

# 1.1GHz Super Low Power Dual Modulus Prescaler

The MC12052A is a super low power dual modulus prescaler used in phase-locked loop applications. Motorola's advanced Bipolar MOSAIC™ V technology is utilized to achieve low power dissipation of 2.7mW at a minimum supply voltage of 2.7V.

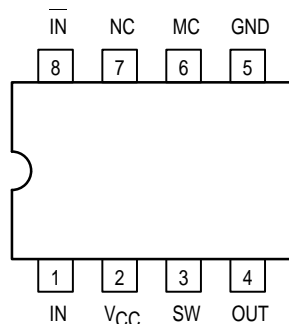
The MC12052A can be used with CMOS synthesizers requiring positive edges to trigger internal counters such as Motorola's MC145XXX series in a PLL to provide tuning signals up to 1.1GHz in programmable frequency steps.

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.

- 1.1GHz Toggle Frequency
- The MC12052 is Pin and Functionally Compatible with the MC12022
- Low Power 1.0mA Typical
- 2.0mA Maximum, -40°C to +85°C,  $V_{CC} = 2.7-5.5$  Vdc
- Short Setup Time ( $t_{set}$ ) 16ns Maximum @ 1.1GHz
- Modulus Control Input Level is Compatible with Standard CMOS and TTL
- Maximum Input Voltage Should Be Limited to 6.5Vdc

**Pinout: 8-Lead Plastic (Top View)**



## MC12052A

### MECL PLL COMPONENTS

÷64/65, ÷128/129

### LOW POWER DUAL MODULUS PRESCALER



**D SUFFIX**  
PLASTIC SOIC PACKAGE  
CASE 751-05



**SD SUFFIX**  
PLASTIC SSOP PACKAGE  
CASE 940-02

### FUNCTIONAL 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	Characteristic	Range	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

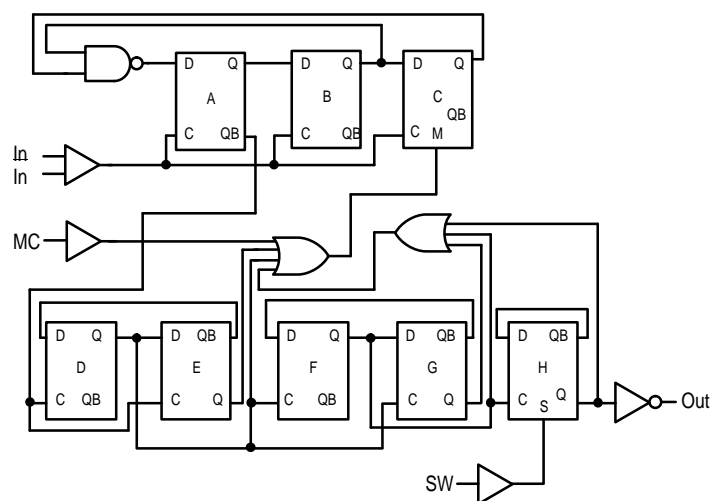
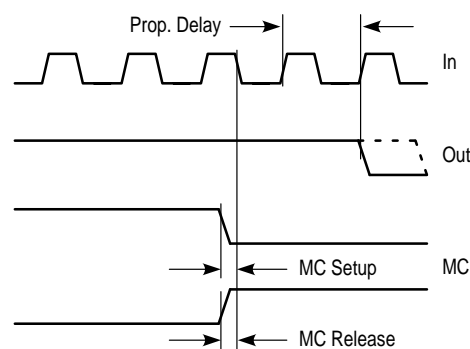
MOSAIC V is a trademark of Motorola



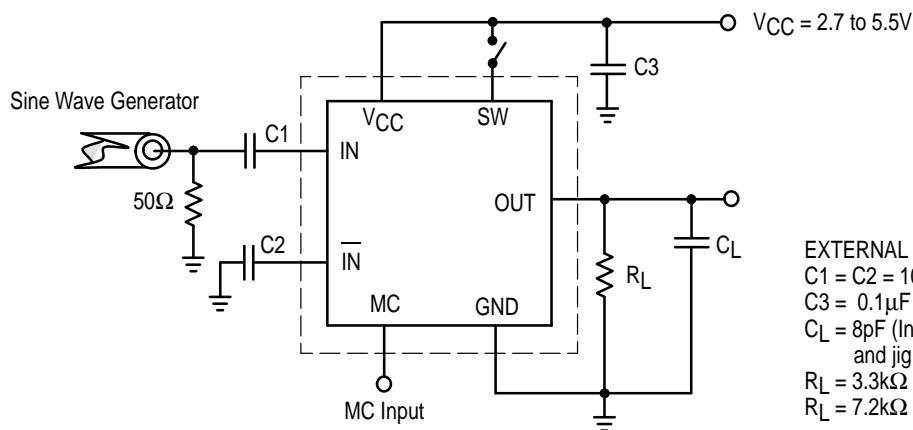
**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 2.7$  to  $5.5$  VDC,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ )

