

## 2.0GHz Super Low Power Dual Modulus Prescaler

The MC12054A 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 5.4mW at a minimum supply voltage of 2.7V.

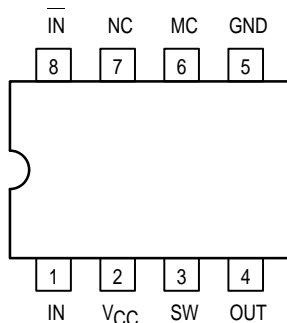
The MC12054A can be used with CMOS synthesizers requiring positive edges to trigger internal counters such as Motorola's MC145XXX series in a PLL to provide tuning signals up to 2.0GHz in programmable frequency steps.

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.

- 2.0GHz Toggle Frequency
- The MC12054 is Pin and Functionally Compatible with the MC12031
- Low Power 2.0mA Typical
- 2.6mA Maximum, -40°C to +85°C, V<sub>CC</sub> = 2.7–5.5Vdc
- Short Setup Time (t<sub>set</sub>) 10ns Maximum @ 2.0GHz
- 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)**



## MC12054A

### 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<sub>CC</sub>, L = Open

MC: H = 2.0V to V<sub>CC</sub>, L = GND to 0.8V

### MAXIMUM RATINGS

Symbol	Characteristic	Range	Unit
V <sub>CC</sub>	Power Supply Voltage, Pin 2	-0.5 to +7.0	VDC
T <sub>A</sub>	Operating Temperature Range	-40 to +85	°C
T <sub>stg</sub>	Storage Temperature Range	-65 to +150	°C
MC	Modulus Control Input, Pin 6	-0.5 to +6.5	VDC

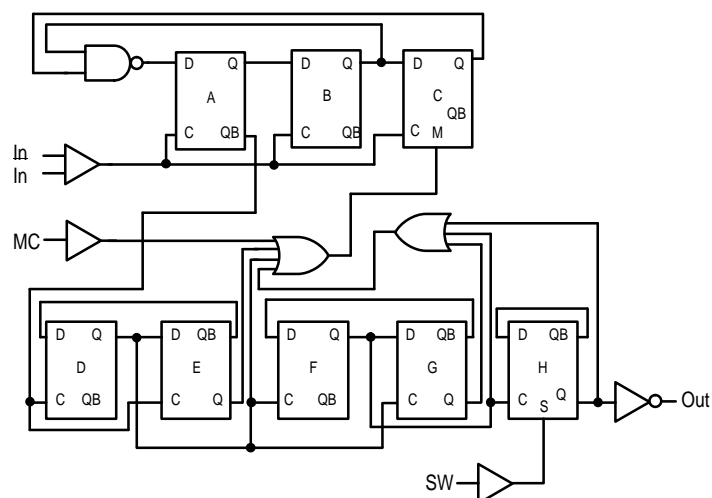
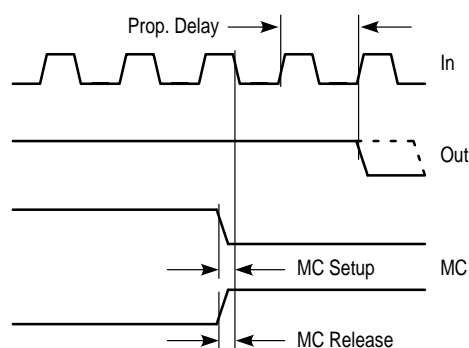
MOSAIC V is a trademark of Motorola



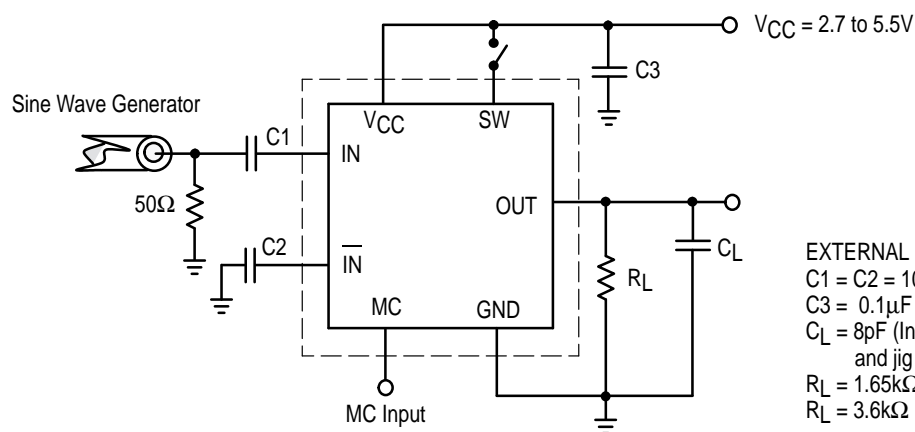
**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 2.7$  to  $5.5$  VDC,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ )

