

2.0GHz 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.

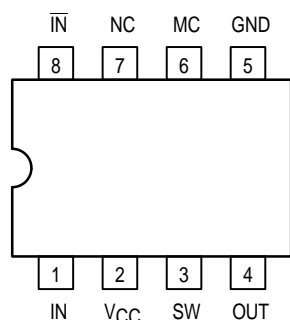
The MC12033A can be used with CMOS synthesizer requiring positive edges to trigger internal counters such as Motorola's MC145XXX series in a PLL to provide tuning signal up to 2.0GHz in programmable frequency steps. The MC12033B can be used with CMOS synthesizers requiring negative edges to trigger internal 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 $+85^{\circ}C$
- 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

Pinout: 8-Lead Plastic (Top View)

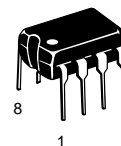


For positive edge triggered synthesizers, order the MC12033A
For negative edge triggered synthesizers, order the MC12033B

MC12033A MC12033B

MECL PLL COMPONENTS

$\div 32/33, \div 64/65$
**LOW VOLTAGE
DUAL MODULUS PRESCALER**



P SUFFIX
PLASTIC PACKAGE
CASE 626-05



D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751-05

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 $+85$	$^{\circ}C$
T_{stg}	Storage Temperature Range	-65 to $+150$	$^{\circ}C$
MC	Modulus Control Input, Pin 6	-0.5 to $+6.5$	Vdc
I_O	Maximum Output Current, Pin 4	10.0	mA

ELECTRICAL CHARACTERISTICS ($V_{CC} = 2.7$ to $5.0V$; $T_A = -40$ to $+85^{\circ}C$)

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) $C_L = 8pF$; $R_L = 600\Omega$	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) $V_{CC} = 2.7V$, $C_L = 8pF$, $R_L = 600\Omega$ $V_{CC} = 5.0V$, $C_L = 8pF$, $R_L = 1.5k\Omega$		2.4 2.4	4.0 4.0	mA

1. Valid over voltage range 2.7 to 5.0V; $R_L = 600\Omega$ @ $V_{CC} = 2.7V$; $R_L = 1.5k\Omega$ @ $V_{CC} = 5.0V$
2. Divide ratio of +32/33 @ 2.0GHz

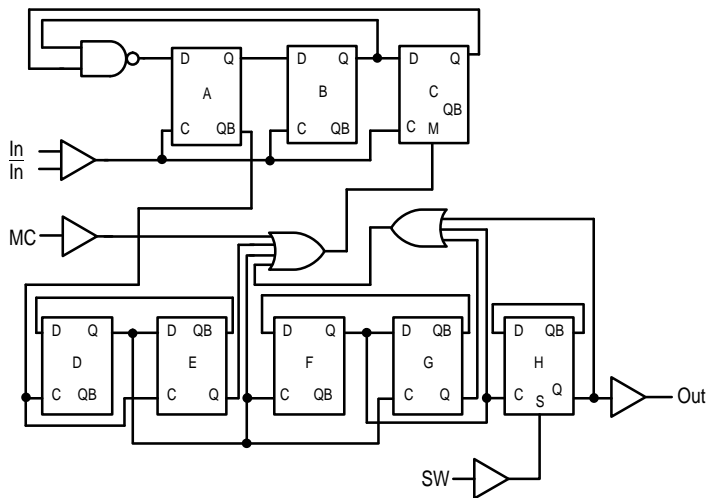


Figure 1. Logic Diagram (MC12033A)

