![Motorola logo] **MOTOROLA**

1.1 GHz Low-Voltage Dual Modulus Prescaler

MC12022LVA
MC12022LVB

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

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

SEMICONDUCTOR
TECHNICAL DATA

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 grounding 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.

DESIGN GUIDE

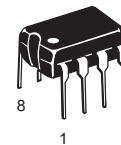| Criteria	Value	Unit
Internal Gate Count*	67	ea
Internal Gate Propagation Delay	200	ps
Internal Gate Power Dissipation	0.75	mW
Speed Power Product	0.15	pJ

NOTE: * Equivalent to a two–input NAND gate

PIN CONNECTIONS

```
          ┌───┐
IN     1  │ ○ │  8  IN
V_CC   2  │   │  7  NC
SW     3  │   │  6  MC
OUT    4  │   │  5  Gnd
          └───┘
       (Top View)
```

ORDERING INFORMATION

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

Rev 3

LIFETIME BUY

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MC123456 PC123[dviceno1]

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

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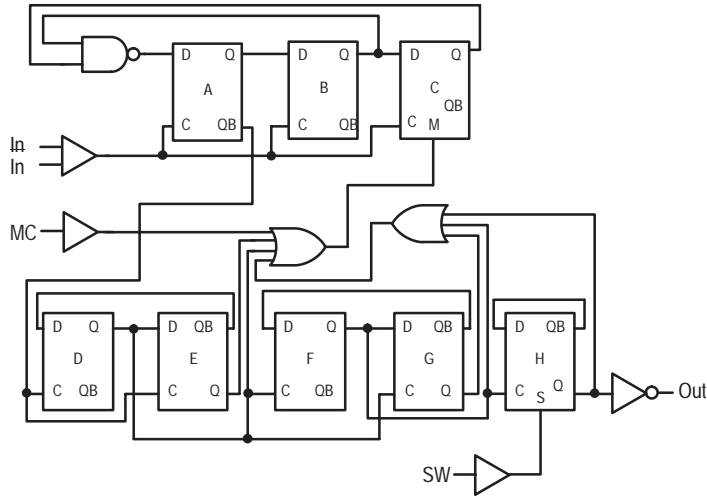# MC123456 PC123[dviceno1]

Figure 1. Logic Diagram (MC12022LVA)
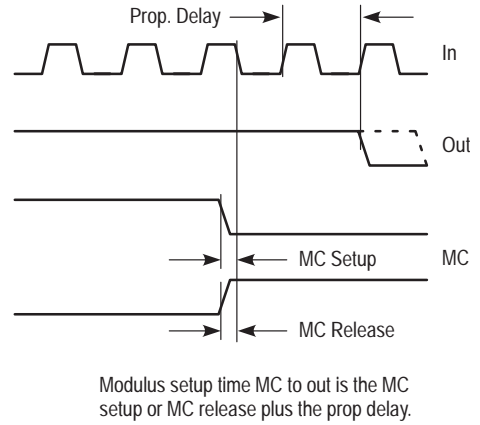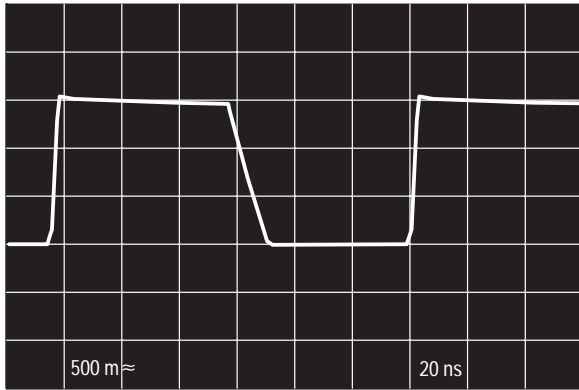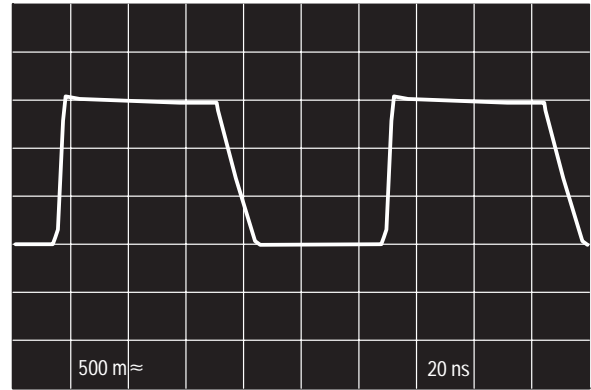

