2.0GHz Low Voltage Dual Modulus Prescaler

MC12033A
MC12033B

MECL PLL COMPONENTS

÷32/33, ÷64/65
LOW VOLTAGE
DUAL MODULUS PRESCALER

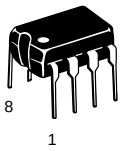
The MC12033 is a high frequency low voltage dual modulus prescaler used in phase-locked loop (PLL) applications. A high frequency input signal up to 2.0GHz is provided for cordless and cellular communication services such as DECT, PHP, and PCS. The MC12033 can be operated down to a minimum supply voltage of 2.7V required for battery operated portable systems.

The MC12033A can be used with CMOS synthesizer requiring positive edges to trigger internal counters such as Motorola's MC145XXX series in a PLL to provide tuning signal up to 2.0GHz in programmable frequency steps. The MC12033B can be used with CMOS synthesizers requiring negative edges to trigger internal counters.

A Divide Ratio Control (SW) permits selection of a 32/33 or 64/65 divide ratio as desired.

The Modulus Control (MC) selects the proper divide number after SW has been biased to select the desired divide ratio.

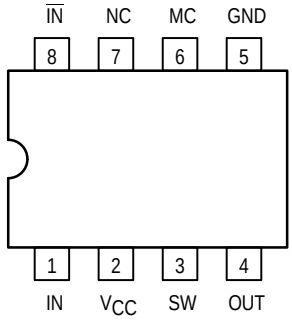
- 2.0GHz Toggle Frequency
- Supply Voltage 2.7V to 5.0Vdc
- Low Power 10.0mA Typical at V_{CC} = 2.7V
- Operating Temperature Range of –40 to +85°C
- The MC12033 is Pin Compatible With the MC12022
- Short Setup Time (t_{set}) 8ns Typical at 2.0GHz
- Modulus Control Input Level Is Compatible With Standard CMOS and TTL



P SUFFIX
PLASTIC PACKAGE
CASE 626-05

D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751-05

Pinout: 8-Lead Plastic (Top View)



For positive edge triggered synthesizers, order the MC12033A
For negative edge triggered synthesizers, order the MC12033B

FUNCTION TABLE

SW	MC	Divide Ratio
H	H	32
H	L	33
L	H	64
L	L	65

Note: SW: H = V_{CC}, L = OPEN
MC: H = 2.0V to V_{CC}; L = GND to 0.8V

MAXIMUM RATINGS

Symbol	Parameter	Value	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
I_O	Maximum Output Current, Pin 4	10.0	mA

MOTOROLA

ELECTRICAL CHARACTERISTICS (V_{CC} = 2.7 to 5.0V; T_A = –40 to +85°C)

Symbol	Parameter	Min	Typ	Max	Unit
ft	Toggle Frequency (Sine Wave)	0.5	2.4	2.0	GHz
I_{CC}	Supply Current Output (Pin 2) V_{CC} = 2.7V V_{CC} = 5.0V		10.0 13.0	12.5 16.0	mA
V_{IH1}	Modulus Control Input HIGH (MC)	2.0		V_{CC}	V
V_{IL1}	Modulus Control Input LOW (MC)	GND		0.8	V
V_{IH2}	Divide Ratio Control Input HIGH (SW)	V_{CC}–0.5V	V_{CC}	V_{CC}+0.5V	V
V_{IL2}	Divide Ratio Control Input LOW (SW)	OPEN	OPEN	OPEN	—
V_{OUT}	Output Voltage Swing (Note 1) C_L = 8pF; R_L = 600Ω	0.8	1.2		V_{PP}
t_{set}	Modulus Setup Time MC to OUT @ 2000MHz		8	10	ns
V_{IN}	Input Voltage Sensitivity 500–2000MHz	100		1000	mV_{PP}
I_O	Output Current (Note 2) V_{CC} = 2.7V, C_L = 8pF, R_L = 600Ω V_{CC} = 5.0V, C_L = 8pF, R_L = 1.5kΩ		2.4 2.4	4.0 4.0	mA

1. Valid over voltage range 2.7 to 5.0V; R_L = 600Ω @ V_{CC} = 2.7V; R_L = 1.5kΩ @ V_{CC} = 5.0V
2. Divide ratio of ÷32/33 @ 2.0GHz

