

## CGS3311 • CGS3312 • CGS3313 • CGS3314 • CGS3315 • CGS3316 • CGS3317 • CGS3318 • CGS3319 CMOS Crystal Clock Generators

### General Description

The CGS3311, CGS3312, CGS3313, CGS3314, CGS3315, CGS3316, CGS3317, CGS3318 and CGS3319 devices are designed for Clock Generation and Support (CGS) applications up to 110 MHz. The CGS331x series of devices are crystal controlled CMOS oscillators requiring a minimum of external components. The 331x devices provide selectable output divide ratio (and selectable crystal drive level). The circuit is designed to operate over a wide frequency range using fundamental model or overtone crystals.

### Features

- Fairchild's CGS family of devices for high frequency clock source applications
- Crystal frequency operation range:  
fundamental: 10 MHz to 100 MHz typical  
3rd or 5th overtone: 10 MHz to 85 MHz
- Programmable oscillator drive
- Selectable fast output edge rates
- Output symmetry circuit to adjust 50% duty cycle point between CMOS and TTL levels
- Output current drive of 48 mA for  $I_{OL}/I_{OH}$
- FACT™ CMOS output levels
- Output has high speed short circuit protection
- Basic oscillator type: Pierce
- Hysteresis inputs to improve noise margin

### Ordering Code:

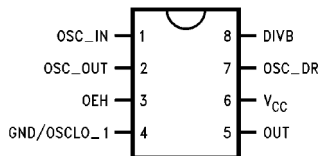
| Order Number | Package Number | Package Description                                                              |
|--------------|----------------|----------------------------------------------------------------------------------|
| CGS3311M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body |
| CGS3312M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body |
| CGS3313M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body |
| CGS3314M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body |
| CGS3315M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body |
| CGS3316M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body |
| CGS3317M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body |
| CGS3318M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body |
| CGS3319M     | M08A           | 8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

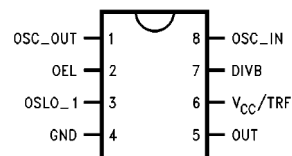
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CGS3311 • CGS3312 • CGS3313 • CGS3314 • CGS3315 • CGS3316 • CGS3317 • CGS3318 • CGS3319 CMOS Crystal Clock Generators

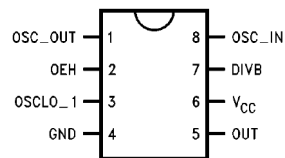
## Connection Diagrams



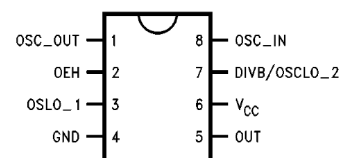
(A) 3311



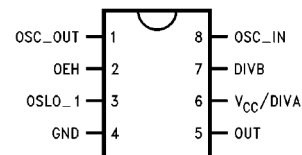
(E) 3315



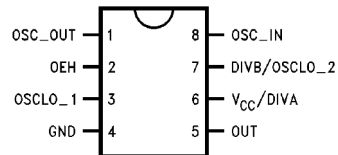
(B) 3312



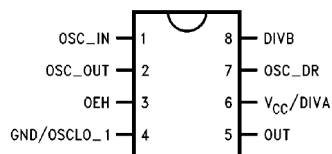
(F) 3316



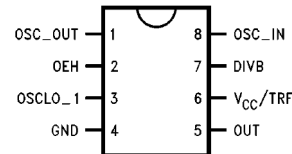
(C) 3313



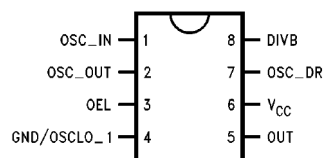
(G) 3317



(D) 3314



(H) 3318



(I) 3319

## Truth Tables

Division Selection

| DIVB | DIVA | OEL | OEH | Divider Output                 |
|------|------|-----|-----|--------------------------------|
| F    | 0/F  | X   | X   | Divide-by 1                    |
| 1    | 0/F  | 0   | 1   | Divide-by 2                    |
| 0    | 0/F  | 0   | 1   | Divide-by 4                    |
| F    | 1    | 0   | 1   | Divide-by 8                    |
| 1    | 1    | 0   | 1   | Divide-by 16                   |
| 0    | 1    | 0   | 1   | Divide-by 32                   |
| X    | X    | 1   | X   | Output Reset HIGH at Re-enable |
| X    | X    | X   | 0   | Output Reset HIGH at Re-enable |

