# ÷2, ÷4, ÷8 1.1 GHz Low Power Prescaler with Stand-By Mode

## Description

The MC12093 is a single modulus prescaler for low power frequency division of a 1.1 GHz high frequency input signal. MOSAIC  $V^{\text{TM}}$  technology is utilized to achieve low power dissipation of 6.75 mW at a minimum supply voltage of 2.7 V.

On-chip output termination provides output current to drive a 2.0 pF (typical) high impedance load. If additional drive is required for the prescaler output, an external resistor can be added parallel from the OUT pin to GND to increase the output power. Care must be taken not to exceed the maximum allowable current through the output.

Divide ratio control inputs SW1 and SW2 select the required divide ratio of  $\div 2$ ,  $\div 4$ , or  $\div 8$ .

Stand–By mode is featured to reduce current drain to  $50 \,\mu\text{A}$  typical when the standby pin SB is switched LOW disabling the prescaler.

#### **Features**

- 1.1 GHz Toggle Frequency
- Supply Voltage 2.7 V to 5.5 Vdc
- Low Power 3.0 mA Typical
- Operating Temperature –40°C to 85°C
- Divide by 2, 4 or 8 Selected by SW1 and SW2 Pins
- On-Chip Termination
- Pb-Free Packages are Available

**Table 1. FUNCTIONAL TABLE** 

sw	SW2	Divide Ratio
L	L	8
Н	L	4
L	Н	4
Н	Н	2

1. SW1 & SW2:  $H = (V_{CC} - 0.5 \text{ V})$  to  $V_{CC}$ ; L = Open.

2. SB: H = 2.0 V to  $V_{CC}$ , L = GND to 0.8 V.

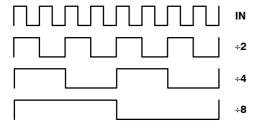


Figure 1. Function Chart



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MARKING DIAGRAM



SO-8 D SUFFIX CASE 751





DFN8 MN SUFFIX CASE 506AA



A = Assembly Location

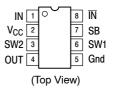
L = Wafer Lot

Y = Year

W = Work Week

= Pb-Free Package

# **PIN CONNECTIONS**



A LOW on the Stand-By Pin 7 disables the device.

#### **ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

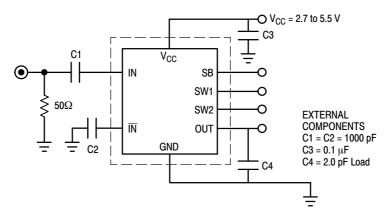


Figure 2. AC Test Circuit

**Table 2. ATTRIBUTES** 

Charac	Value		
Internal Input Pulldown Resistor		N/A	
Internal Input Pullup Resistor	N/A		
ESD Protection	> 4 kV > 200 V > 2 kV		
Moisture Sensitivity, Indefinite	Pb Pkg	Pb-Free Pkg	
	SOIC-8 DFN8	Level 1 Level 1	Level 1 Level 1
Flammability Rating	UL 94 V-0 @ 0.125 in		
Transistor Count		125 Devices	
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test			

<sup>1.</sup> For additional information, see Application Note AND8003/D.

**Table 3. MAXIMUM RATINGS** 

Symbol	Rating	Value	Unit
V <sub>CC</sub>	Power Supply Voltage, Pin 2	-0.5 to 6.0	Vdc
T <sub>A</sub>	Operating Temperature Range	-40 to 85	°C
T <sub>stg</sub>	Storage Temperature Range	-65 to 150	°C
Io	Maximum Output Current, Pin 4	4.0	mA
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case) (Note 2) DFN8	35 to 40	°C/W

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

NOTE: ESD data available upon request.

2. JEDEC standard multilayer board – 2S2P (2 signal, 2 power). For DFN8 only, thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open.