Symbol	Characteristic	Min	Typ	Max	Unit
$f_t$	Toggle Frequency (Sine Wave Input)	0.1	2.5	2.0	GHz
$I_{CC}$	Supply Current (Pin 2)	—	2.0	2.6	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> ( $C_L = 8\text{pF}$ , $R_L = 1.65\text{k}\Omega$ )	0.8	1.1	—	V <sub>PP</sub>
$t_{set}$	Modulus Setup Time MC to Out @ 2000MHz	—	8	10	ns
$V_{in}$	Input Voltage Sensitivity 250–2000MHz 100–250MHz	100 400	— —	1000 1000	mV <sub>PP</sub>
$I_O$	Output Current <sup>1</sup> $V_{CC} = 2.7\text{V}$ , $C_L = 8\text{pF}$ , $R_L = 1.65\text{k}\Omega$ $V_{CC} = 5.0\text{V}$ , $C_L = 8\text{pF}$ , $R_L = 3.6\text{k}\Omega$	— —	1.0 1.0	4.0 4.0	mA

1. Divide ratio of +64/65 @ 2.0GHz

2. Valid over voltage range 2.7–5.5V;  $R_L = 1.65\text{k}\Omega$  @  $V_{CC} = 2.7\text{V}$ ;  $R_L = 3.6\text{k}\Omega$  @  $V_{CC} = 5.0\text{V}$ **Figure 1. Logic Diagram (MC12054A)**