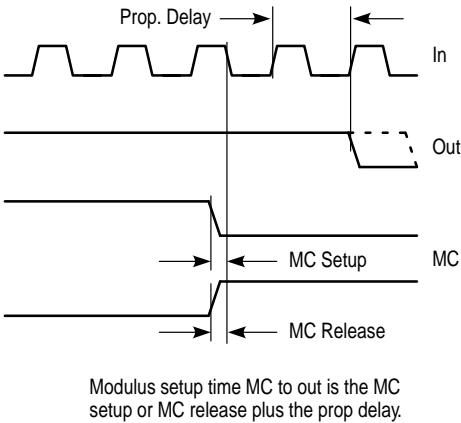


Figure 2. Modulus Setup Time

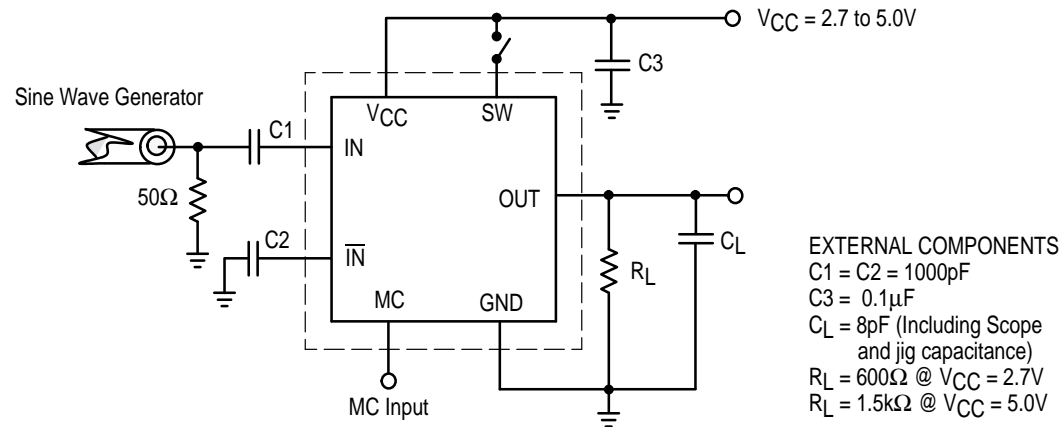


Figure 3. AC Test Circuit

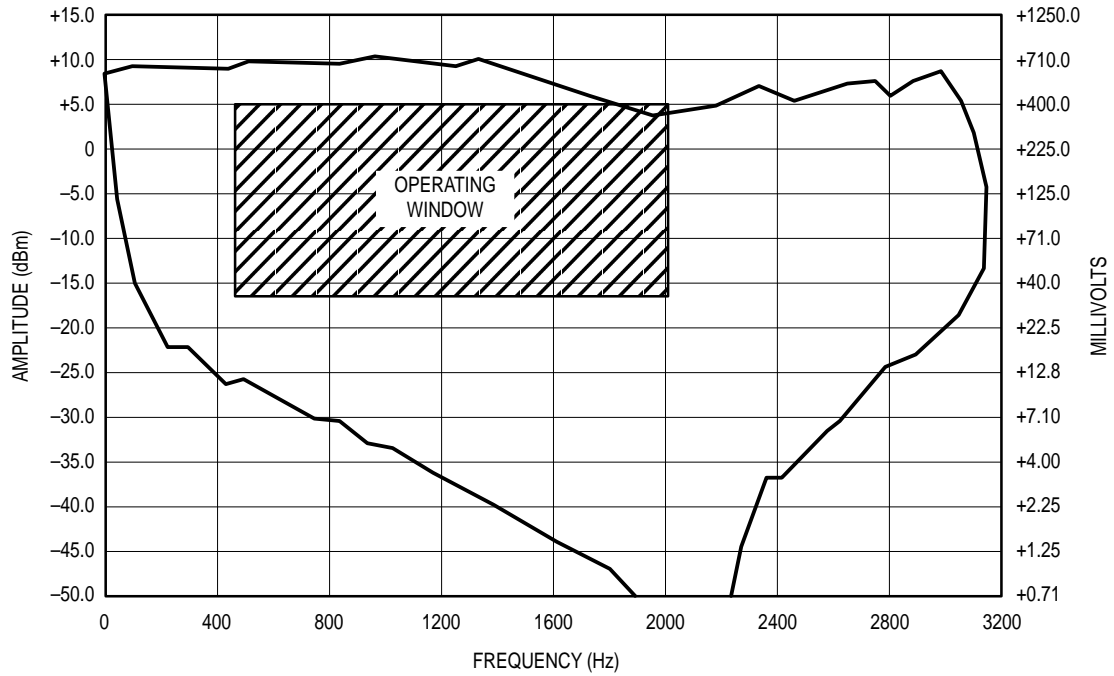


Figure 4. Input Signal Amplitude versus Input Frequency
Divide Ratio = 64; $V_{CC} = 5.0V$; $T_A = 25^{\circ}C$