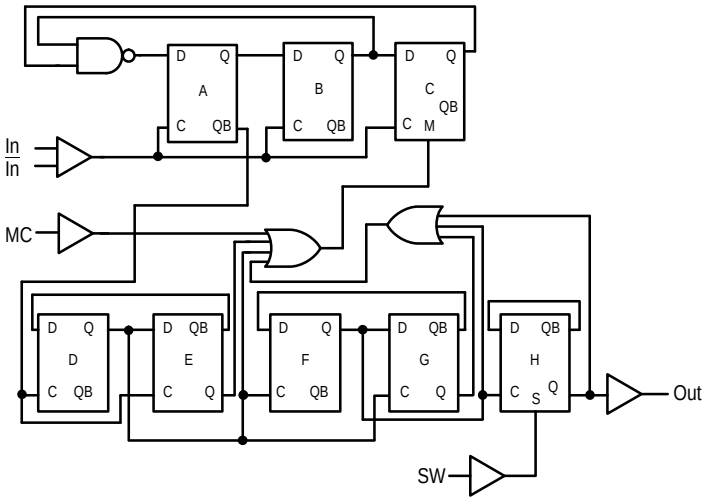
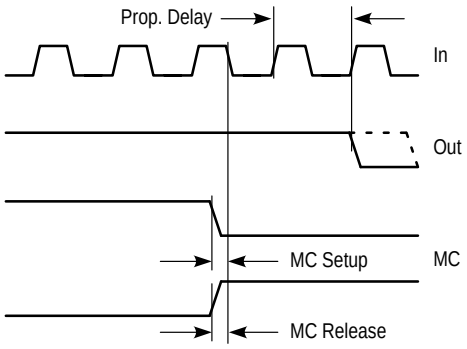
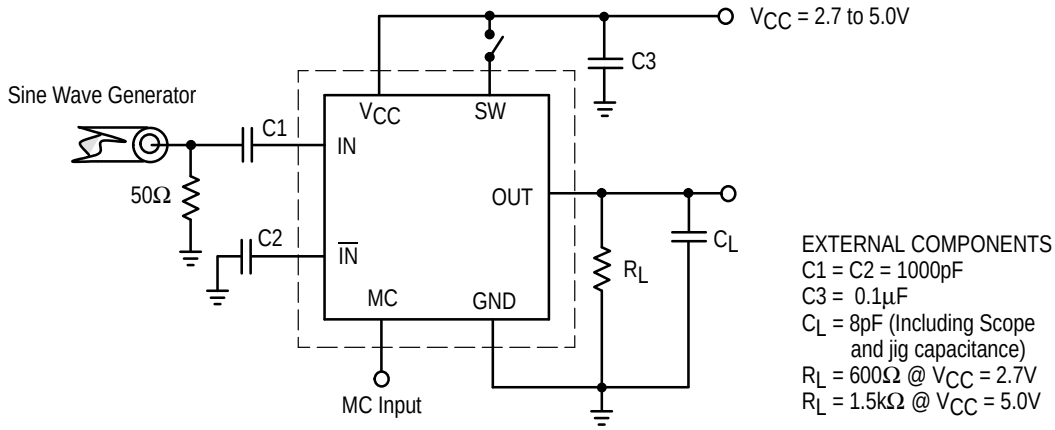


Figure 1. Logic Diagram (MC12033A)



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

Figure 2. Modulus Setup Time



EXTERNAL COMPONENTS
C1 = C2 = 1000pF
C3 = 0.1µF
C_L = 8pF (Including Scope and jig capacitance)
R_L = 600Ω @ V_{CC} = 2.7V
R_L = 1.5kΩ @ V_{CC} = 5.0V

Figure 3. AC Test Circuit

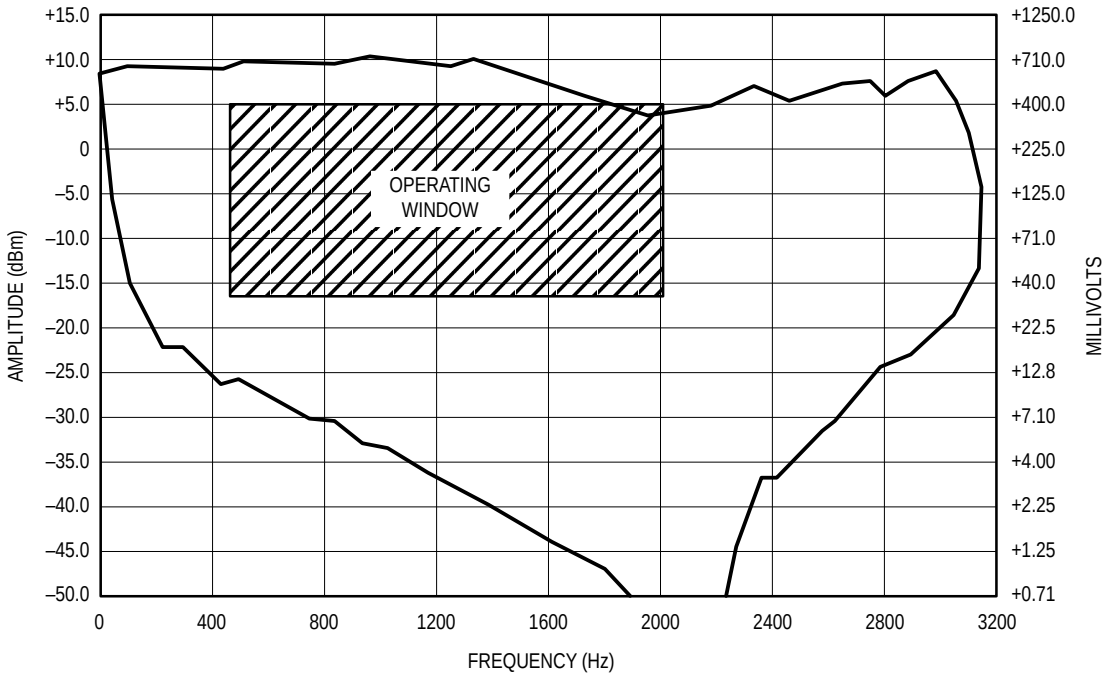


Figure 4. Input Signal Amplitude versus Input Frequency
Divide Ratio = 64; V_{CC} = 5.0V; T_A = 25°C