Table 4. ELECTRICAL CHARACTERISTICS ( $V_{CC}$  = 2.7 to 5.5 V;  $T_A$  = -40 to 85°C)

Symbol	Characteristic	Min	Тур	Max	Unit
ft	Toggle Frequency (Sine Wave)	0.1	1.4	1.1	GHz
I <sub>CC</sub>	Supply Current	-	3.0	4.5	mA
ISB	Stand-By Current	-	120	200	μΑ
V <sub>IH1</sub>	Stand-By Input HIGH (SB)	2.0	-	V <sub>CC</sub>	V
V <sub>IL1</sub>	Stand-By Input LOW (SB)	Gnd	-	0.8	V
V <sub>IH2</sub>	Divide Ratio Control Input HIGH (SW1 & SW2)	V <sub>CC</sub> – 0.5	V <sub>CC</sub>	V <sub>CC</sub> + 0.5	V
$V_{IL2}$	Divide Ratio Control Input LOW (SW1 & SW2)	OPEN	OPEN	OPEN	
V <sub>OUT</sub>	Output Voltage Swing (2.0 pF Load) Output Frequency 12.5–350 MHz (Note 1) Output Frequency 350–400 MHz (Note 2) Output Frequency 400–450 MHz (Note 3) Output Frequency 450–550 MHz (Note 4)	0.6 0.5 0.4 0.3	0.80 0.70 0.55 0.45	- - - -	$V_{pp}$
V <sub>IN</sub>	Input Voltage Sensitivity 250-1100 MHz 100-250 MHz	100 400	- -	1000 1000	mVpp

Input frequency 1.1 GHz, ÷8, minimum output frequency of 12.5 MHz.
 Input frequency 700–800 MHz, ÷2.
 Input frequency 800–900 MHz, ÷2.
 Input frequency 900–1100 MHz, ÷2.

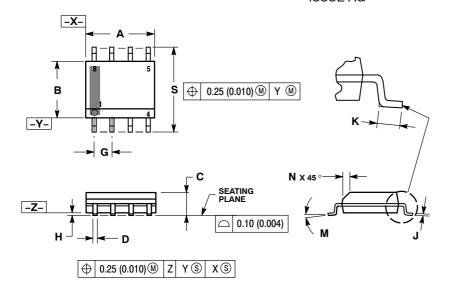
# **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>	
MC12093D	SOIC-8	98 Units / Rail	
MC12093DG	SOIC-8 (Pb-Free)	98 Units / Rail	
MC12093DR2	SOIC-8	2500 / Tape & Reel	
MC12093DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel	
MC120932MNR4	DFN8	1000 / Tape & Reel	
MC12093MNR4G	DFN8 (Pb-Free)	1000 / Tape & Reel	

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# **PACKAGE DIMENSIONS**

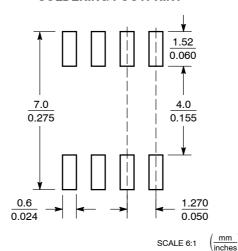
# SOIC-8 NB CASE 751-07 **ISSUE AG**



- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
  4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) DED SIDE
- MAXIMUM MOLE FITO THOUSEN C. 15 (6.655)
   PER SIDE.
   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.
  751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

	MILLIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
Α	4.80	5.00	0.189	0.197
В	3.80	4.00	0.150	0.157
С	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
Η	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
М	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

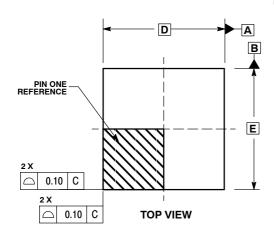
### **SOLDERING FOOTPRINT\***

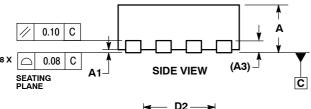


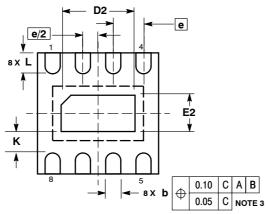
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

#### PACKAGE DIMENSIONS

### DFN8 CASE 506AA-01 **ISSUE C**







#### NOTES

- DIMENSIONING AND TOLERANCING PER
- ASME Y14.5M, 1994 .
  CONTROLLING DIMENSION: MILLIMETERS.
  DIMENSION & APPLIES TO PLATED
  TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
  COPLANARITY APPLIES TO THE EXPOSED
- PAD AS WELL AS THE TERMINALS.

	MILLIMETERS			
DIM	MIN	MAX		
Α	0.80	1.00		
<b>A</b> 1	0.00	0.05		
А3	0.20 REF			
b	0.20	0.30		
D	2.00 BSC			
D2	1.10	1.30		
Е	2.00	2.00 BSC		
E2	0.70	0.90		
е	0.50 BSC			
K	0.20			
1	0.25	0.35		

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