



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.

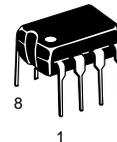
MC12033A MC12033B

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

SEMICONDUCTOR TECHNICAL DATA

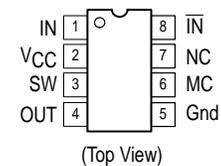


D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO-8)



P SUFFIX
PLASTIC PACKAGE
CASE 626

PIN CONNECTIONS



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)	f_t	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	mV _{pp}
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)

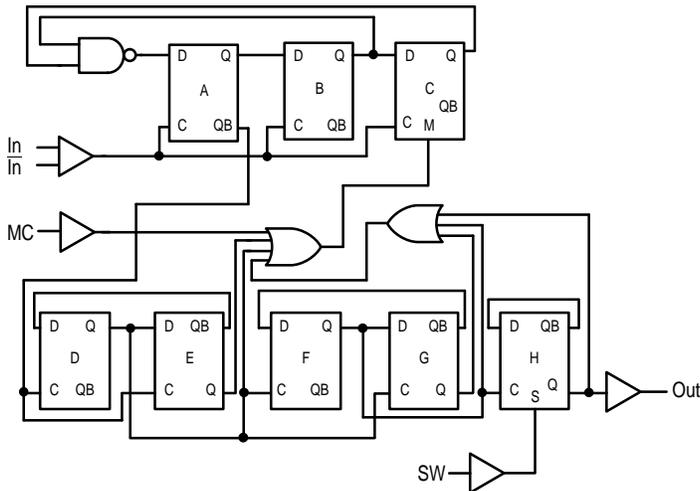


Figure 2. Modulus Setup Time

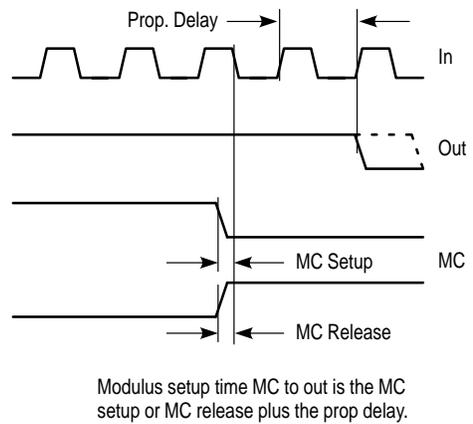
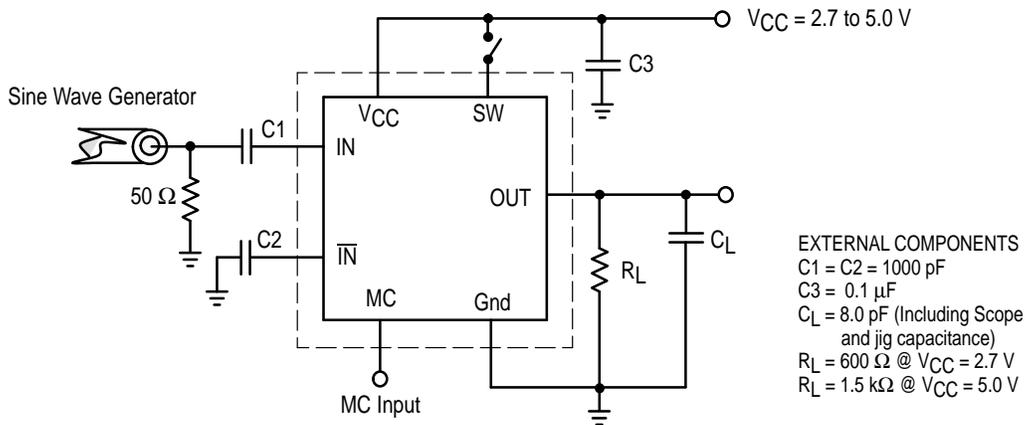
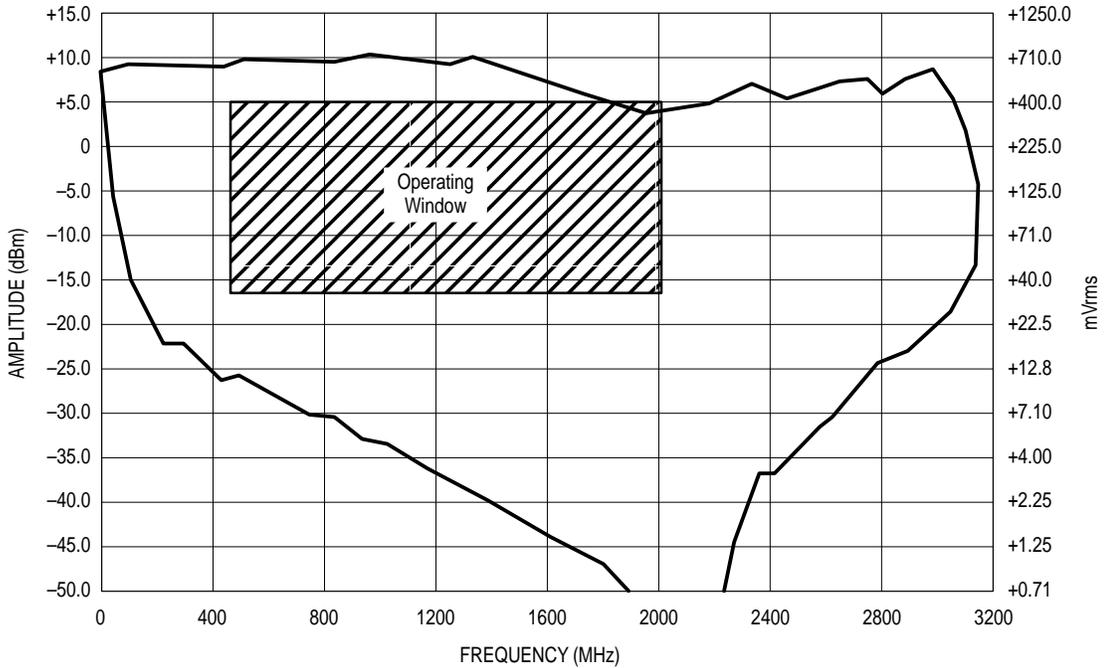


