

# 1.1GHz 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 1.1GHz 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 5.5V
- Low-Power 4.0mA Typical
- Operating Temperature Range of -40 to +85°C
- Short Setup Time ( $t_{set}$ ) 16ns Maximum @ 1.1GHz
- 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

Note: SW: H =  $V_{CC}$ , L = Open

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

\* Equivalent to a two-input NAND gate

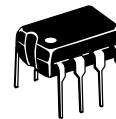
## MAXIMUM RATINGS

Symbol	Characteristic	Range	Unit
$V_{CC}$	Power Supply Voltage, Pin 2	-0.5 to +7.0	Vdc
$T_A$	Operating Temperature Range	-40 to +85	°C
$T_{stg}$	Storage Temperature Range	-65 to +150	°C
MC	Modulus Control Input, Pin 6	-0.5 to +6.5	Vdc

**MC12022SLA**  
**MC12022SLB**

## MECL PLL COMPONENTS

**÷64/65, ÷128/129**  
**DUAL MODULUS**  
**PRESCALER**

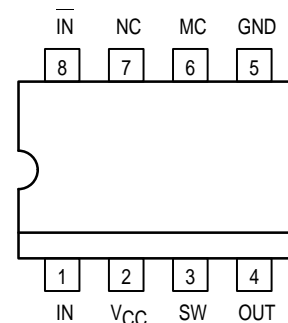


**P SUFFIX**  
8-LEAD PLASTIC PACKAGE  
CASE 626-05



**D SUFFIX**  
8-LEAD PLASTIC SOIC PACKAGE  
CASE 751-05

## Pinout: 8-Lead Plastic (Top View)



**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 4.5$  to  $5.5V$ ;  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ )

Symbol	Characteristic	Min	Typ	Max	Unit
$f_t$	Toggle Frequency (Sine Wave Input)	0.1	1.4	1.1	GHz
$I_{CC}$	Supply Current Output Unloaded (Pin 2) at 5.0Vdc		3.8	6.5	mA
$V_{IH1}$	Modulus Control Input High (MC)	2.0		$V_{CC} + 0.5V$	V
$V_{IL1}$	Modulus Control Input Low (MC)			0.8	V
$V_{IH2}$	Divide Ratio Control Input High (SW)	$V_{CC} - 0.5V$	$V_{CC}$	$V_{CC} + 0.5V$	Vdc
$V_{IL2}$	Divide Ratio Control Input Low (SW)	Open	Open	Open	—
$V_{out}$	Output Voltage Swing ( $C_L = 8pF$ ; $R_L = 4.4k\Omega$ )	1.0	1.6		$V_{p-p}$
$t_{set}$	Modulus Setup Time MC to Out		11	16	ns
$V_{in(min)}$	Input Voltage Sensitivity 250–1100 MHz 100–250 MHz	100 400		1500 1500	mVpp
$I_O$	Output Current ( $C_L = 8pF$ ; $R_L = 4.4k\Omega$ , $V_{CC} = 5.0V$ )		0.75	4.0	mA

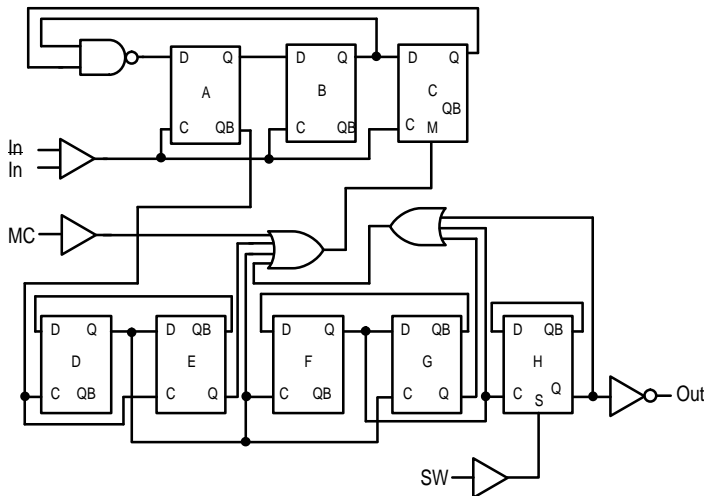
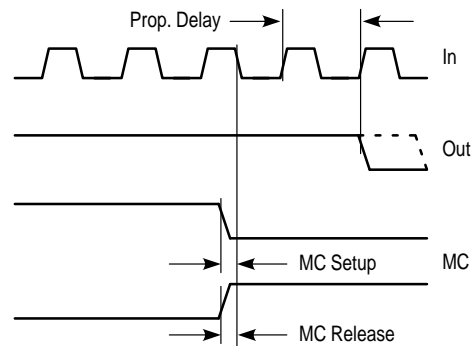
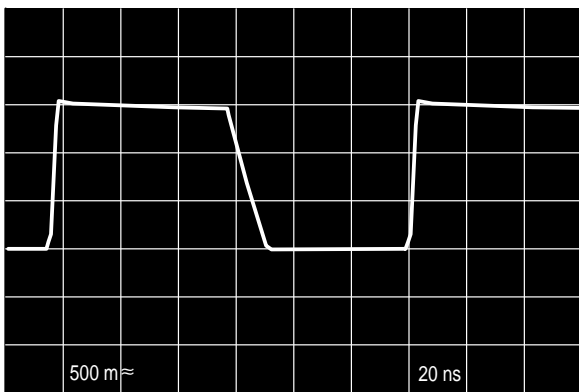


