

1.1 GHz Low Power Dual Modulus Prescaler

The MC12038A 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 1.1 GHz in programmable frequency steps.

A Divide Ratio Control (SW) permits selection of a 127/128 or 255/256 divide ratio as desired.

The Modulus Control (MC) selects the proper divide number after SW has been biased to select the desired divide ratio.

- 1.1 GHz Toggle Frequency
- Supply Voltage of 4.5 to 5.5 V
- Low-Power 4.8 mA Typical
- Operating Temperature Range of -40 to 85°C
- Short Setup Time (tset) 16ns Maximum @ 1.1 GHz
- Modulus Control Input Level Is Compatible With Standard CMOS and TTL
- On-Chip Output Termination

FUNCTIONAL TABLE

| sw | МС | Divide Ratio |
|----|----|--------------|
| Н | Н | 127 |
| Н | L | 128 |
| L | Н | 255 |
| L | L | 256 |

NOTES: 1. SW: H = V_{CC}, L = Open. A logic L can also be applied by grounding this pin, but this is not recommended due to increased power consumption.

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

DESIGN GUIDE

| Criteria | Value | Unit |
|---------------------------------|-------|------|
| Internal Gate Count* | 67 | ea |
| Internal Gate Propagation Delay | 200 | ps |
| Internal Gate Power Dissipation | 0.75 | mW |
| Speed Power Product | 0.15 | pJ |

NOTE: * Equivalent to a two-input NAND gate

MAXIMUM RATINGS

| Characteristic | Symbol | Range | Unit |
|------------------------------|------------------|-------------|------|
| Power Supply Voltage, Pin 2 | VCC | -0.5 to 7.0 | Vdc |
| Operating Temperature Range | TA | -40 to 85 | °C |
| Storage Temperature Range | T _{stg} | -65 to 150 | °C |
| Modulus Control Input, Pin 6 | MC | -0.5 to 6.5 | Vdc |

NOTE: ESD data available upon request.

MC12038A

MECL PLL COMPONENTS ÷127/128, ÷255/256 DUAL MODULUS PRESCALER

SEMICONDUCTOR TECHNICAL DATA

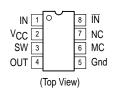


D SUFFIXPLASTIC PACKAGE
CASE 751
(SO-8)



P SUFFIX PLASTIC PACKAGE CASE 626

PIN CONNECTIONS



ORDERING INFORMATION

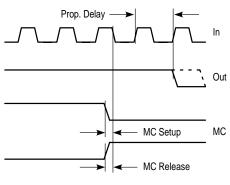
| Device | Operating Temperature Range | Package |
|-----------|---|---------|
| MC12038AD | $T_A = -40^{\circ} \text{ to } +85^{\circ}\text{C}$ | SO-8 |
| MC12038AP | 1A = -40 10 +03 C | Plastic |

ELECTRICAL CHARACTERISTICS (V_{CC} = 4.5 to 5.5V; T_A = -40 to 85°C, unless otherwise noted.)

| Characteristic | Symbol | Min | Тур | Max | Unit |
|---|------------------|------------|------|--------------|-----------------|
| Toggle Frequency (Sine Wave Input) | f _t | 0.1 | 1.4 | 1.1 | GHz |
| Supply Current Output Unloaded (Pin 2) at 5.0 Vdc | Icc | - | 4.8 | 6.5 | mA |
| Modulus Control Input High (MC) | V _{IH1} | 2.0 | _ | VCC | V |
| Modulus Control Input Low (MC) | V _{IL1} | - | - | 0.8 | V |
| Divide Ratio Control Input High (SW) | V _{IH2} | VCC | Vcc | VCC | Vdc |
| Divide Ratio Control Input Low (SW) | V _{IL2} | Open | Open | Open | - |
| Output Voltage Swing (C _L = 8.0 pF) | V _{out} | 1.0 | 1.6 | _ | V _{pp} |
| Modulus Setup Time MC to Out | t _{set} | - | 11 | 16 | ns |
| Input Voltage Sensitivity 250–1100 MHz 100–250 MHz | Vin(min) | 100 400 | - | 1500 1500 | mVpp |

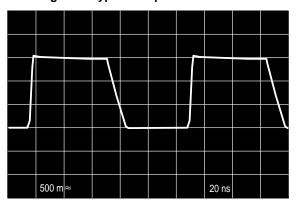
Figure 1. Logic Diagram (MC12038A)