Figure 3. AC Test Circuit



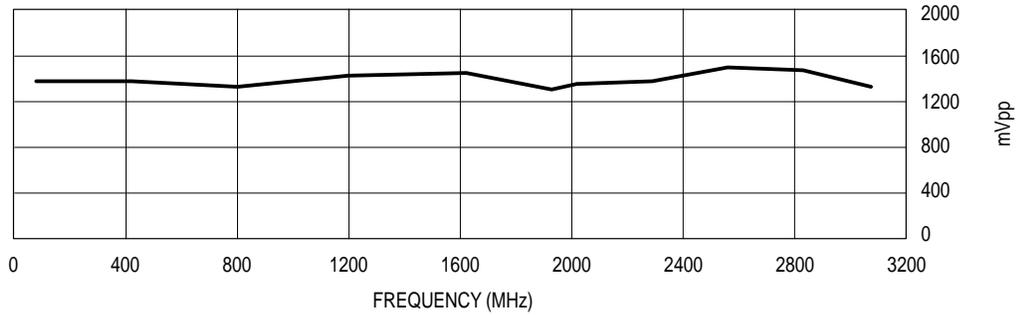
MC12033A MC12033B

Figure 4. Input Signal Amplitude versus Input Frequency



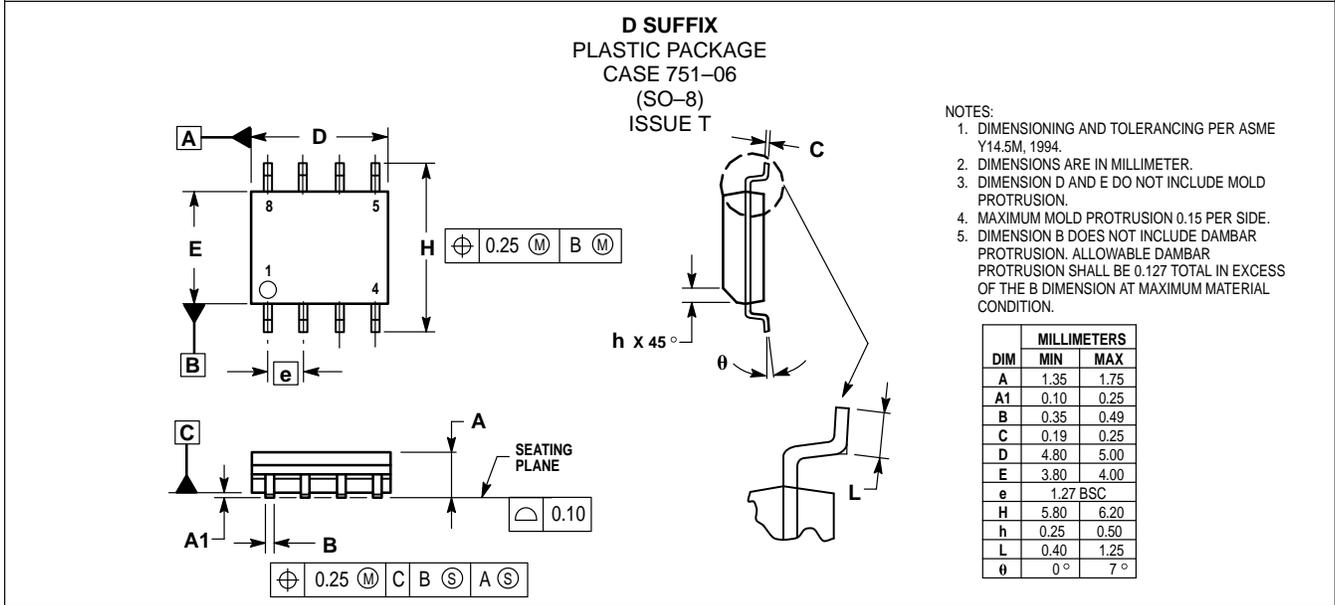
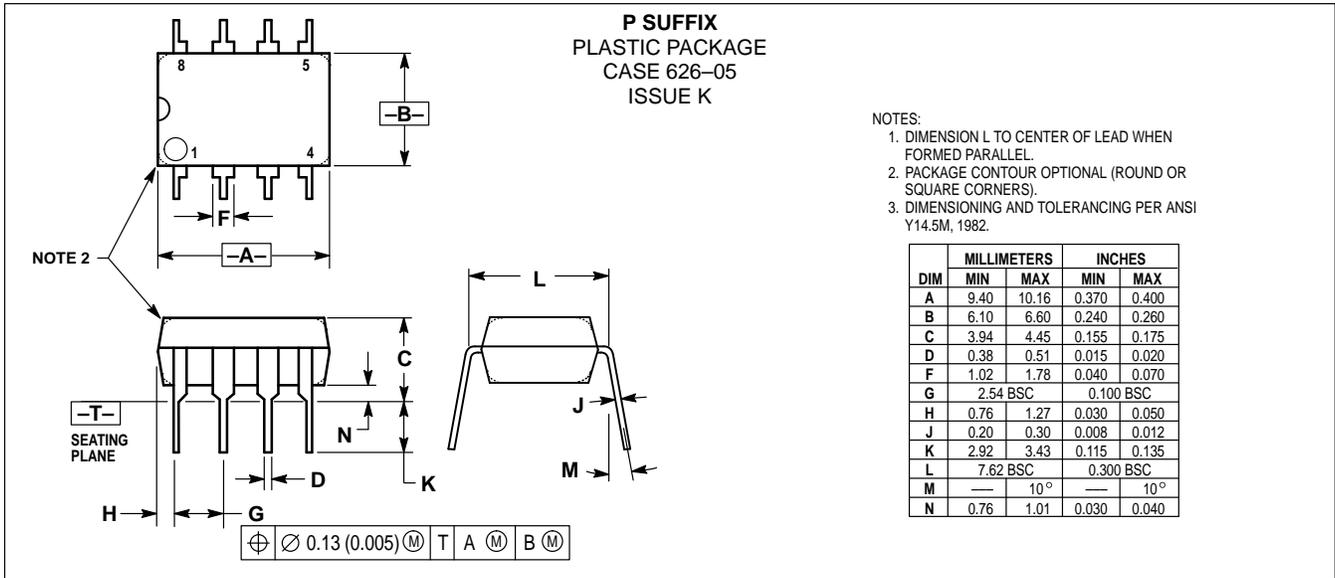
Divide Ratio = 64; $V_{CC} = 5.0\text{ V}$; $T_A = 25^\circ\text{C}$

Figure 5. Output Amplitude versus Input Frequency



MC12033A MC12033B

OUTLINE DIMENSIONS



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 which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. 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.

Mfax is a trademark of Motorola, Inc.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

JAPAN: Nippon Motorola Ltd.: SPD, Strategic Planning Office, 141,
4-32-1 Nishi-Gotanda, Shagawa-ku, Tokyo, Japan. 03-5487-8488

Customer Focus Center: 1-800-521-6274

Mfax™: RMFAX0@email.sps.mot.com - TOUCHTONE 1-602-244-6609
Motorola Fax Back System - US & Canada ONLY 1-800-774-1848
- http://sps.motorola.com/mfax/

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

HOME PAGE: <http://motorola.com/sps/>

