

# 1.1GHz Low Power Dual Modulus Prescaler With On-Chip Output Termination

The MC12022TSA 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 drain version of the MC12022A/B with the addition of on-chip output termination.

The MC12022TSB 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 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
- Output Load Resistor on Die

## 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

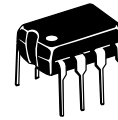
## MAXIMUM RATINGS

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

**MC12022TSA**  
**MC12022TSB**

## MECL PLL COMPONENTS

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

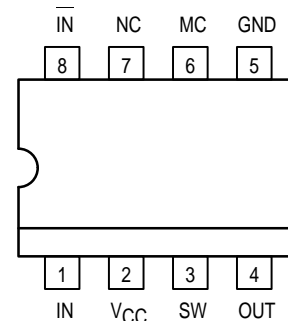


**P SUFFIX**  
8-LEAD PLASTIC PACKAGE  
CASE 626-05



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

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



# MC12022TSA MC12022TSB

## 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 (Pin 2)		4.6	6.5	mA
$V_{IH1}$	Modulus Control Input High (MC)	2.0		$V_{CC}$	V
$V_{IL1}$	Modulus Control Input Low (MC)			0.8	V
$V_{IH2}$	Divide Ratio Control Input High (SW)	$V_{CC}$	$V_{CC}$	$V_{CC}$	Vdc
$V_{IL2}$	Divide Ratio Control Input Low (SW)	Open	Open	Open	—
$V_{out}$	Output Voltage Swing ( $C_L = 8pF$ )	1.0	1.4		$V_{p-p}$
$t_{set}$	Modulus Setup Time MC to Out		11	16	ns
$V_{in}$	Input Voltage Sensitivity 250–1100 MHz 100–250 MHz	100 400		1500 1500	mVpp

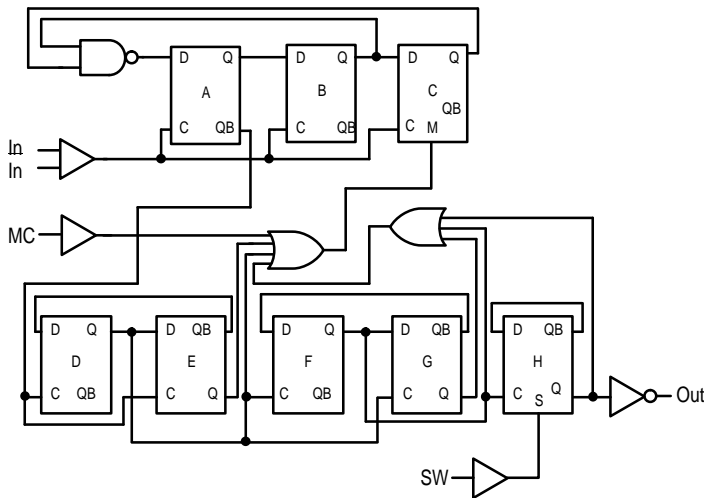


Figure 1. Logic Diagram (MC12022TSA)

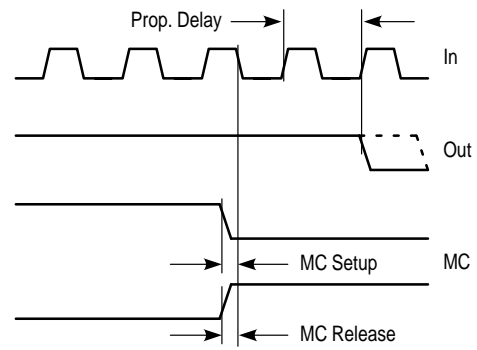
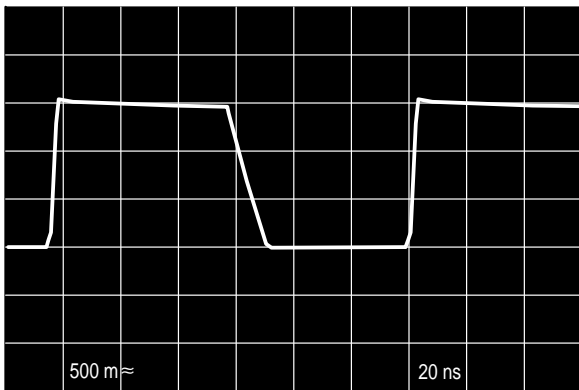
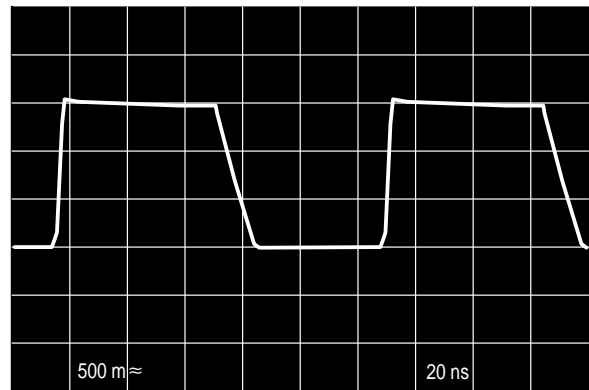


