MOTOROLA

Consider MC12052A for New Designs

1.1 GHz Low Power
Dual Modulus Prescaler

The MC12022SLA 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. This device is a reduced current version of the MC12022A/B.

The MC12022SLB 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.

- 1.1 GHz Toggle Frequency
- Supply Voltage of 4.5 to 5.5 V
- Low–Power 4.0 mA Typical
- Operating Temperature Range of –40 to 85°C
- Short Setup Time (t_{set}) 16 ns 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

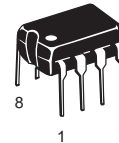NOTE: * Equivalent to a two–input NAND gate

MC12022SLA
MC12022SLB

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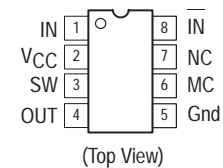## ÷64/65, ÷128/129
DUAL MODULUS PRESCALER

SEMICONDUCTOR
TECHNICAL DATA

D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO–8)

P SUFFIX
PLASTIC PACKAGE
CASE 626

PIN CONNECTIONS

IN 1	8 $\overline{IN}$
V_{CC} 2	7 NC
SW 3	6 MC
OUT 4	5 Gnd

(Top View)

ORDERING INFORMATION

Device	Operating Temp Range	Package
MC12022SLAD		SO–8
MC12022SLAP	T_A = – 40° to +85°C	Plastic
MC12022SLBD		SO–8
MC12022SLBP		Plastic

Rev 4

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.)

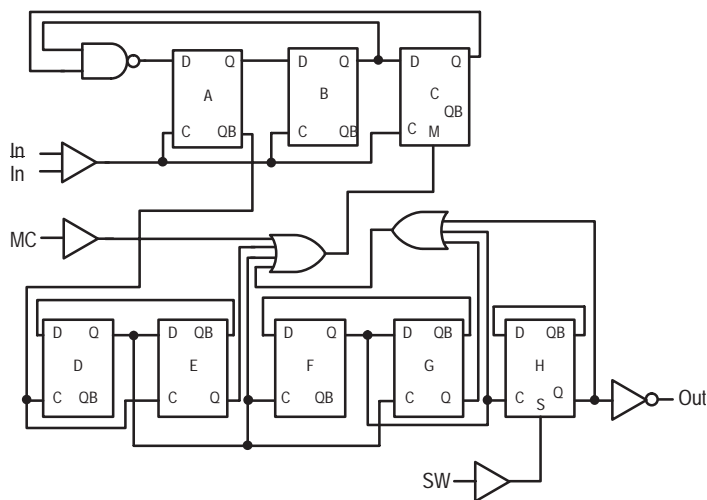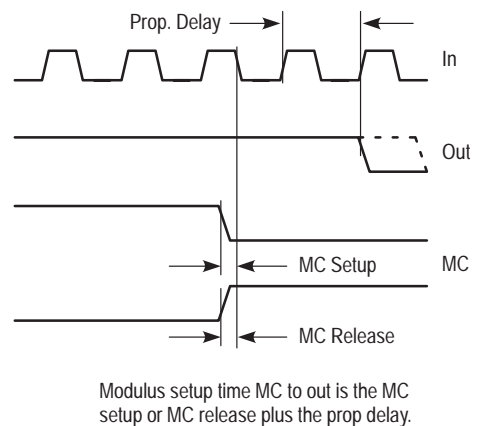| Characteristic	Symbol	Min	Typ	Max	Unit
Toggle Frequency (Sine Wave Input)	f_t	0.1	1.4	1.1	GHz
Supply Current Output Unloaded (Pin 2) at 5.0 Vdc	I_{CC}	−	3.8	6.5	mA
Modulus Control Input High (MC)	V_{IH1}	2.0	−	V_{CC} + 0.5 V	V
Modulus Control Input Low (MC)	V_{IL1}	−	−	0.8	V
Divide Ratio Control Input High (SW)	V_{IH2}	V_{CC} − 0.5 V	V_{CC}	V_{CC} − 0.5V	Vdc
Divide Ratio Control Input Low (SW)	V_{IL2}	Open	Open	Open	−
Output Voltage Swing (C_L = 8.0 pF; R_L = 14.4 kΩ)	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 = 8.0 pF; R_L = 4.4 kΩ, V_{CC} = 5.0 V)	I_O	−	.75	4.0	mA