Figure 2. Modulus Setup Time

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

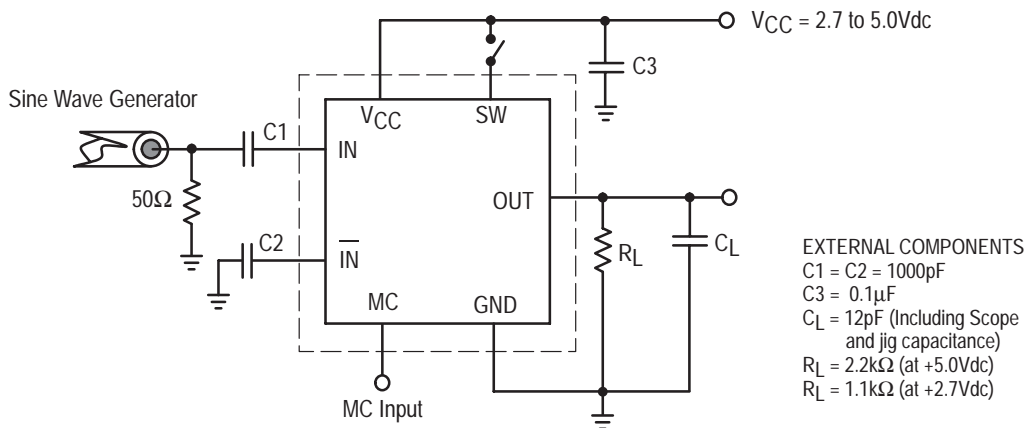**Figure 3. Typical Output Waveform**s

500 m≈   20 ns

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

500 m≈   20 ns

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

Figure 4. AC Test Circuit

Sine Wave Generator

V_{CC} = 2.7 to 5.0Vdc

50Ω

MC Input

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)

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MC123456 PC123[dviceno1]

Figure 5. Input Signal Amplitude versus Input Frequency
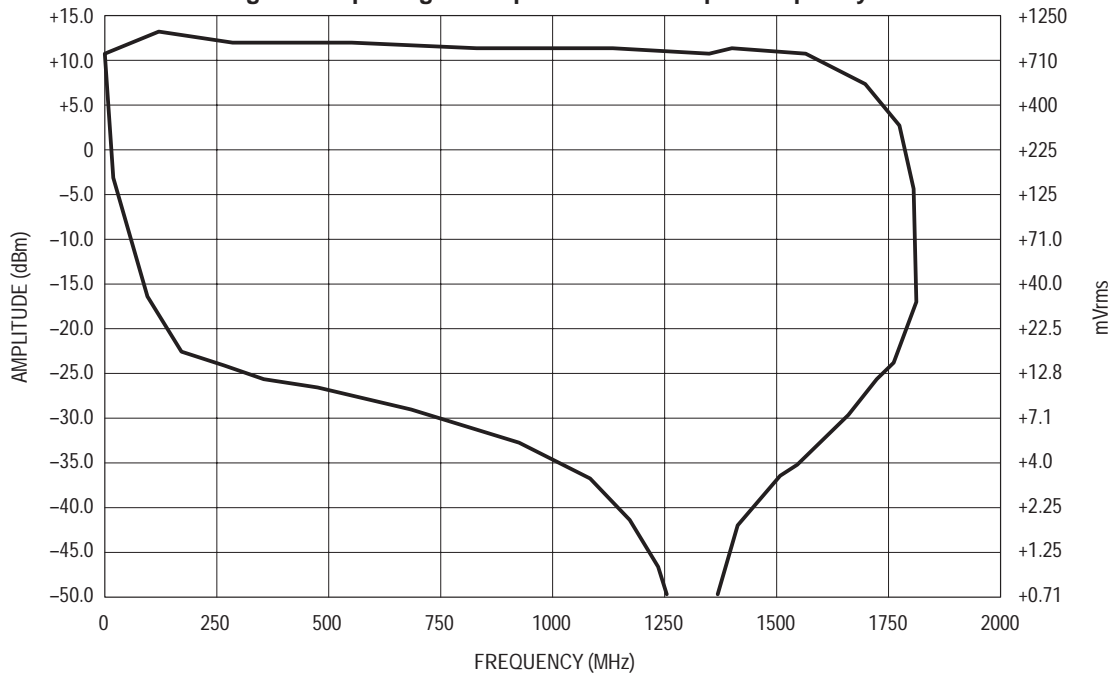
Divide Ratio = 128; V_{CC} = 5.0 V; T_A = 25°C