Note: Actual value of the floating OSC\_DR and DIVB input is  $V_{CC/2}$

Rise and Fall Time Selection

| OSC_DR | DIV | TRF | Rise/Fall Time (ns) |
|--------|-----|-----|---------------------|
| F      | N   | 0/F | 2                   |
| F      | N   | 1   | less than 2         |
| F      | Y   | 0/F | 4                   |
| F      | Y   | 1   | 2                   |
| 0,1    | X   | 0/F | 4                   |
| 0,1    | X   | 1   | 2                   |

Drive Selection

| OSC_DR | Drive  |
|--------|--------|
| 0      | Low    |
| 1      | Medium |
| F      | High   |

Note: Where "F" indicates floating the input.

## Pin Descriptions

Note: Pin out varies for each device.

|         |                                                                                                                                                                      |          |                                                                                                                                                                    |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OSC_IN  | Input to Oscillator Inverter. The output of the crystal would be connected here.                                                                                     | OEL      | Active LOW 3-STATE enable pin. This pin pulls to a low value when left floating and 3-STATE the output when forced HIGH. This pin has TTL compatible input levels. |
| OSC_OUT | Resistive Buffered Output of the Oscillator Inverter                                                                                                                 | TRF      | Rise and Fall time override pin. Available only for die form.                                                                                                      |
| OSC_DR  | 3 Level input pin that selects Oscillator Drive Level                                                                                                                | OUT      | This pin is the main clock output on the device.                                                                                                                   |
| DIVA    | Input used to select Binary Divide-by Option. This pin has CMOS compatible input levels.                                                                             | OSCLO_1  | The Oscillator LOW pin is the ground for the Oscillator.                                                                                                           |
| OEH     | Active HIGH 3-STATE enable pin. This pin pulls to a high value when left floating and 3-STATES the output when forced low. This pin has TTL compatible input levels. | OSCLO_2  | This pin is the same signal as OSCLO_1. It has been provided as an alternate connection for OSCLO_1 for hybrid assemblies.                                         |
|         |                                                                                                                                                                      | $V_{CC}$ | The power pin for the chip.                                                                                                                                        |
|         |                                                                                                                                                                      | GND      | The ground pin for all sections of the circuitry except the oscillator and oscillator related circuitry.                                                           |