Symbol	Characteristic	Min	Typ	Max	Unit
$f_t$	Toggle Frequency (Sine Wave Input)	0.1	1.4	1.1	GHz
$I_{CC}$	Supply Current (Pin 2)	—	1.0	2.0	mA
$V_{IH1}$	Modulus Control Input High (MC)	2.0	—	$V_{CC} + 0.5\text{V}$	V
$V_{IL1}$	Modulus Control Input Low (MC)	GND	—	0.8	V
$V_{IH2}$	Divide Ratio Control Input High (SW)	$V_{CC} - 0.5\text{V}$	$V_{CC}$	$V_{CC} + 0.5\text{V}$	VDC
$V_{IL2}$	Divide Ratio Control Input Low (SW)	Open	Open	Open	—
$V_{out}$	Output Voltage Swing <sup>2</sup> ( $C_L = 8\text{pF}$ , $R_L = 3.3\text{k}\Omega$ )	0.8	1.1	—	V <sub>PP</sub>
$t_{set}$	Modulus Setup Time MC to Out @ 1100MHz	—	11	16	ns
$V_{in}$	Input Voltage Sensitivity 250–1100MHz 100–250MHz	100 400	— —	1000 1000	mV <sub>PP</sub>
$I_O$	Output Current <sup>1</sup> $V_{CC} = 2.7\text{V}$ , $C_L = 8\text{pF}$ , $R_L = 3.3\text{k}\Omega$ $V_{CC} = 5.0\text{V}$ , $C_L = 8\text{pF}$ , $R_L = 7.2\text{k}\Omega$	— —	0.5 0.5	3.0 3.0	mA

1. Divide ratio of +64/65 @ 1.1GHz

2. Valid over voltage range 2.7–5.5V;  $R_L = 3.3\text{k}\Omega$  @  $V_{CC} = 2.7\text{V}$ ;  $R_L = 7.2\text{k}\Omega$  @  $V_{CC} = 5.0\text{V}$ **Figure 1. Logic Diagram (MC12052A)**

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

**Figure 2. Modulus Setup Time**

**EXTERNAL COMPONENTS**  
 $C1 = C2 = 1000\text{pF}$   
 $C3 = 0.1\mu\text{F}$   
 $C_L = 8\text{pF}$  (Including Scope and jig capacitance)  
 $R_L = 3.3\text{k}\Omega$  @  $V_{CC} = 2.7\text{V}$   
 $R_L = 7.2\text{k}\Omega$  @  $V_{CC} = 5.0\text{V}$

