



2.0 GHz 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 2.0 GHz is provided for cordless and cellular communication services such as DECT, PHS, and PCS. The MC12033 can be operated down to a minimum supply voltage of 2.7 V 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 2.0 GHz 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.

NOTE: The "B" Version Is Not Recommended for New Designs

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

FUNCTIONAL TABLE

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

NOTES: 1. SW: H = V_{CC} , L = Open. A logic L can also be applied by grounding this pin, but this is not recommended due to increased power consumption.
2. MC: H = 2.0 V to V_{CC} , L = GND to 0.8 V.

MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Power Supply Voltage, Pin 2	V_{CC}	-0.5 to 7.0	Vdc
Operating Temperature Range	T_A	-40 to 85	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	-65 to 150	$^{\circ}\text{C}$
Modulus Control Input, Pin 6	MC	-0.5 to 6.5	Vdc
Maximum Output Current, Pin 4	I_O	10.0	mA

NOTE: ESD data available upon request.

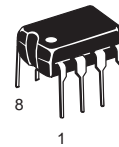
MC12033A MC12033B

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

SEMICONDUCTOR TECHNICAL DATA

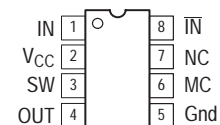


D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO-8)



P SUFFIX
PLASTIC PACKAGE
CASE 626

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

Device	Operating Temp Range	Package
MC12033AD	$T_A = -40^{\circ}$ to $+85^{\circ}\text{C}$	SO-8
MC12033AP		Plastic
MC12033BD		SO-8
MC12033BP		Plastic

MC12033A MC12033B

ELECTRICAL CHARACTERISTICS ($V_{CC} = 2.7$ to 5.0 V; $T_A = -40$ to 85°C , unless otherwise noted.)

Parameter	Symbol	Min	Typ	Max	Unit
Toggle Frequency (Sine Wave)	ft	0.5	2.4	2.0	GHz
Supply Current Output (Pin 2)	I_{CC}	–	10.0 13.0	12.5 16.0	mA
Modulus Control Input HIGH (MC)	V_{IH1}	2.0	–	V_{CC}	V
Modulus Control Input LOW (MC)	V_{IL1}	Gnd	–	0.8	V
Divide Ratio Control Input HIGH (SW)	V_{IH2}	V_{CC}	V_{CC}	V_{CC}	V
Divide Ratio Control Input LOW (SW)	V_{IL2}	OPEN	OPEN	OPEN	–
Output Voltage Swing (Note 1)	V_{OUT}	0.8	1.2	–	V_{pp}
Modulus Setup Time MC to OUT @ 2000 MHz	t_{set}	–	8.0	10	ns
Input Voltage Sensitivity	V_{IN}	100	–	1000	mVpp
Output Current (Note 2)	I_O	–	2.4 2.4	4.0 4.0	mA

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

Figure 1. Logic Diagram (MC12033A)

