

## 2.0GHz Low Voltage Dual Modulus Prescaler

The MC12031 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 MC12031 can be operated down to a minimum supply voltage of 2.7V required for battery operated portable systems.

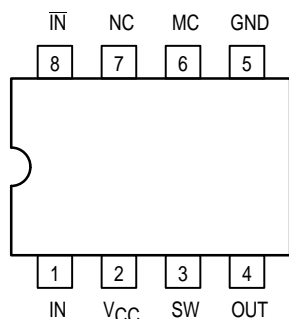
The MC12031A can be used with CMOS synthesizer requiring positive edges to trigger internal counters such as Motorola's MC145XXX series in a PLL to provide tuning signal up to 1.1GHz in programmable frequency steps. The MC12031B can be used with CMOS synthesizers requiring negative edges to trigger internal 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.

- 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 MC12031 is Pin and Functionally 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)



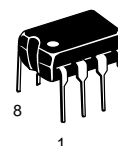
For positive edge triggered synthesizers, order the MC12031A  
For negative edge triggered synthesizers, order the MC12031B

**MC12031A**  
**MC12031B**

### MECL PLL COMPONENTS

$\div 64/65$ ,  $\div 128/129$

**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	64
H	L	65
L	H	128
L	L	129

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<sub>CC</sub> = 2.7 to 5.0V; T<sub>A</sub> = -40 to +85°C)

Symbol	Parameter	Min	Typ	Max	Unit
f <sub>t</sub>	Toggle Frequency (Sine Wave)	0.5	2.4	2.0	GHz
I <sub>CC</sub>	Supply Current Output (Pin 2) V <sub>CC</sub> = 2.7V V <sub>CC</sub> = 5.0V		10.0 13.0	12.5 16.0	mA
V <sub>IH1</sub>	Modulus Control Input HIGH (MC)	2.0		V <sub>CC</sub>	V
V <sub>IL1</sub>	Modulus Control Input LOW (MC)	GND		0.8	V
V <sub>IH2</sub>	Divide Ratio Control Input HIGH (SW)	V <sub>CC</sub> -0.5V	V <sub>CC</sub>	V <sub>CC</sub> +0.5V	V
V <sub>IL2</sub>	Divide Ratio Control Input LOW (SW)	OPEN	OPEN	OPEN	—
V <sub>OUT</sub>	Output Voltage Swing (Note 1) C <sub>L</sub> = 8pF; R <sub>L</sub> = 1.2kΩ	0.8	1.2		V <sub>pp</sub>
t <sub>set</sub>	Modulus Setup Time MC to OUT @ 2000MHz		8	10	ns
V <sub>IN</sub>	Input Voltage Sensitivity 500-2000MHz	100		1000	mV <sub>pp</sub>
I <sub>O</sub>	Output Current (Note 2) V <sub>CC</sub> = 2.7V, C <sub>L</sub> = 8pF, R <sub>L</sub> = 1.2kΩ V <sub>CC</sub> = 5.0V, C <sub>L</sub> = 8pF, R <sub>L</sub> = 3.0kΩ		1.2 1.2	4.0 4.0	mA

1. Valid over voltage range 2.7 to 5.0V; R<sub>L</sub> = 1.2kΩ @ V<sub>CC</sub> = 2.7V; R<sub>L</sub> = 3.0kΩ @ V<sub>CC</sub> = 5.0V  
2. Divide ratio of +64/65 @ 2.0GHz

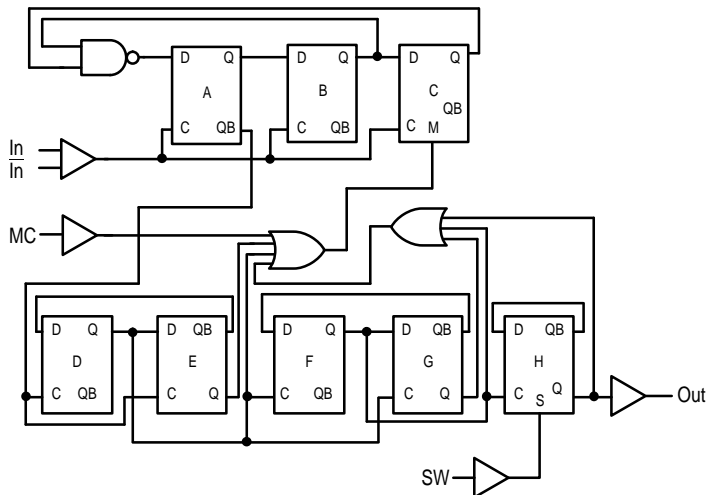


Figure 1. Logic Diagram (MC12031A)