Figure 6. Output Amplitude versus Input Frequency

MC123456 PC123[dviceno1]
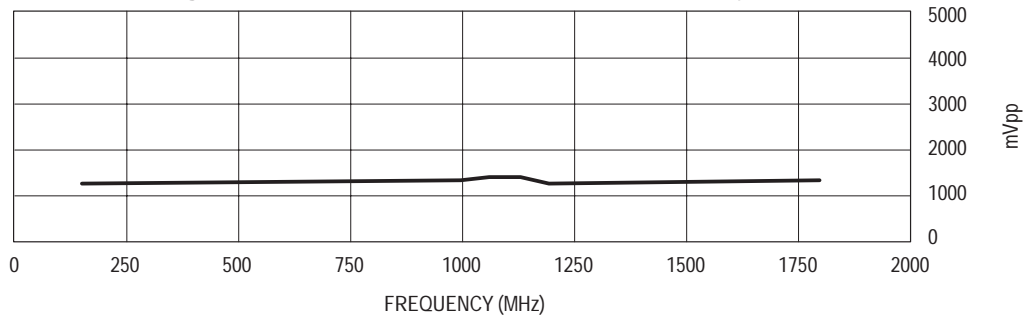
Figure 7. Typical Input Impedance versus Input Frequency

MC123456 PC123[dviceno1]
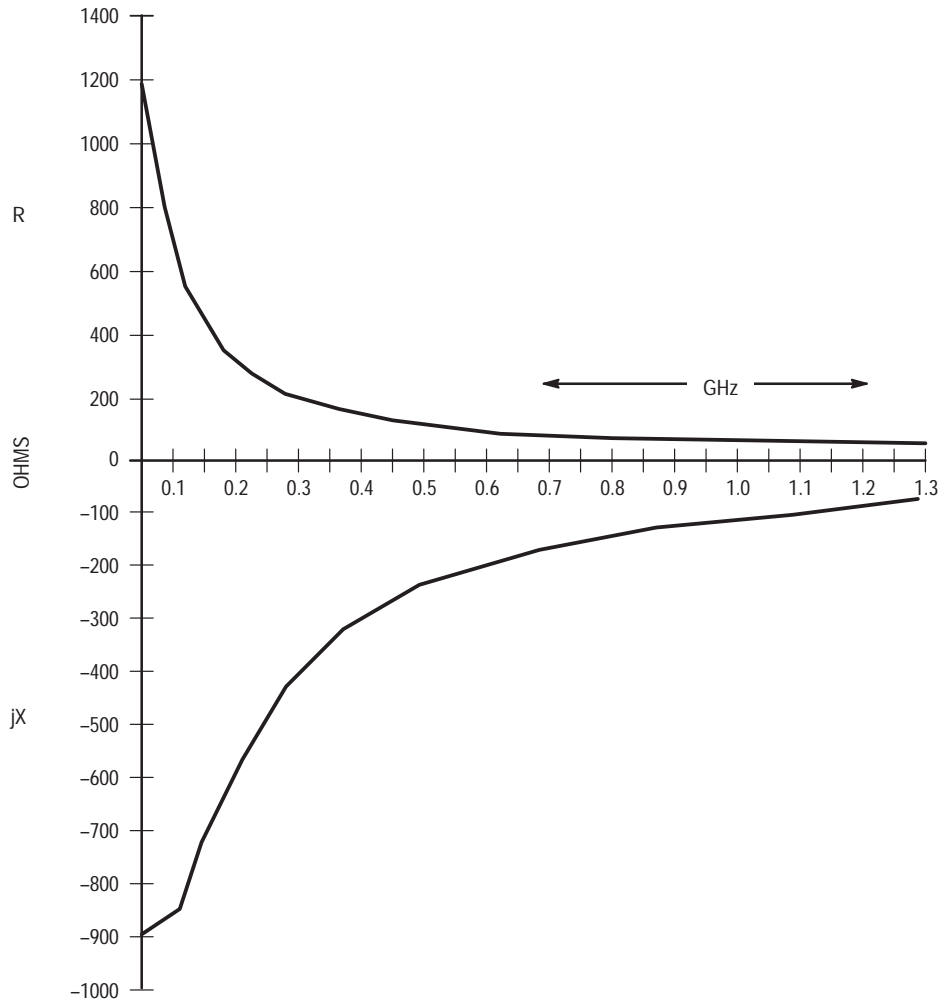
OUTLINE DIMENSIONS