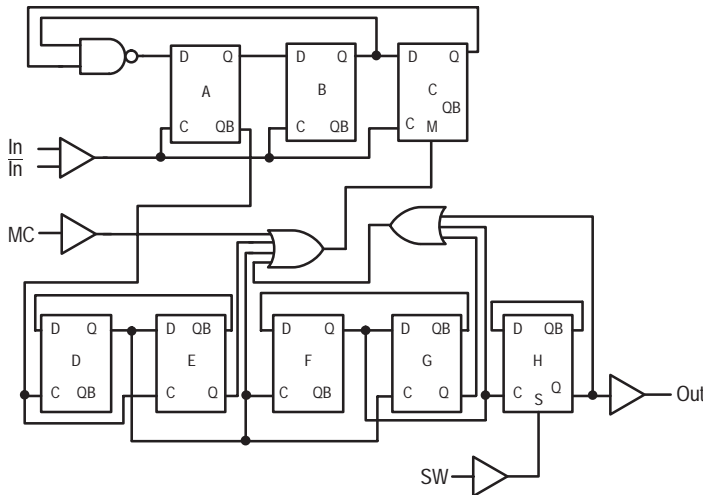


Figure 2. Modulus Setup Time

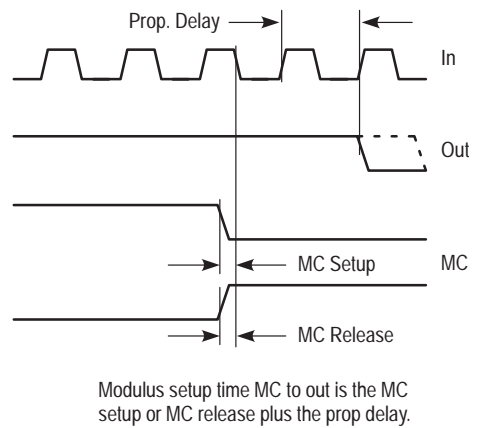
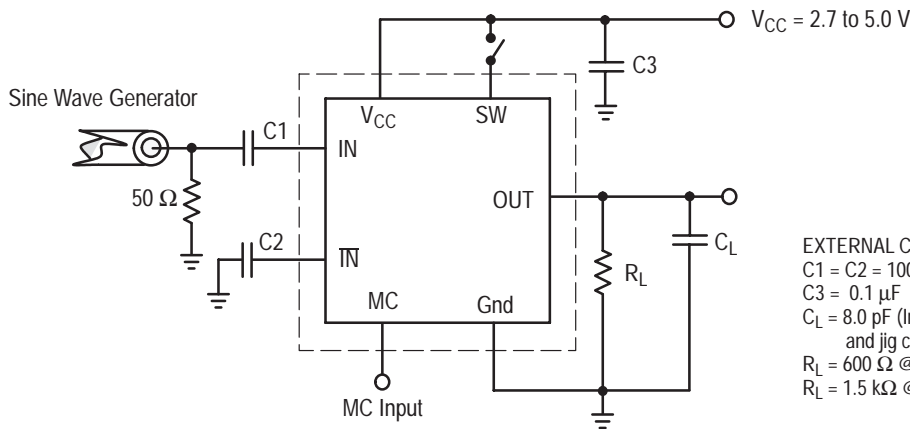


Figure 3. AC Test Circuit

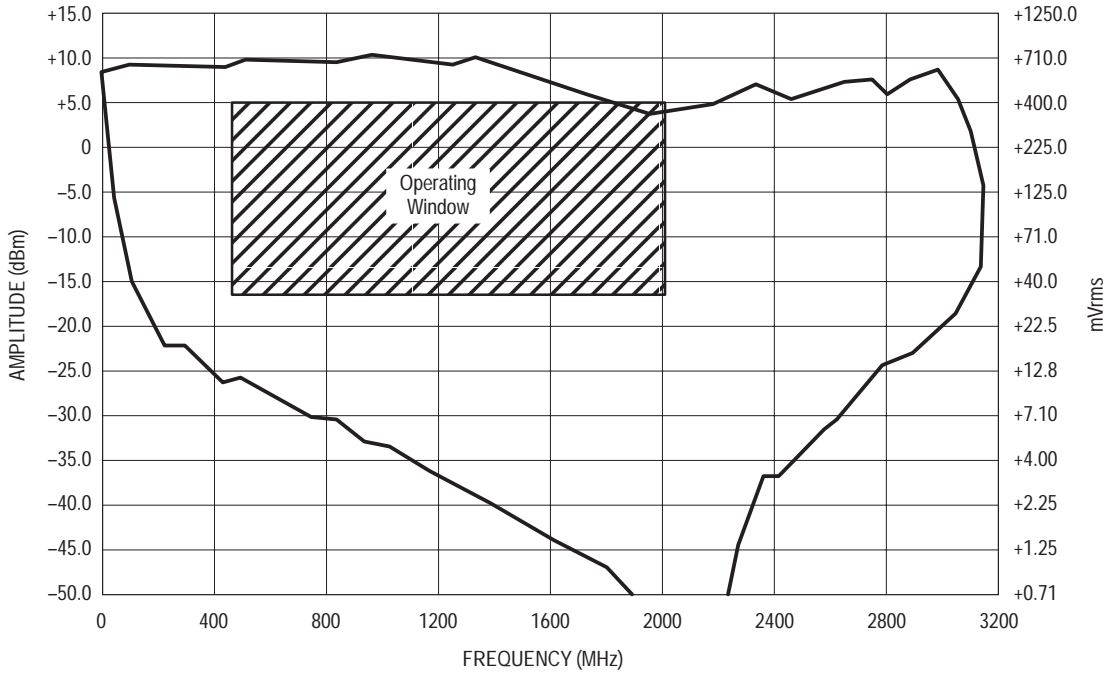


EXTERNAL COMPONENTS
 $C_1 = C_2 = 1000 \text{ pF}$
 $C_3 = 0.1 \mu\text{F}$
 $C_L = 8.0 \text{ pF}$ (Including Scope and jig capacitance)
 $R_L = 600 \Omega$ @ $V_{CC} = 2.7 \text{ V}$
 $R_L = 1.5 \text{ k}\Omega$ @ $V_{CC} = 5.0 \text{ V}$