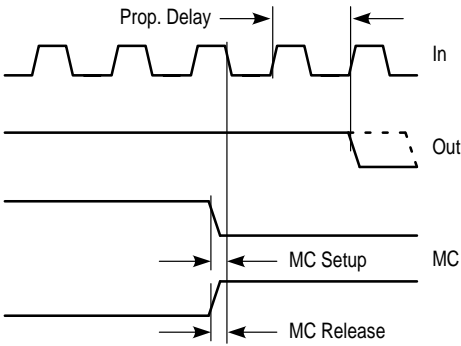


Figure 2. Modulus Setup Time

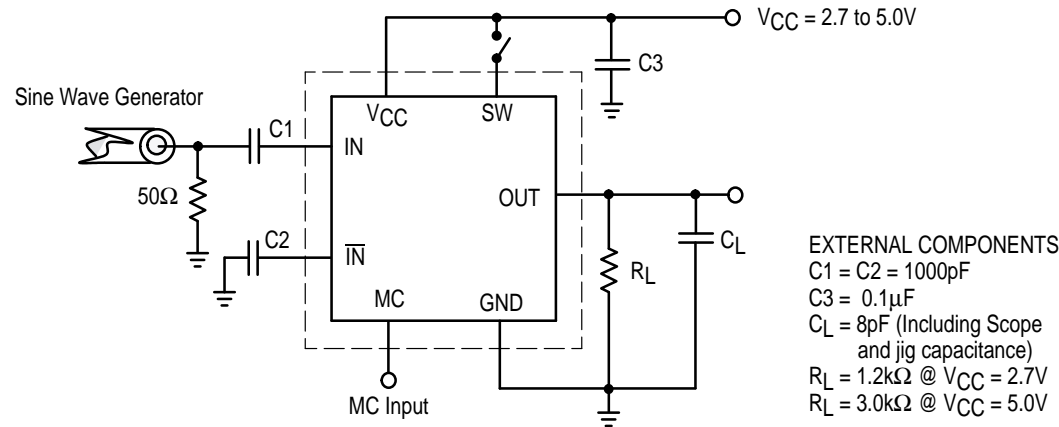
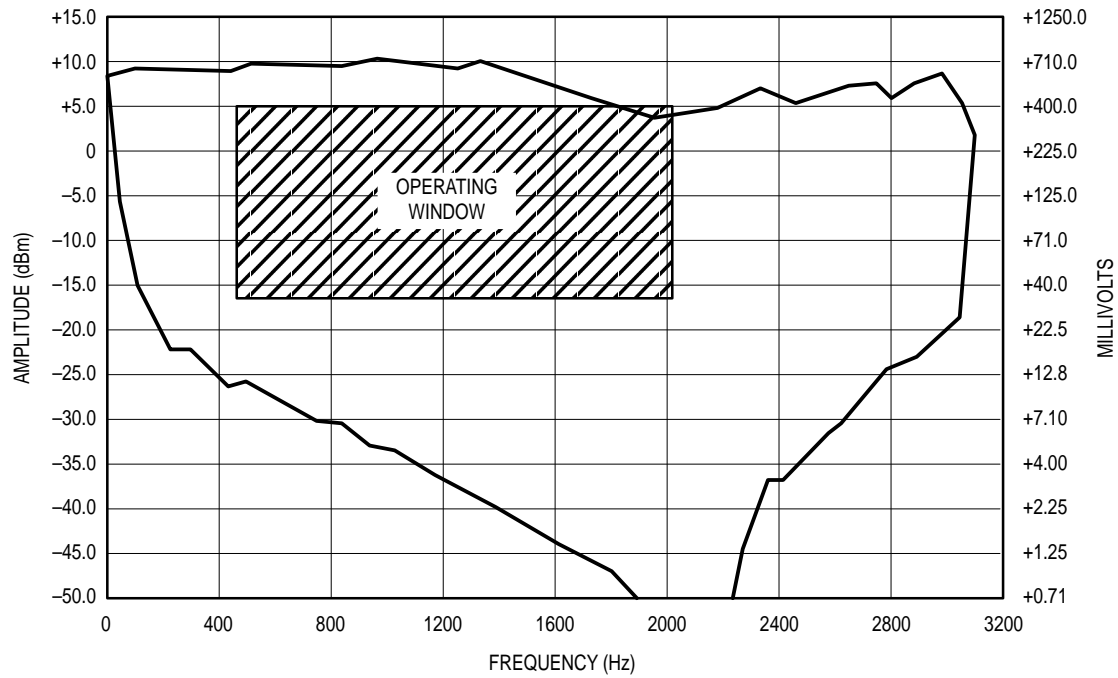
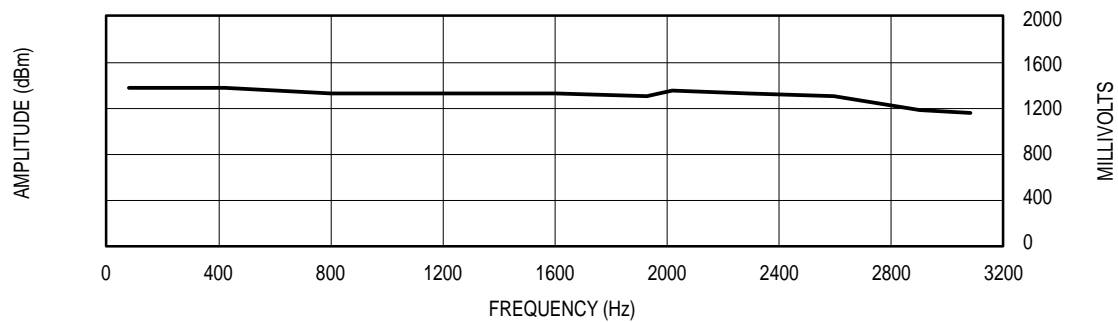