## Functional Table

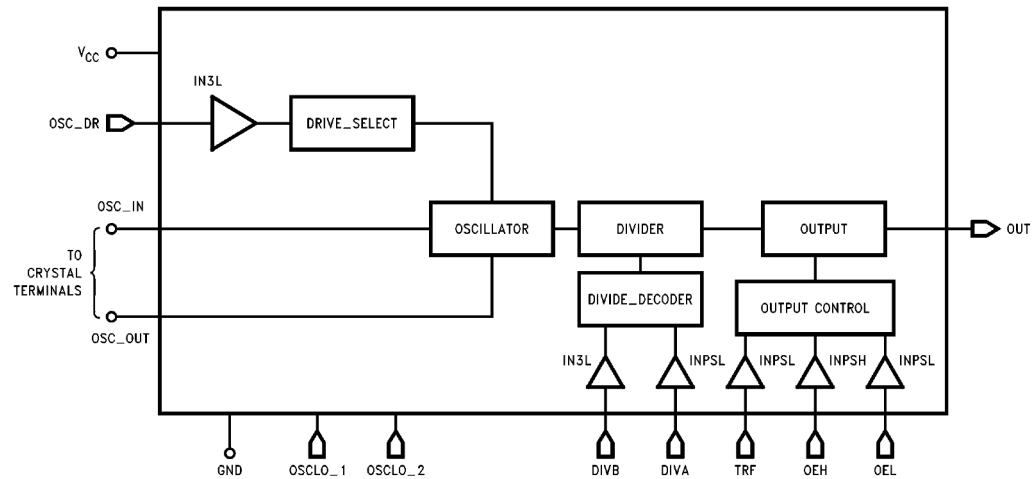
Summary of Device Options

| Device | Divide    | Enable | Drive   | Output Rise/Fall Time (ns) |
|--------|-----------|--------|---------|----------------------------|
| 3311   | 1, 2, 4   | OEH    | L, M, H | 2, 4                       |
| 3312   | 1, 2, 4   | OEH    | H       | 2, 4                       |
| 3313   | 8, 16, 32 | OEH    | H       | 4                          |
| 3314   | 8, 16, 32 | OEH    | L, M, H | 4                          |
| 3315   | 1, 2, 4   | OEL    | H       | 1, 2                       |
| 3316   | 4         | OEH    | H       | 4                          |
| 3317   | 32        | OEH    | H       | 4                          |
| 3318   | 1, 2, 4   | OEH    | H       | 1, 2                       |
| 3319   | 1, 2, 4   | OEL    | L, M, H | 2, 4                       |

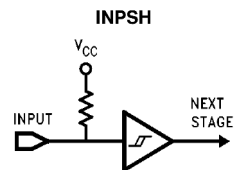
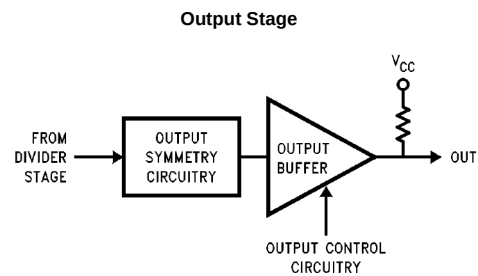
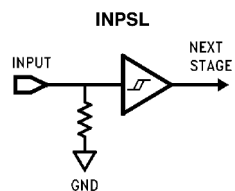
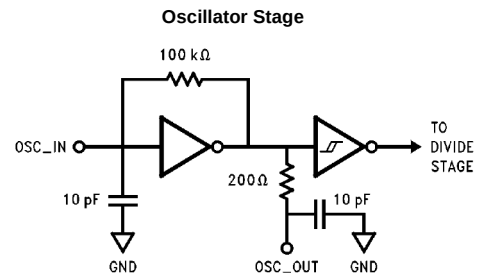
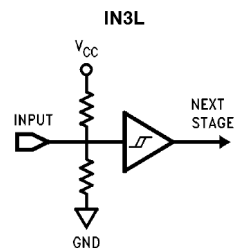
Each drive has one output with the choices of selecting frequency divide, output enable, crystal drive and output rise and fall time. Crystal drive options are:

L = LOW Drive  
M = MEDIUM Drive  
H = HIGH Drive

## Block Diagrams



Note: Pin numbers vary for each device



**Absolute Maximum Ratings**(Note 1)

|                                               |                          |
|-----------------------------------------------|--------------------------|
| Supply Voltage ( $V_{CC}$ )                   | -0.5V to 7.0V            |
| DC Input Voltage Diode Current ( $I_{IK}$ )   | ±9 mA                    |
| DC Input Voltage ( $V_I$ )                    | -0.5V to 7.0V            |
| DC Output Diode Current ( $I_{OK}$ )          | ±20 mA                   |
| DC Output Voltage ( $V_O$ )                   | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Source<br>or Sink Current ( $I_O$ ) | ±70 mA                   |
| Storage Temperature ( $T_{STG}$ )             | -55°C to 150°C           |
| Junction Temperature ( $T_J$ )                |                          |
| SOIC                                          | 140°C/W                  |

**Recommended Operating Conditions**

|                                 |                  |
|---------------------------------|------------------|
| Supply Voltage ( $V_{CC}$ )     | 4.5V to 5.5V     |
| Input Voltage ( $V_I$ )         | 0V to 5.5V       |
| Output Voltage ( $V_O$ )        | 0V to $V_{CC}$ V |
| Operating Temperature ( $T_A$ ) | -40° to +85°C    |

**Note 1:** The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the DC and AC Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The Recommended Operating Conditions will define the conditions for actual device operation.

