



**THE DATASHEET OF  
MC12093DR2G**



# MC12093

## ÷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™ 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 ÷2, ÷4, or ÷8.

Stand-By mode is featured to reduce current drain to 50 µA 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
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

Table 1. FUNCTIONAL TABLE

| SW | SW2 | Divide Ratio |
|----|-----|--------------|
| L  | L   | 8            |
| H  | L   | 4            |
| L  | H   | 4            |
| H  | H   | 2            |

1. SW1 & SW2: H = (V<sub>CC</sub> - 0.5 V) to V<sub>CC</sub>; L = Open.
2. SB: H = 2.0 V to V<sub>CC</sub>, L = GND to 0.8 V.

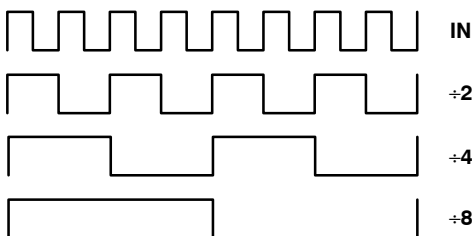


Figure 1. Function Chart

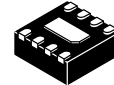


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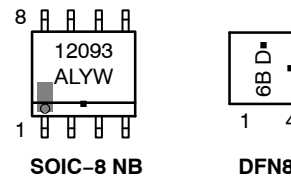


SOIC-8 NB  
D SUFFIX  
CASE 751-07



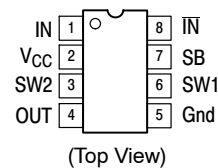
DFN8  
MN SUFFIX  
CASE 506AA

### MARKING DIAGRAM



- 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

| Device       | Package             | Shipping         |
|--------------|---------------------|------------------|
| MC12093DG    | SOIC-8 NB (Pb-Free) | 98 Units/Tube    |
| MC12093DR2G  | SOIC-8 NB (Pb-Free) | 2500 Tape & Reel |
| MC12093MNR4G | DFN8 (Pb-Free)      | 1000 Tape & Reel |

# MC12093

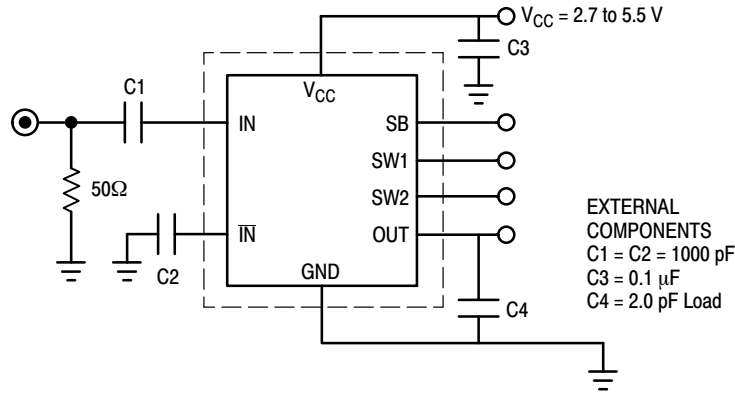


Figure 2. AC Test Circuit

Table 2. ATTRIBUTES

| Characteristics   | Value                       |
|---|-----------------------------|
| Internal Input Pulldown Resistor  | N/A                         |
| Internal Input Pullup Resistor  | N/A                         |
| ESD Protection<br>Human Body Model<br>Machine Model<br>Charged Device Model | > 4 kV<br>> 200 V<br>> 2 kV |
| Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)               | Pb-Free Pkg                 |
| SOIC-8 NB<br>DFN8   | Level 1<br>Level 1          |
| Flammability Rating<br>Oxygen Index: 28 to 34                               | UL 94 V-0 @ 0.125 in        |
| Transistor Count  | 125 Devices                 |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test                      |                             |

1. For additional information, see Application Note [AND8003/D](#).

Table 3. MAXIMUM RATINGS

| Symbol        | Rating  | Value       | Unit |
|---------------|---|-------------|------|
| $V_{CC}$      | Power Supply Voltage, Pin 2                         | -0.5 to 6.0 | Vdc  |
| $T_A$         | Operating Temperature Range                         | -40 to 85   | °C   |
| $T_{stg}$     | Storage Temperature Range                           | -65 to 150  | °C   |
| $I_O$         | Maximum Output Current, Pin 4                       | 4.0         | mA   |
| $\theta_{JC}$ | Thermal Resistance (Junction-to-Case) (Note 1) DFN8 | 35 to 40    | °C/W |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

NOTE: ESD data available upon request.

1. 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.

# MC12093

**Table 4. ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 2.7$  to  $5.5$  V;  $T_A = -40$  to  $85^\circ\text{C}$ )