Figure 2. Modulus Setup Time



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

Figure 3. Typical Output Waveforms



(÷128, 1.1 GHz Input Frequency, V_{CC} = 5.0 V, T_A = 25°C, Output Loaded)

Figure 4. AC Test Circuit

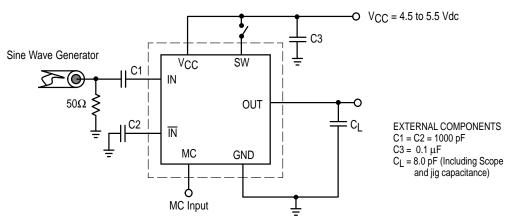


Figure 5. Input Signal Amplitude versus Input Frequency

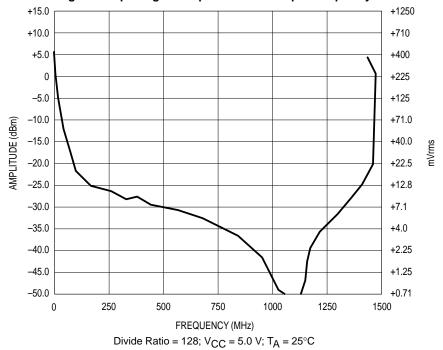
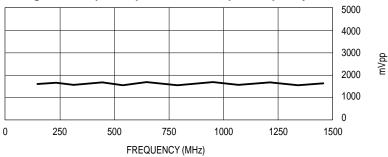


Figure 6. Output Amplitude versus Input Frequency



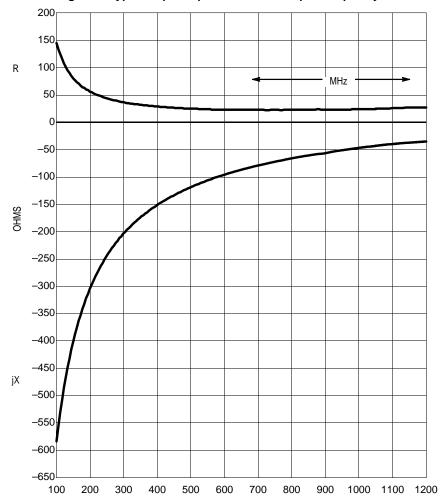
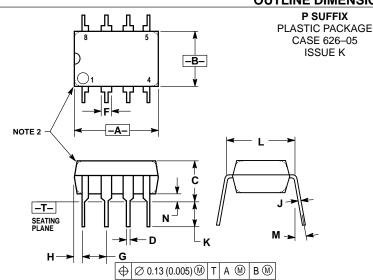


Figure 7. Typical Input Impedance versus Input Frequency

OUTLINE DIMENSIONS

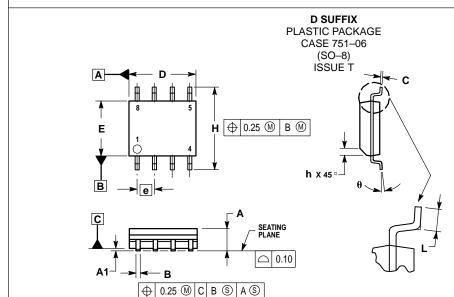


NOTES:

- 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.

| | MILLIMETERS | | INC | HES |
|-----|-------------|-------|-----------|-------|
| DIM | MIN | MAX | MIN | MAX |
| Α | 9.40 | 10.16 | 0.370 | 0.400 |
| В | 6.10 | 6.60 | 0.240 | 0.260 |
| С | 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 | |
| Н | 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 | |
| М | | 10° | | 10° |
| N | 0.76 | 1.01 | 0.030 | 0.040 |



- AUTES:
 1 DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2 DIMENSIONS ARE IN MILLIMETER.
 3 DIMENSION D AND E DO NOT INCLUDE MOLD PROTRICION IN AND E DO NOT INCLUDE MOLD

- PROTRUSION.

 MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

 DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR
 PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS
 OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION

| | MILLIMETERS | | | |
|-----|-------------|----------|--|--|
| DIM | MIN | MAX | | |
| Α | 1.35 | 1.75 | | |
| A1 | 0.10 | 0.25 | | |
| В | 0.35 | 0.49 | | |
| С | 0.19 | 0.25 | | |
| D | 4.80 | 5.00 | | |
| Е | 3.80 | 4.00 | | |
| e | 1.27 | 1.27 BSC | | |
| Н | 5.80 | 6.20 | | |
| h | 0.25 | 0.50 | | |
| ٦ | 0.40 | 1.25 | | |
| θ | 0° | 7° | | |

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MC12038A/D