**Figure 3. AC Test Circuit**

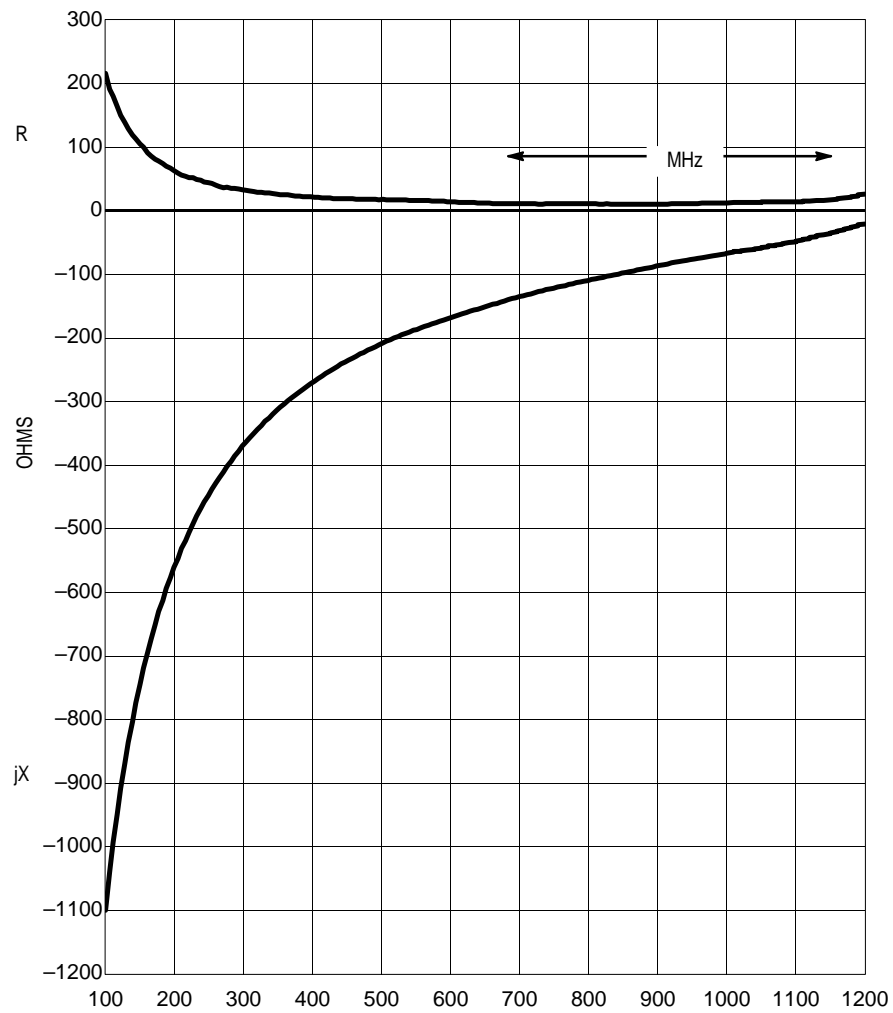
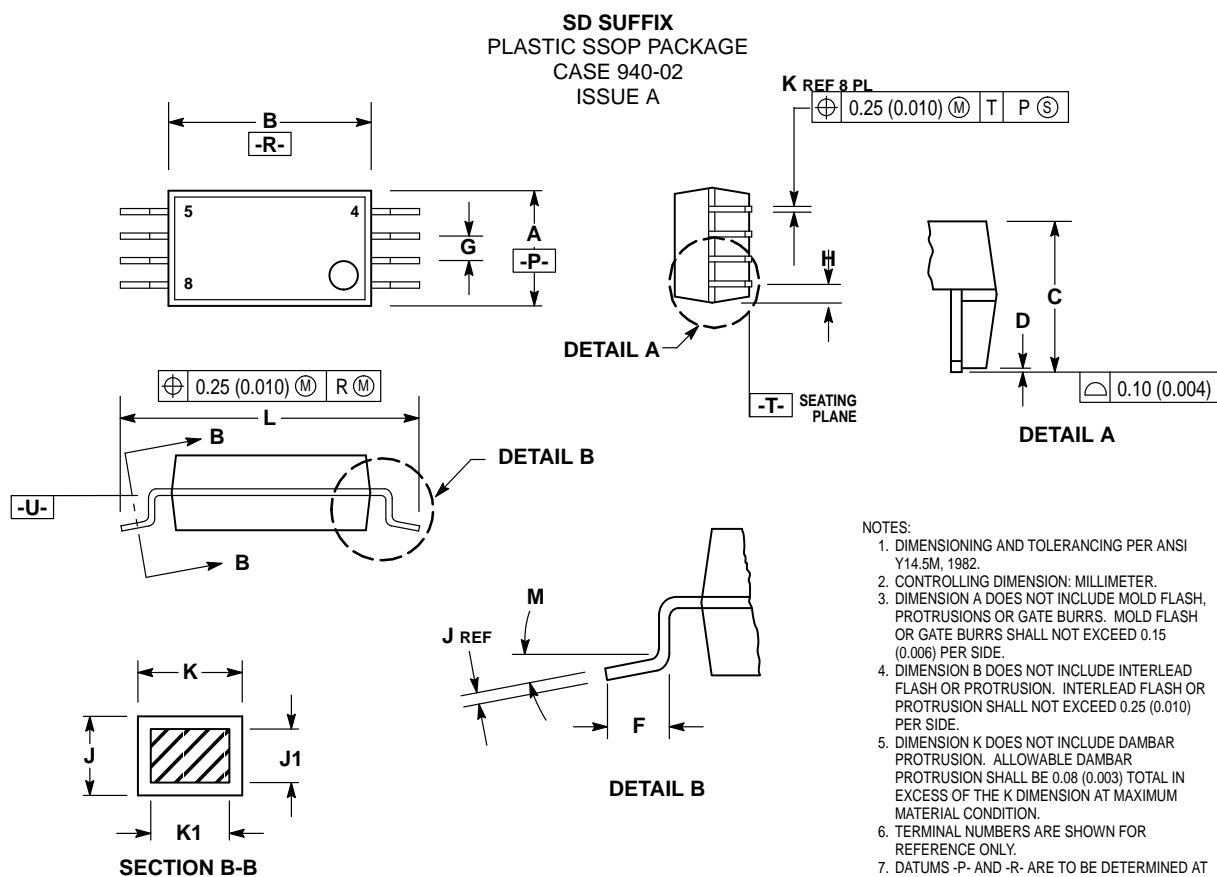


