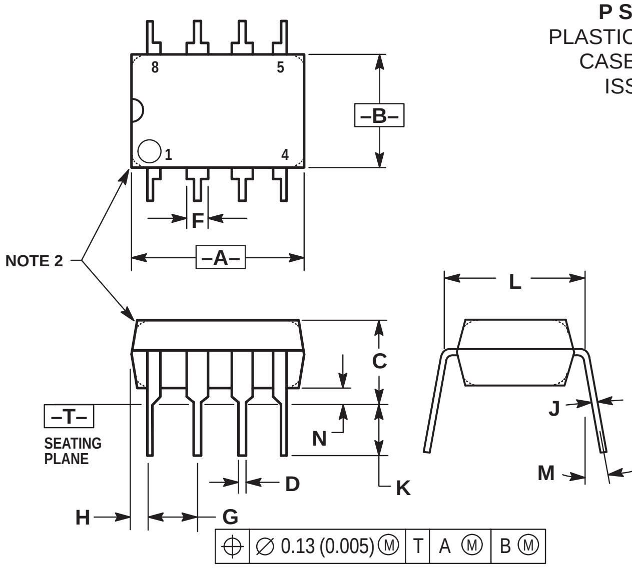


Figure 7. Typical Input Impedance versus Input Frequency



OUTLINE DIMENSIONS

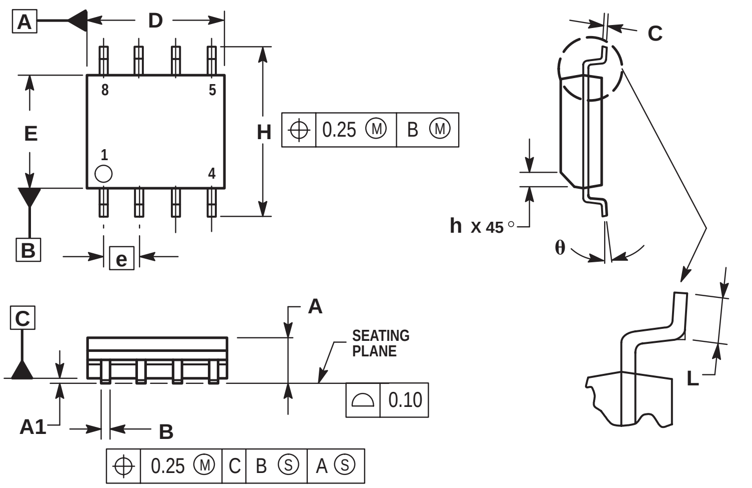
P SUFFIX
PLASTIC PACKAGE
CASE 626–05
ISSUE K



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.

	MILLIMETERS		INCHES	
DIM	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.

	MILLIMETERS	
DIM	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°

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