Figure 1. Logic Diagram (MC12022SLA)

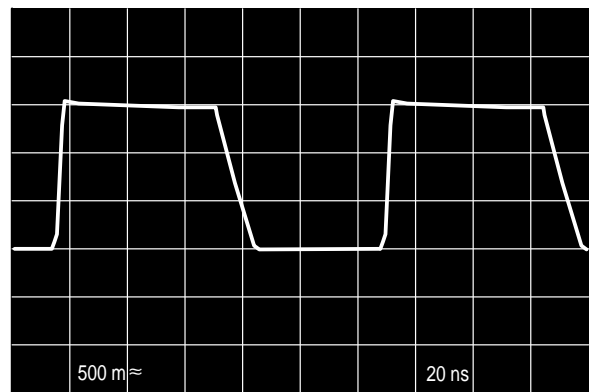


Modulus setup time MC to out is the MC setup or MC release plus the prop delay.

Figure 2. Modulus Setup Time



(±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 3. Typical Output Waveforms

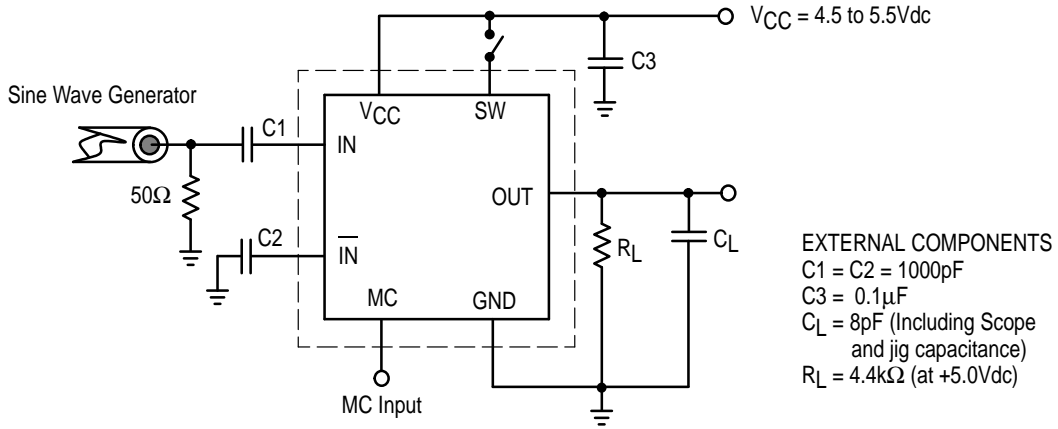


Figure 4. AC Test Circuit

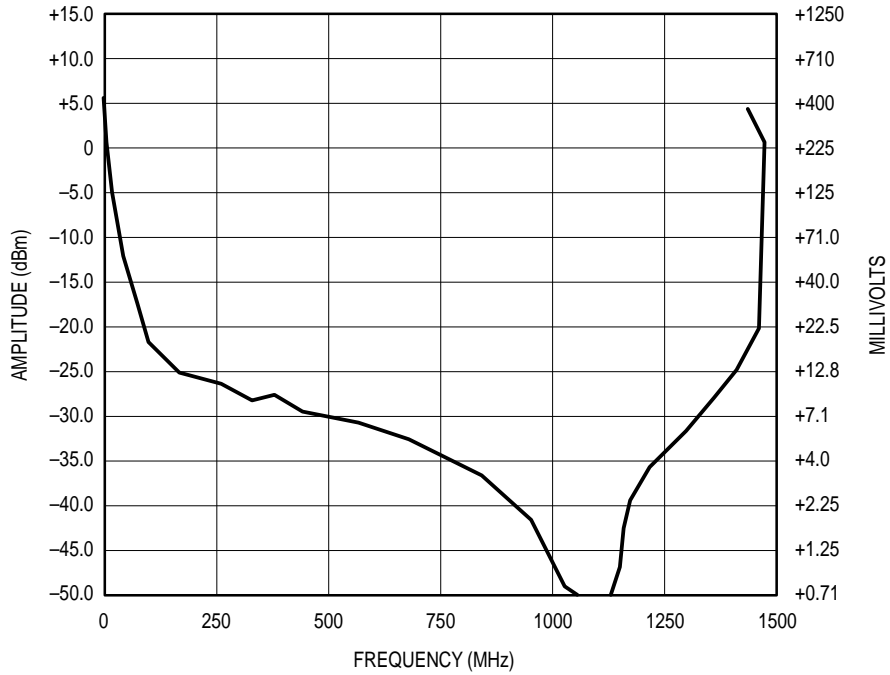


Figure 5. Input Signal Amplitude versus Input Frequency  
 Divide Ratio = 128; VCC = 5.0V; TA = 25°C