Figure 4. Typical Input Impedance versus Input Frequency

## OUTLINE DIMENSIONS



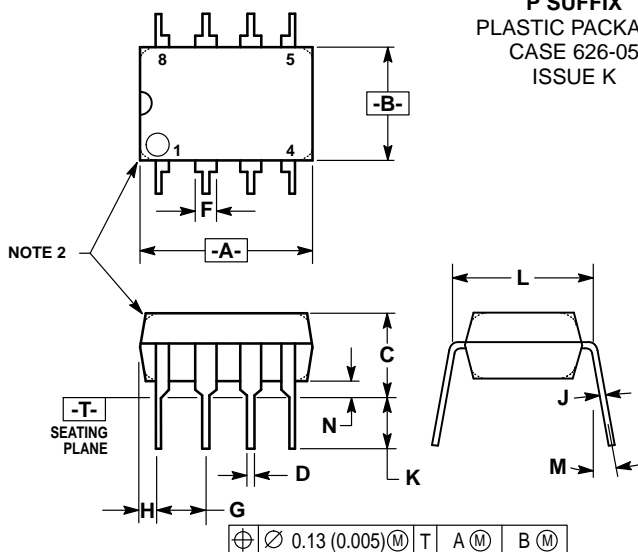
## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DATUMS -P- AND -R- ARE TO BE DETERMINED AT DATUM PLANE -U-.
8. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -U-.
9. CROSS SECTION B-B TO BE DETERMINED AT 0.10 (0.004) TO 0.25 (0.010) FROM THE LEAD TIP.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.87	3.13	0.113	0.123
B	5.20	5.38	0.205	0.212
C	1.73	1.99	0.068	0.078
D	0.05	0.21	0.002	0.008
F	0.55	0.95	0.022	0.037
G	0.65 BSC		0.026 BSC	
H	0.50	—	0.020	—
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.22	0.38	0.009	0.015
K1	0.22	0.33	0.009	0.013
L	7.65	7.90	0.301	0.311
M	0°	8°	0°	8°

## OUTLINE DIMENSIONS

**P SUFFIX**  
**PLASTIC PACKAGE**  
**CASE 626-05**  
**ISSUE K**

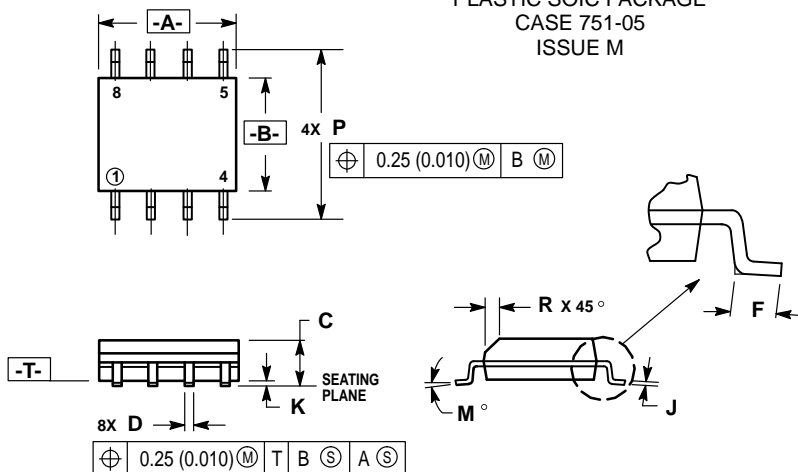


## NOTES:

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.