Figure 3. AC Test Circuit

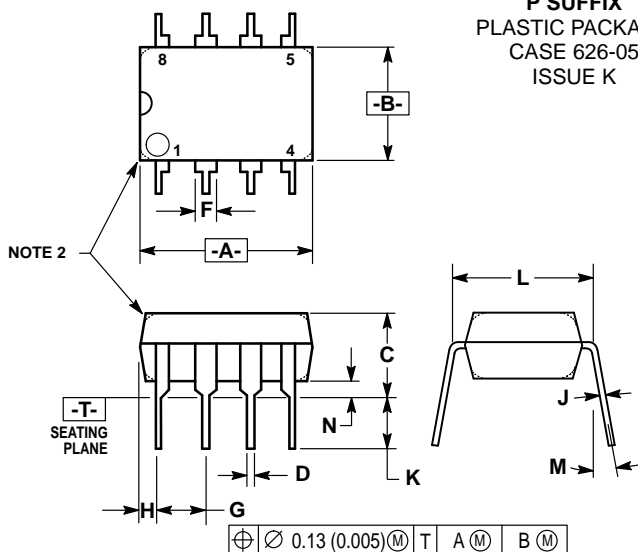


**Figure 4. Input Signal Amplitude versus Input Frequency**  
Divide Ratio = 64;  $V_{CC} = 5.0V$ ;  $T_A = 25^{\circ}C$



**Figure 5. Output Amplitude versus Input Frequency**

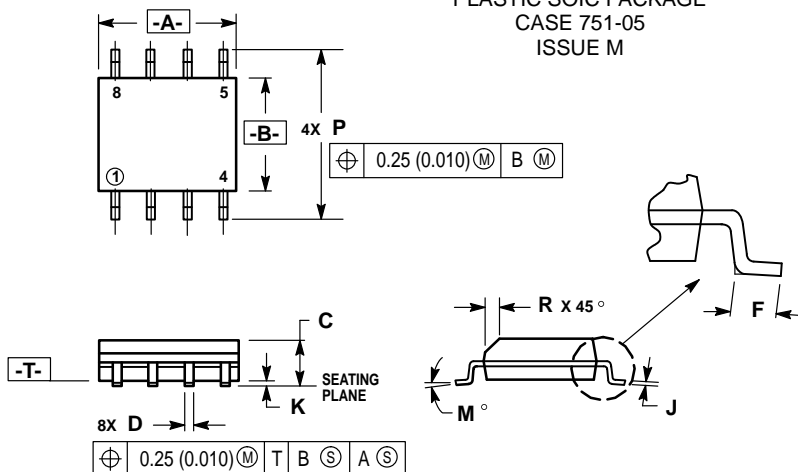
## OUTLINE DIMENSIONS

**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

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