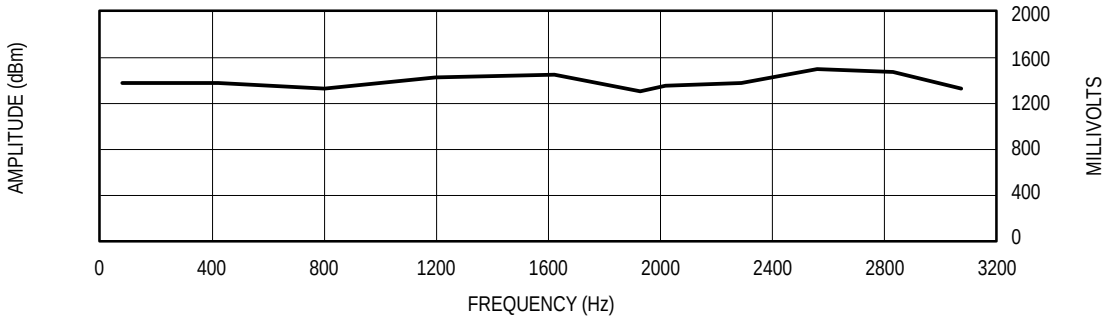
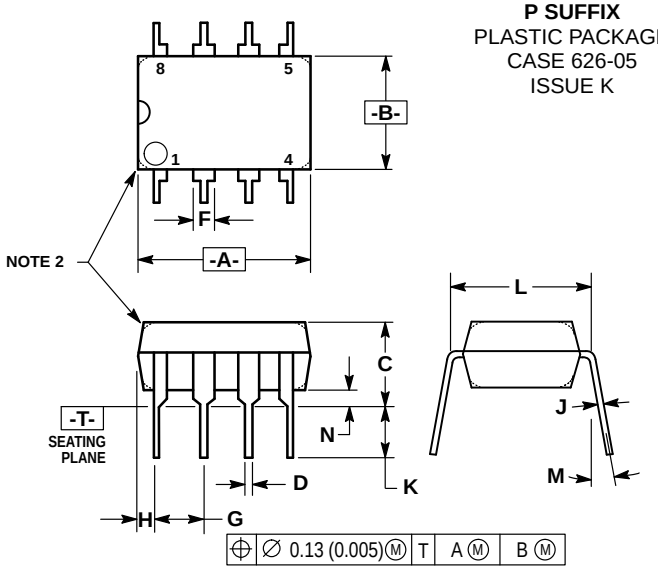


Figure 5. Output Amplitude versus Input Frequency

OUTLINE DIMENSIONS

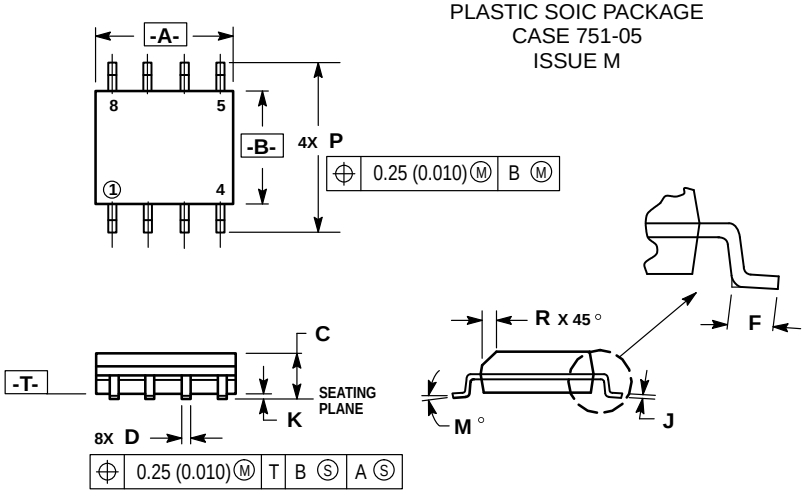
P SUFFIX
PLASTIC PACKAGE
CASE 626-05
ISSUE K



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.

	MILLIMETERS		INCHES	
DIM	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 SOIC PACKAGE
CASE 751-05
ISSUE M



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.

	MILLIMETERS		INCHES	
DIM	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

Literature Distribution Centers:
USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.
EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.
JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141 Japan.
ASIA-PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.