P SUFFIX
PLASTIC PACKAGE
CASE 626–05
ISSUE K

NOTE 2

SEATING PLANE

⊕ | ⌀ 0.13 (0.005) Ⓜ | T | A Ⓜ | B Ⓜ |
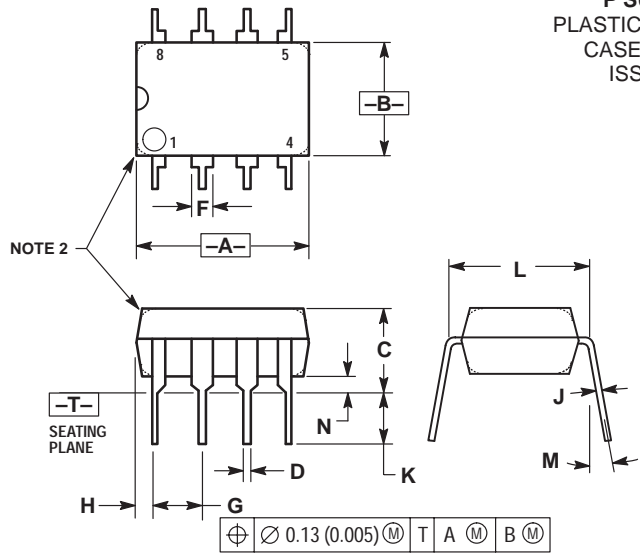
NOTES:
1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

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

⊕ | 0.25 Ⓜ | B Ⓜ |

SEATING PLANE

⊓ | 0.10 |

⊕ | 0.25 Ⓜ | C | B Ⓢ | A Ⓢ |

h X 45°

θ
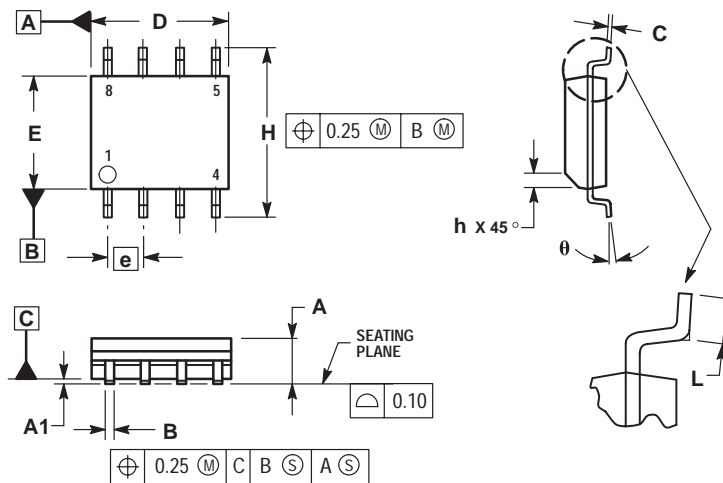
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETER.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF 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
θ	0°	7°

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MC12022LVA/D