Figure 1. Logic Diagram (MC12022SLA)
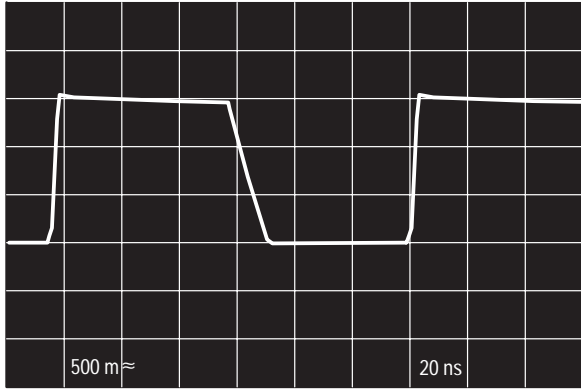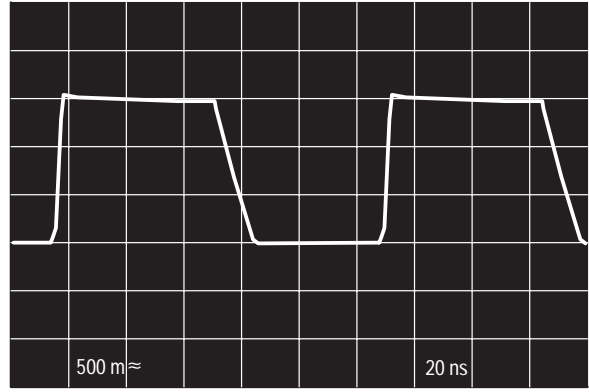

Figure 2. Modulus Setup Time

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

MOTOROLA RF/IF DEVICE DATA

Figure 3. Typical Output Waveforms

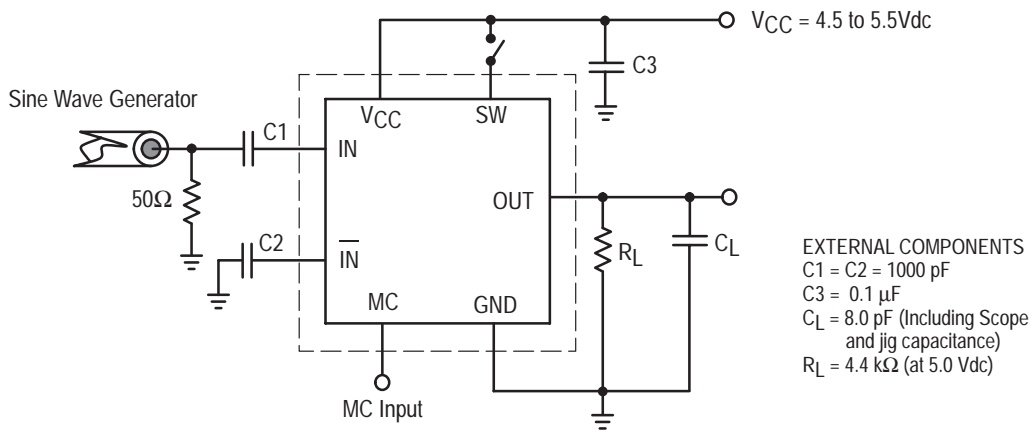(÷64, 500MHz Input Frequency, V_{CC} = 5.0V, T_A = 25°C, Output Loaded)

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

Figure 4. AC Test Circuit

Sine Wave Generator

V_{CC} = 4.5 to 5.5Vdc

EXTERNAL COMPONENTS
C1 = C2 = 1000 pF
C3 = 0.1 μF
C_L = 8.0 pF (Including Scope
and jig capacitance)
R_L = 4.4 kΩ (at 5.0 Vdc)

LIFETIME BUY

LAST SHIP 18/06/00

LAST ORDER 19/12/99

MC123456 PC123[dviceno1]

Figure 5. Input Signal Amplitude versus Input Frequency

AMPLITUDE (dBm)

mVrms

FREQUENCY (MHz)

Divide Ratio = 128; V_{CC} = 5.0V; T_A = 25°C

Figure 6. Output Amplitude versus Input Frequency

mVpp

FREQUENCY (MHz)

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Figure 7. Typical Input Impedance versus Input Frequency