**DC Electrical Characteristics**

| Symbol                | Parameter                                                                  | V <sub>CC</sub><br>(V) | T <sub>A</sub> = +25°C |                   |      | T <sub>A</sub> = −40° C to +85°C |      | Units | Conditions                                                                       |
|-----------------------|----------------------------------------------------------------------------|------------------------|------------------------|-------------------|------|----------------------------------|------|-------|----------------------------------------------------------------------------------|
|                       |                                                                            |                        | Typ                    | Guaranteed Limits |      | Min                              | Max  |       |                                                                                  |
|                       |                                                                            |                        |                        | Min               | Max  |                                  |      |       |                                                                                  |
| V <sub>IHTTL</sub>    | Minimum HIGH Level Input Voltage, TTL Level Inputs (OE <sub>H</sub> , OEL) | 4.5                    |                        | 2.0               |      | 2.0                              |      | V     |                                                                                  |
|                       |                                                                            | 5.5                    |                        | 2.0               |      | 2.0                              |      |       |                                                                                  |
| V <sub>ILTTL</sub>    | Maximum LOW Level Input Voltage, TTL Level Inputs (OE <sub>H</sub> , OEL)  | 4.5                    |                        |                   | 0.8  |                                  | 0.8  | V     |                                                                                  |
|                       |                                                                            | 5.5                    |                        |                   | 0.8  |                                  | 0.8  |       |                                                                                  |
| V <sub>IHCMOS</sub>   | Minimum HIGH Level Input Voltage. CMOS Level Inputs (DIVA)                 | 4.5                    |                        | 3.15              |      | 3.15                             |      | V     |                                                                                  |
|                       |                                                                            | 5.5                    |                        | 3.85              |      | 3.85                             |      |       |                                                                                  |
| V <sub>ILCMOS</sub>   | Maximum LOW Level Input voltage. CMOS Level Inputs (DIVA)                  | 4.5                    |                        | 1.35              |      | 1.35                             |      | V     |                                                                                  |
|                       |                                                                            | 5.5                    |                        | 1.65              |      | 1.65                             |      |       |                                                                                  |
| V <sub>IN3L_H</sub>   | Minimum Logic 1 Input for Three Level Input (DIVB, OSC_DR)                 | 4.5                    |                        | 4.05              |      | 4.05                             |      | V     |                                                                                  |
|                       |                                                                            | 5.5                    |                        | 4.95              |      | 4.95                             |      |       |                                                                                  |
| V <sub>IN3L_1/2</sub> | Minimum Logic 1/2 Input for Three Level Input (DIVB, OSC_DR)               | 4.5                    |                        | 1.8               | 2.7  | 1.8                              | 2.7  | V     |                                                                                  |
|                       |                                                                            | 5.5                    |                        | 2.2               | 3.3  | 2.2                              | 3.3  |       |                                                                                  |
| V <sub>IN3L_L</sub>   | Maximum Logic 0 Input Level Three Level Input (DIVB, OSC_DR)               | 4.5                    |                        |                   | 0.45 |                                  | 0.45 | V     |                                                                                  |
|                       |                                                                            | 5.5                    |                        |                   | 0.45 |                                  | 0.45 |       |                                                                                  |
| V <sub>OH</sub>       | Minimum HIGH Level Output Voltage                                          | 4.5                    | 4.49                   | 4.40              |      | 4.40                             |      | V     | I <sub>OUT</sub> = −50μA                                                         |
|                       |                                                                            | 5.5                    | 5.49                   | 5.40              |      | 5.40                             |      |       |                                                                                  |
|                       |                                                                            | 4.5                    |                        | 3.86              |      | 3.76                             |      |       |                                                                                  |
|                       |                                                                            | 5.5                    |                        | 4.86              |      | 4.76                             |      |       | I <sub>OH</sub> = −48 mA<br>V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IH</sub> |
| V <sub>OL</sub>       | Minimum LOW Level Output Voltage                                           | 4.5                    | 0.001                  |                   | 0.1  |                                  | 0.1  | V     | I <sub>OUT</sub> = 50μA                                                          |
|                       |                                                                            | 5.5                    | 0.001                  |                   | 0.1  |                                  | 0.1  |       |                                                                                  |
|                       |                                                                            | 4.5                    |                        |                   | 0.44 |                                  | 0.44 |       |                                                                                  |
|                       |                                                                            | 5.5                    |                        |                   | 0.44 |                                  | 0.44 |       |                                                                                  |
| I <sub>IHRES</sub>    | Input Current for Pins DIVB, OSC_DR, and DIVA (Input is Logic HIGH)        | 5.5                    |                        | 220               | 360  | 200                              | 380  | μA    | V <sub>IN</sub> = 5.5V                                                           |
| I <sub>ILRES</sub>    | Input Current for Pins DIVB, OSC_DR, and DIVA (Input is Logic LOW)         | 5.5                    |                        | −220              | −360 | −200                             | −380 | μA    | V <sub>IN</sub> = 0.0V                                                           |
| I <sub>IHENAB</sub>   | Input Current for Enable Pin OEL                                           | 5.5                    |                        | 90                | 160  | 85                               | 175  | μA    | V <sub>IN</sub> = 5.5V                                                           |
| I <sub>ILENAB</sub>   | Input Current for Enable Pin OE <sub>H</sub>                               | 5.5                    |                        | −90               | −160 | −85                              | −175 | μA    | V <sub>IN</sub> = 0.0V                                                           |
| I <sub>IHOSC</sub>    | Input Current for OSC_IN Pin (Indicates Bias Resistance)                   | 5.5                    |                        | 20                | 100  | 20                               | 125  | μA    | V <sub>IN</sub> = 5.5V                                                           |
| I <sub>ILOSC</sub>    | Input Current for OSC_IN Pin (Indicates Bias Resistance)                   | 5.5                    |                        | −20               | −100 | −20                              | −125 | μA    | V <sub>IN</sub> = 0.0V                                                           |
| I <sub>OZH</sub>      | Output Disabled Current (Output HIGH)                                      | 4.5                    |                        |                   | 3.0  |                                  | 5.0  | μA    | V <sub>OUT</sub> = V <sub>CC</sub>                                               |
|                       |                                                                            | 5.5                    |                        |                   | 3.0  |                                  | 5.0  |       |                                                                                  |