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

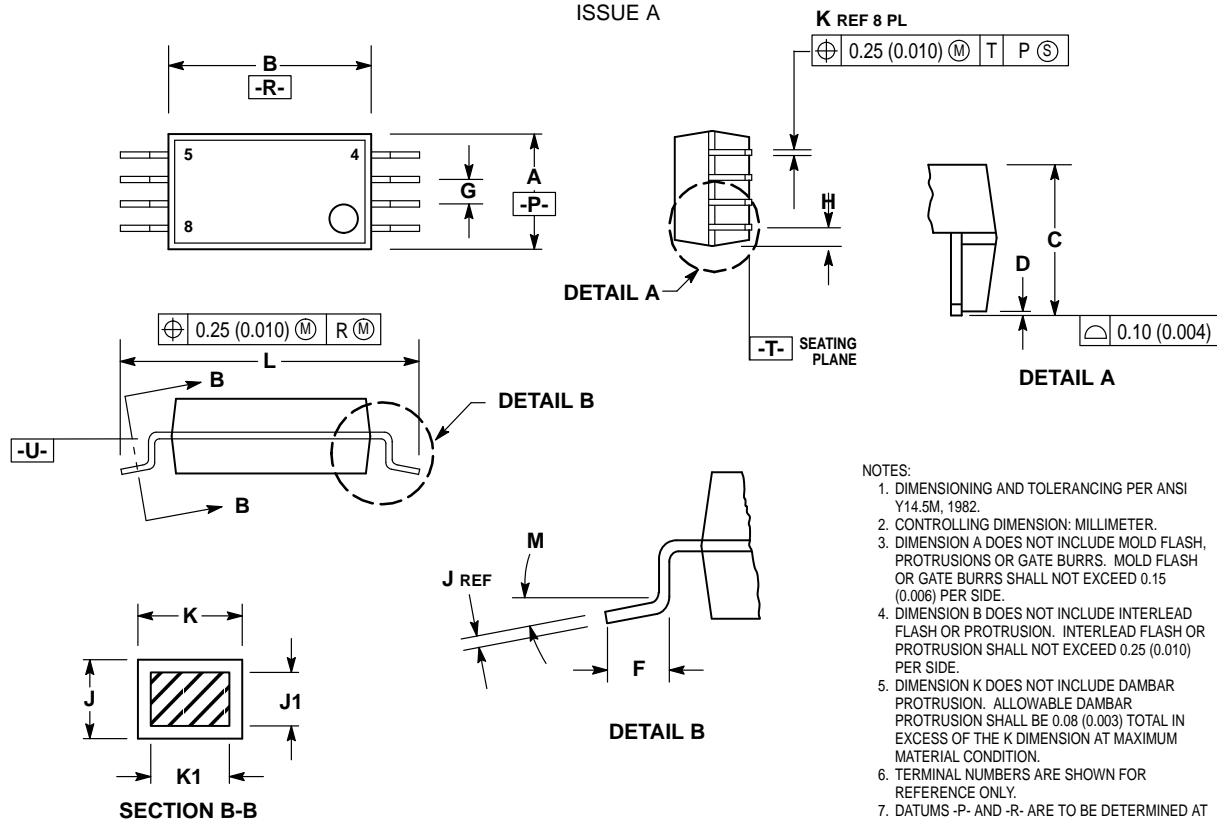
**Figure 2. Modulus Setup Time**

**EXTERNAL COMPONENTS**  
 $C1 = C2 = 1000\text{pF}$   
 $C3 = 0.1\mu\text{F}$   
 $C_L = 8\text{pF}$  (Including Scope  
and jig capacitance)  
 $R_L = 1.65\text{k}\Omega$  @  $V_{CC} = 2.7\text{V}$   
 $R_L = 3.6\text{k}\Omega$  @  $V_{CC} = 5.0\text{V}$

**Figure 3. AC Test Circuit**

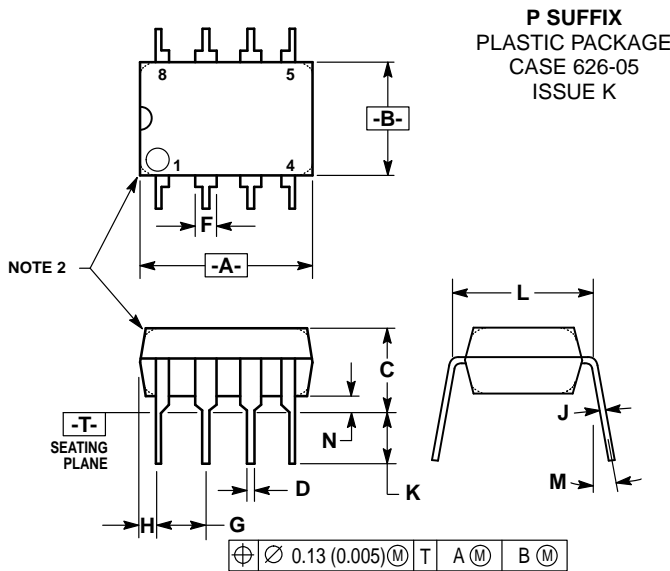
## OUTLINE DIMENSIONS

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



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°

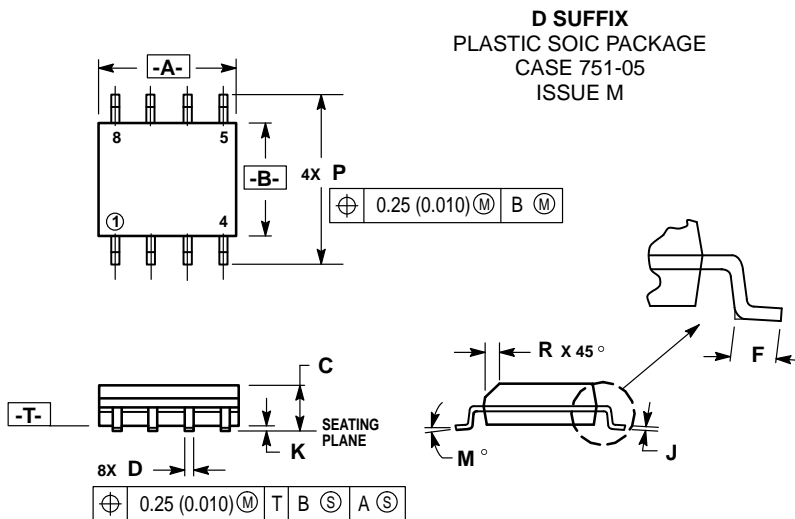
## OUTLINE DIMENSIONS



## 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



## 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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