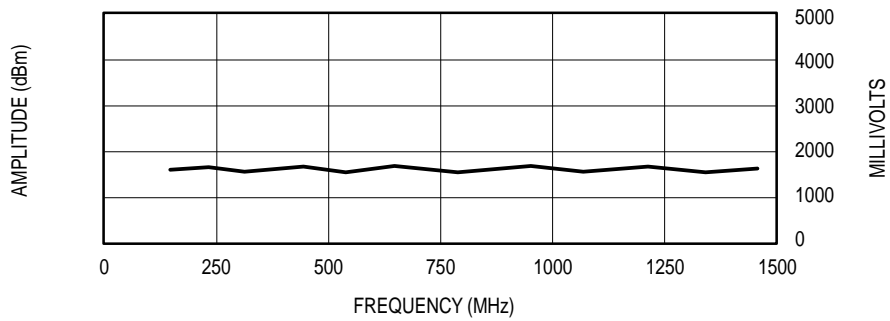


Figure 6. Output Amplitude versus Input Frequency

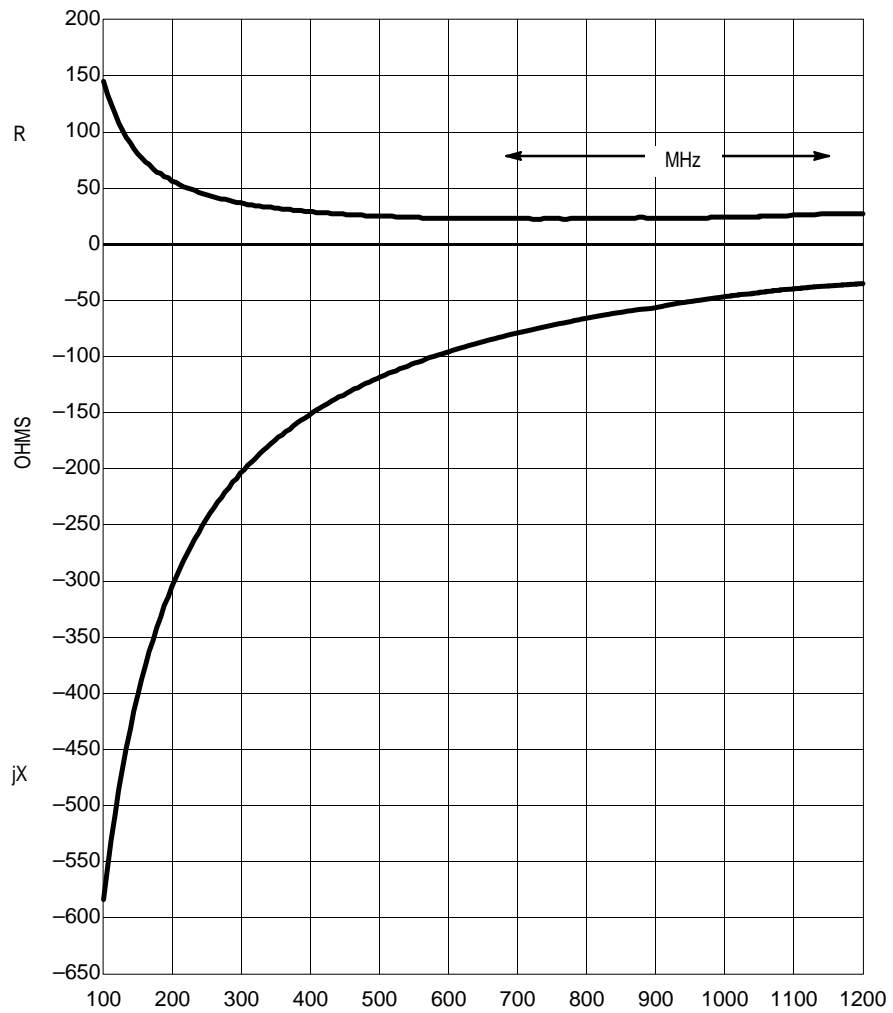


Figure 7. Typical Input Impedance versus Input Frequency

OUTLINE DIMENSIONS

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

NOTE 2: (points to lead profile)

SEATING PLANE (indicated by -T-)

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

$\oplus \text{ } \ominus \text{ } 0.13 \text{ (0.005)} \text{ } \textcircled{M} \text{ } T \text{ } A \text{ } \textcircled{M} \text{ } B \text{ } \textcircled{M}$

**D SUFFIX**  
PLASTIC SOIC PACKAGE  
CASE 751-05  
ISSUE R

NOTE 1: DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

NOTE 2: DIMENSIONS ARE IN MILLIMETERS.

NOTE 3: DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.

NOTE 4: MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

NOTE 5: DIMENSION B DOES NOT INCLUDE MOLD 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	0.18	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°	

$\oplus \text{ } \ominus \text{ } 0.25 \text{ } \textcircled{M} \text{ } C \text{ } B \text{ } \textcircled{S} \text{ } A \text{ } \textcircled{S}$

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