

1.1GHz Low Power Two-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.

- 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

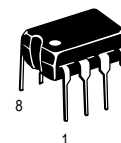
MAXIMUM RATINGS

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
**TWO-MODULUS
PRESCALER**

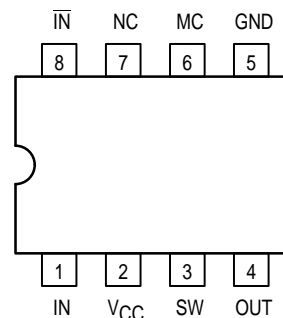


P SUFFIX
PLASTIC PACKAGE
CASE 626-05



D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751-05

Pinout: 8-Lead Plastic (Top View)



ELECTRICAL CHARACTERISTICS ($V_{CC} = 4.5 \text{ to } 5.5\text{V} \pm 10\%$; $T_A = -40^\circ\text{C} \text{ to } +85^\circ\text{C}$)

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 2.7Vdc		4.0	6.5	mA
V_{IH1}	Modulus Control Input High (MC)	2.0			V
V_{IL1}	Modulus Control Input Low (MC)			0.8	V
V_{IH2}	Divide Ratio Control Input High (SW)	$V_{CC} - 0.5\text{V}$	V_{CC}	$V_{CC} - 0.5\text{V}$	Vdc
V_{IL2}	Divide Ratio Control Input Low (SW)	Open	Open	Open	—
V_{out}	Output Voltage Swing ($C_L = 8\text{pF}$; $R_L = 4.4\text{k}\Omega$)	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

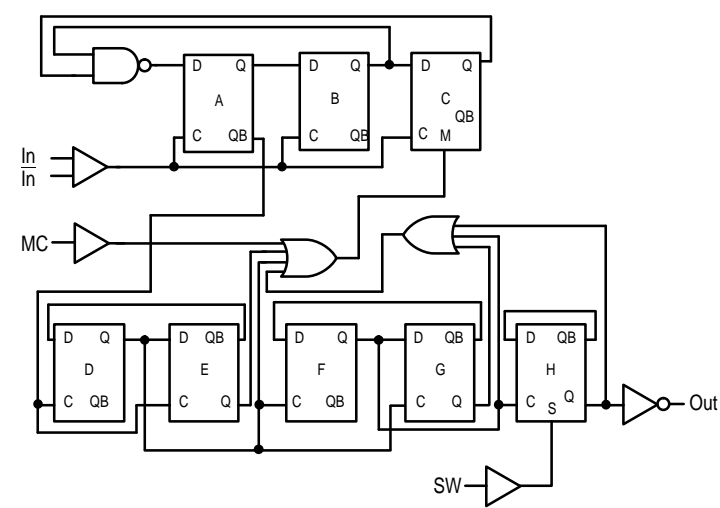
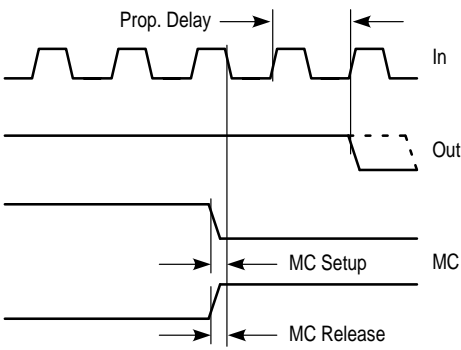
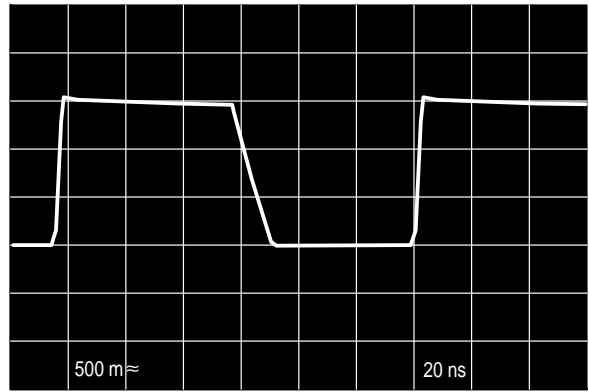


Figure 1. Logic Diagram (MC12022TSA)

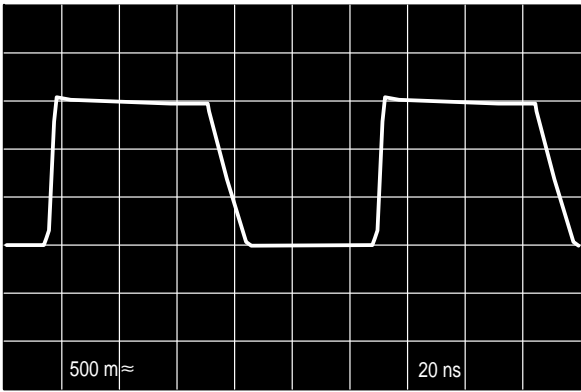


Modulus setup time MC to out is the MC setup or MC release plus the prop delay.