Figure 2. Modulus Setup Time

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



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



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

Figure 3. Typical Output Waveforms

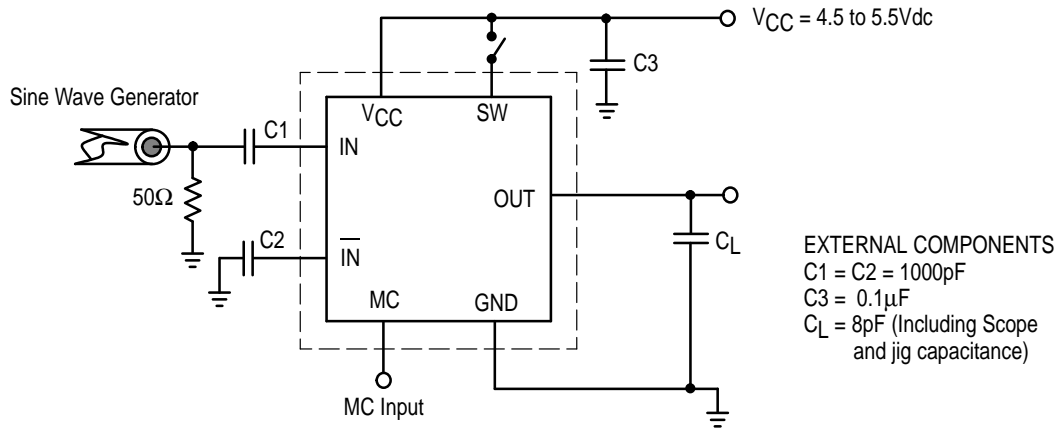


Figure 4. AC Test Circuit

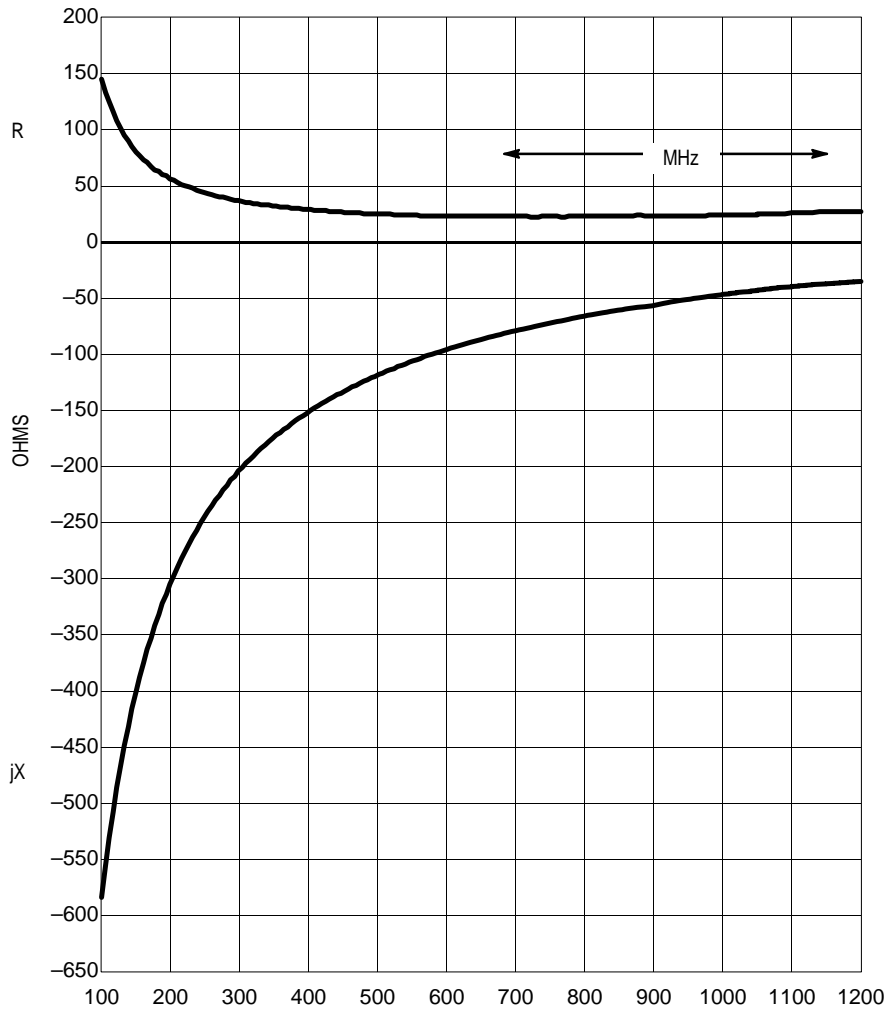


Figure 5. Typical Input Impedance versus Input Frequency

OUTLINE DIMENSIONS

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

NOTE 2: [Diagram pointing to lead dimensions]

SEATING PLANE: [Diagram pointing to lead base]

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

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

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

NOTE 1: [Diagram pointing to lead length]

NOTE 2: [Diagram pointing to lead width]

NOTE 3: [Diagram pointing to lead thickness]

NOTE 4: [Diagram pointing to lead angle]

NOTE 5: [Diagram pointing to lead width]

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°	

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

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