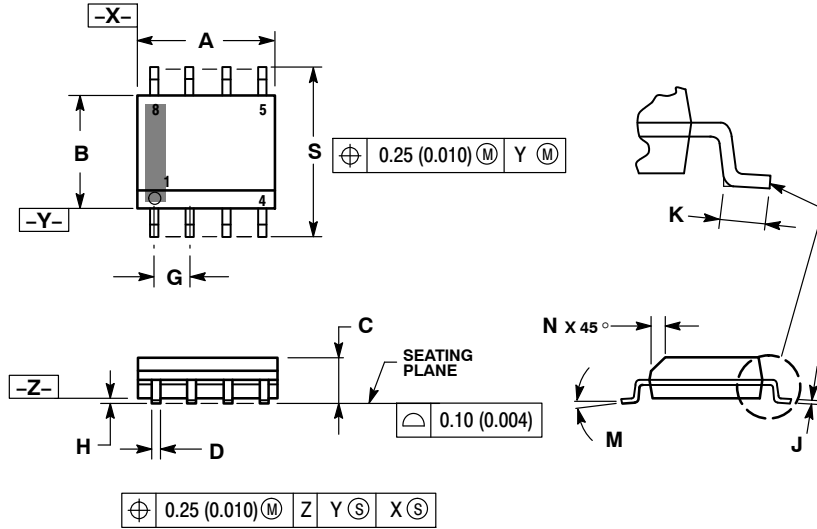
| Symbol           | Characteristic  | Min                      | Typ                          | Max                   | Unit            |
|------------------|---|--------------------------|------------------------------|-----------------------|-----------------|
| ft               | Toggle Frequency (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                   | μA              |
| 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 <sub>IL2</sub> | Divide Ratio Control Input LOW (SW1 & SW2)  | OPEN                     | OPEN                         | OPEN                  |                 |
| V <sub>OUT</sub> | Output Voltage Swing (2.0 pF Load)<br>Output Frequency 12.5–350 MHz (Note 1)<br>Output Frequency 350–400 MHz (Note 2)<br>Output Frequency 400–450 MHz (Note 3)<br>Output Frequency 450–550 MHz (Note 4) | 0.6<br>0.5<br>0.4<br>0.3 | 0.80<br>0.70<br>0.55<br>0.45 | –<br>–<br>–<br>–      | V <sub>pp</sub> |
| V <sub>IN</sub>  | Input Voltage Sensitivity<br>250–1100 MHz<br>100–250 MHz  | 100<br>400               | –<br>–                       | 1000<br>1000          | mVpp            |

1. Input frequency 1.1 GHz, ±8, minimum output frequency of 12.5 MHz.
2. Input frequency 700–800 MHz, ±2.
3. Input frequency 800–900 MHz, ±2.
4. Input frequency 900–1100 MHz, ±2.

# MC12093

## PACKAGE DIMENSIONS

SOIC-8 NB  
D SUFFIX  
CASE 751-07  
ISSUE AK

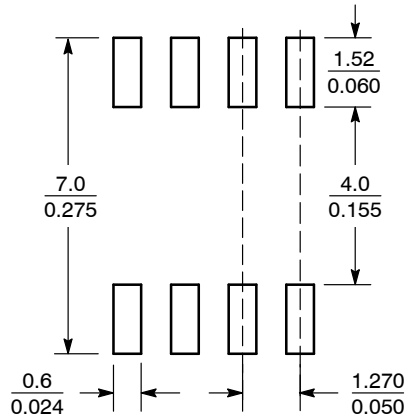


**NOTES:**

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) 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.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.80        | 5.00 | 0.189     | 0.197 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.053     | 0.069 |
| D   | 0.33        | 0.51 | 0.013     | 0.020 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 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 |
| M   | 0°          | 8°   | 0°        | 8°    |
| N   | 0.25        | 0.50 | 0.010     | 0.020 |
| S   | 5.80        | 6.20 | 0.228     | 0.244 |

### SOLDERING FOOTPRINT\*



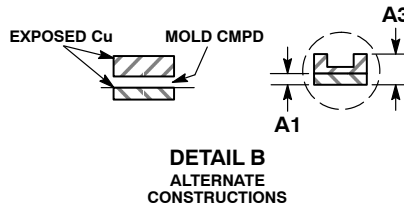
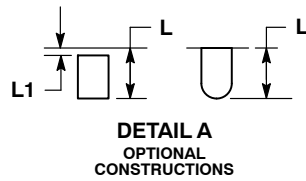
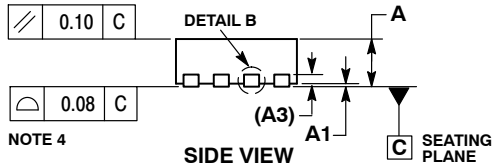
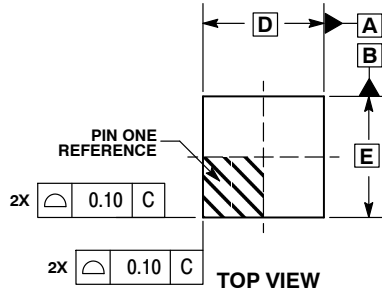
SCALE 6:1  $\left(\frac{\text{mm}}{\text{inches}}\right)$

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

# MC12093

## PACKAGE DIMENSIONS

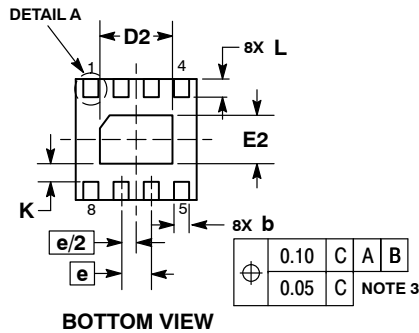
DFN8 2x2, 0.5 P  
MN SUFFIX  
CASE 506AA  
ISSUE F



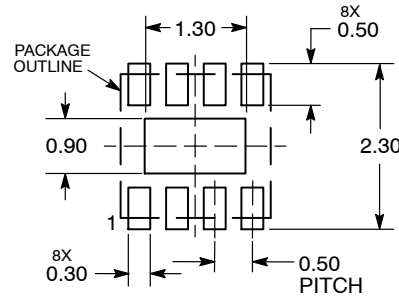
**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.80        | 1.00 |
| A1  | 0.00        | 0.05 |
| A3  | 0.20        | REF  |
| b   | 0.20        | 0.30 |
| D   | 2.00        | BSC  |
| D2  | 1.10        | 1.30 |
| E   | 2.00        | BSC  |
| E2  | 0.70        | 0.90 |
| e   | 0.50        | BSC  |
| K   | 0.30        | REF  |
| L   | 0.25        | 0.35 |
| L1  | ---         | 0.10 |



### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

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