Figure 2. Modulus Setup Time



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



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

Figure 3. Typical Output Waveforms

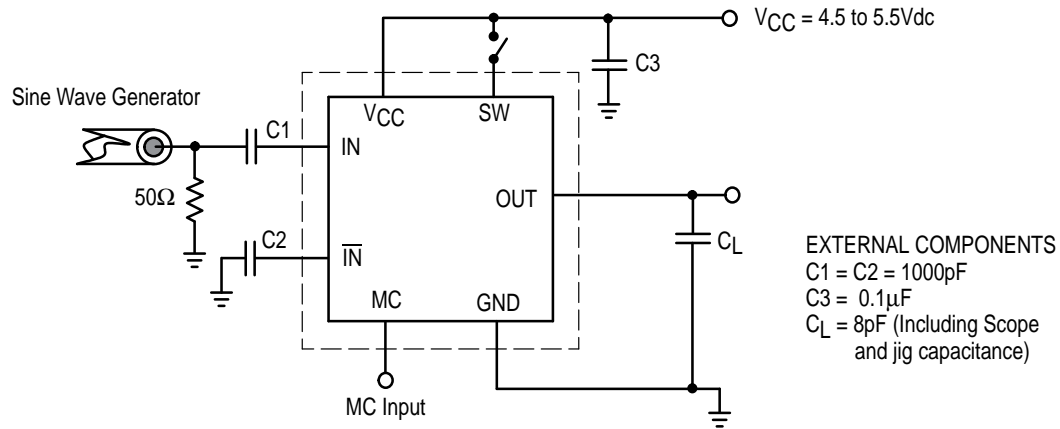
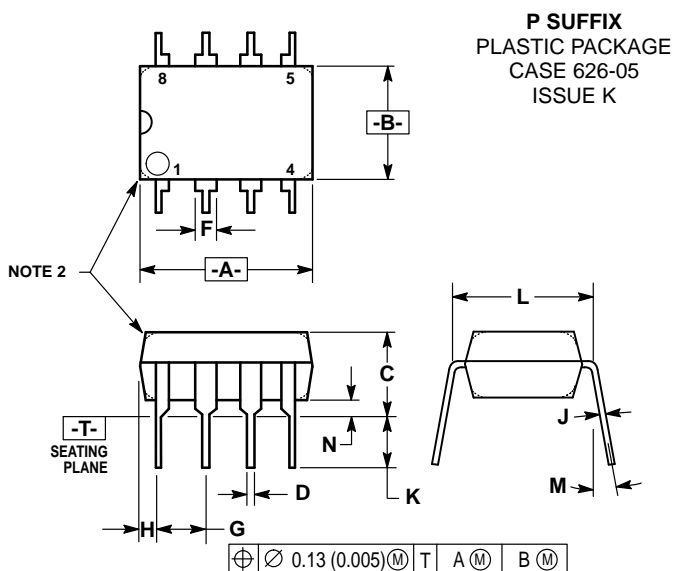


Figure 4. AC Test Circuit

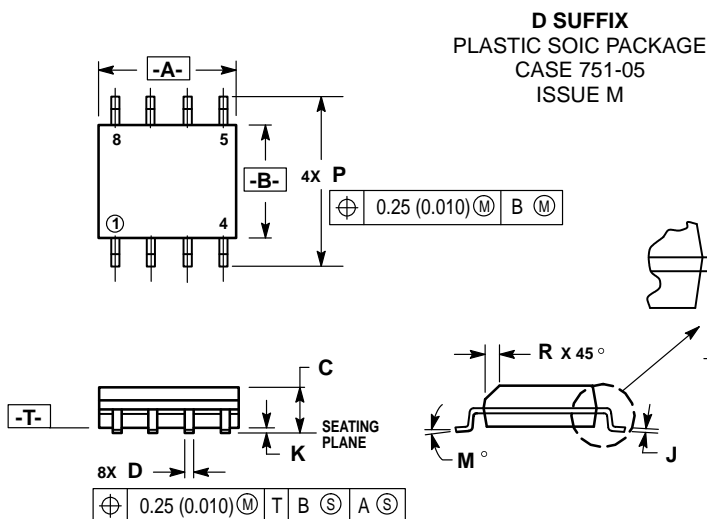
OUTLINE DIMENSIONS



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



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.18	0.25	0.007	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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