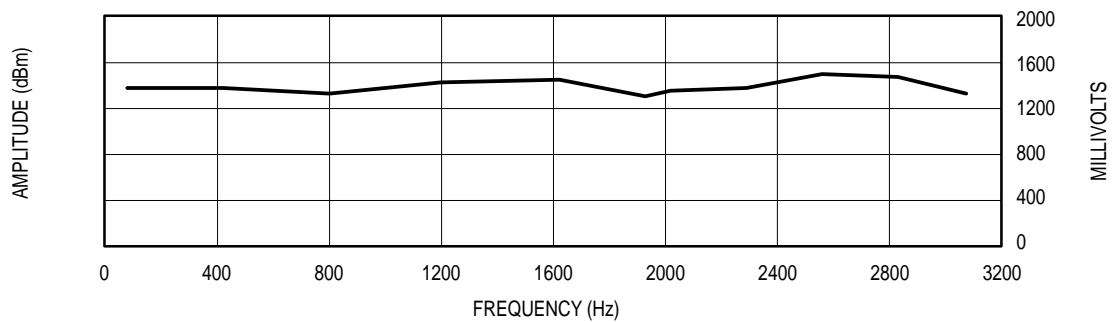
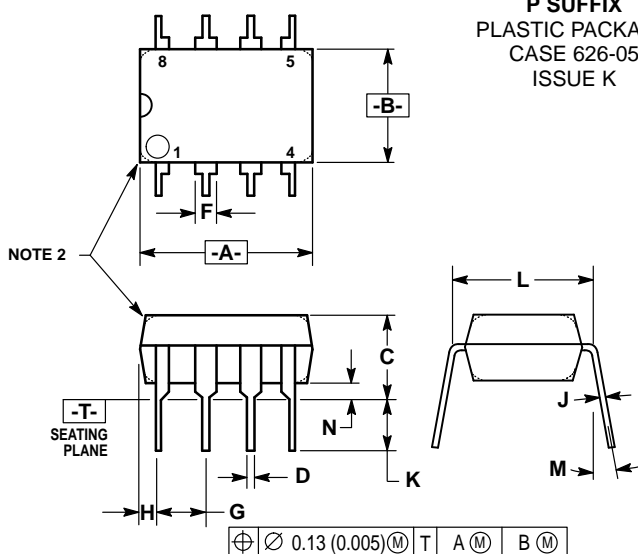


Figure 5. Output Amplitude versus Input Frequency

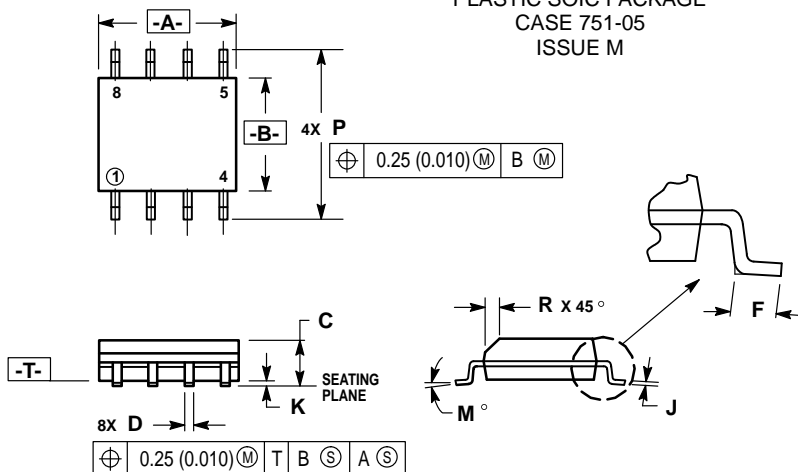
OUTLINE DIMENSIONS

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.


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 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.

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

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

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.


MOTOROLA

CODELINE TO BE PLACED HERE

MC12033A/D