LIFETIME BUY

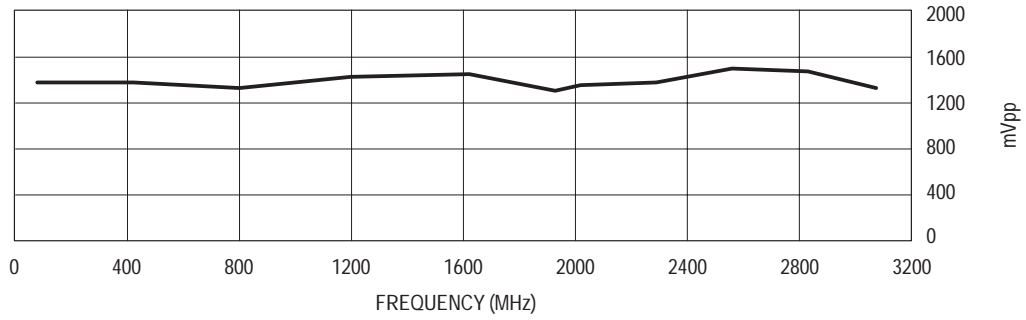
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Figure 4. Input Signal Amplitude versus Input Frequency



Divide Ratio = 64; $V_{CC} = 5.0\text{ V}$; $T_A = 25^\circ\text{C}$

Figure 5. Output Amplitude versus Input Frequency



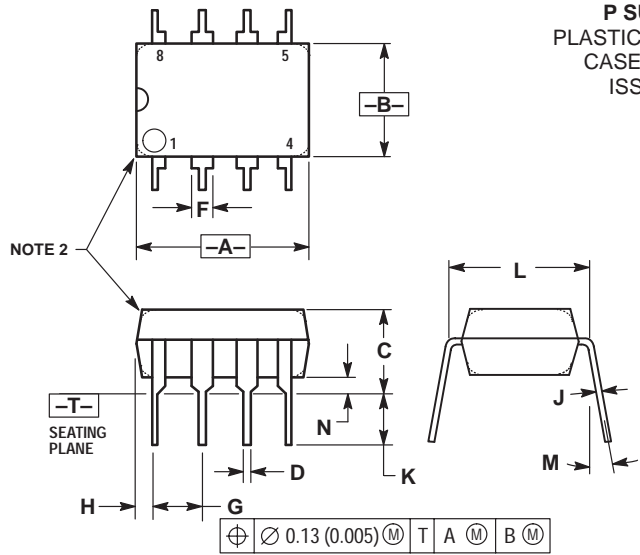
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MC12033A MC12033B

OUTLINE DIMENSIONS

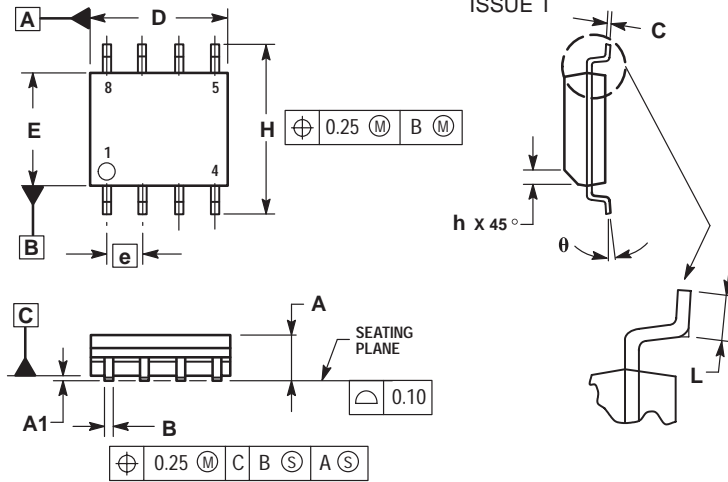
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ISSUE K



- 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 PACKAGE
CASE 751-06
(SO-8)
ISSUE T



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. DIMENSIONS ARE IN MILLIMETER.
 3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
 5. DIMENSION B DOES NOT INCLUDE DAMBAR 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	0.19	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
θ	0° - 7°	

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