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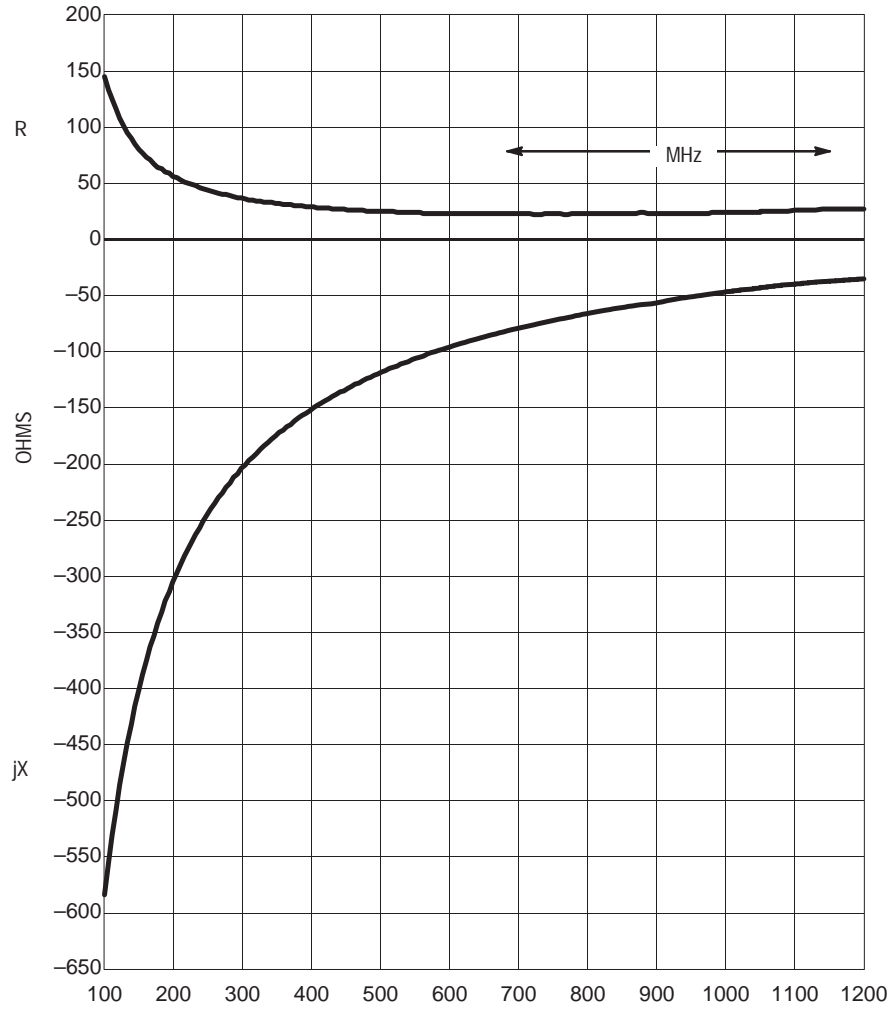
OUTLINE DIMENSIONS

P SUFFIX
PLASTIC PACKAGE
CASE 626–05
ISSUE K

NOTE 2

–B–

–A–

F

C

–T–
SEATING
PLANE

N

D

H

G

K

L

J

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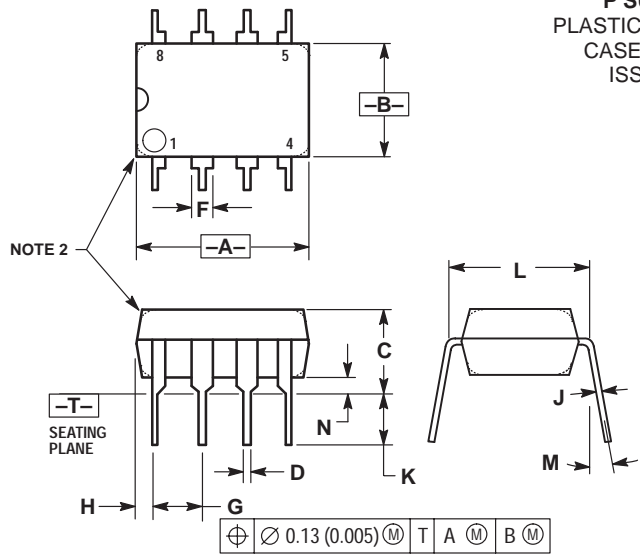
NOTES:
1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

⊕ | ⌀ 0.13 (0.005) Ⓜ | T | A Ⓜ | B Ⓜ

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

A

D

E

B

e

H

⊕ | 0.25 Ⓜ | B Ⓜ

C

A

A1

B

C

SEATING
PLANE

⌓ | 0.10

⊕ | 0.25 Ⓜ | C | B Ⓢ | A Ⓢ

h X 45°

θ

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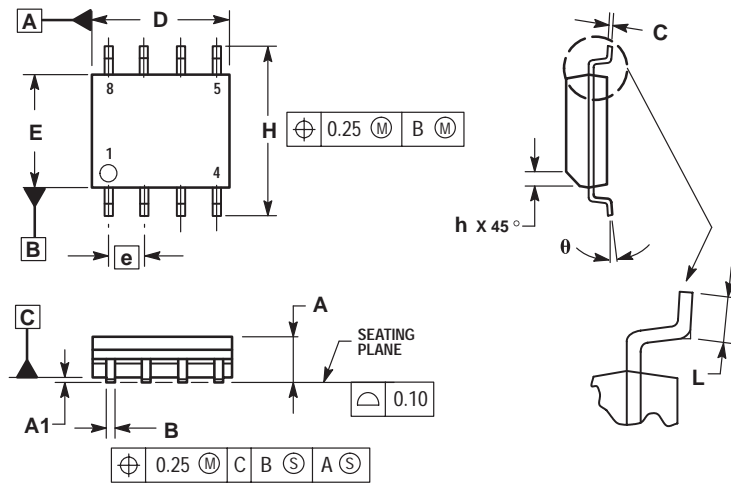
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETER.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF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

MOTOROLA RF/IF DEVICE DATA

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MC12022SLA/D