## DC Electrical Characteristics (Continued)

| Symbol               | Parameter                                                                                   | V <sub>CC</sub><br>(V) | T <sub>A</sub> = +25°C |                   |              | T <sub>A</sub> = −40° C to +85°C |              | Units | Conditions                                        |
|----------------------|---------------------------------------------------------------------------------------------|------------------------|------------------------|-------------------|--------------|----------------------------------|--------------|-------|---------------------------------------------------|
|                      |                                                                                             |                        | Typ                    | Guaranteed Limits |              |                                  |              |       |                                                   |
|                      |                                                                                             |                        |                        | Min               | Max          | Min                              | Max          |       |                                                   |
| I <sub>OZL</sub>     | Output Disabled Current<br>(Output LOW)                                                     | 4.5<br>5.5             |                        |                   | −140<br>−170 |                                  | −150<br>−180 | μA    | V <sub>OUT</sub> = 0.0V                           |
| I <sub>OLD</sub>     | Minimum Dynamic<br>Output Current                                                           | 5.5                    | 75                     |                   | 75           |                                  |              | mA    | V <sub>OLD</sub> = 1.65v                          |
| I <sub>OHD</sub>     | Minimum Dynamic<br>Output Current                                                           | 5.5                    | −75                    |                   | −75          |                                  |              | mA    | V <sub>OHD</sub> = 3.85V                          |
| I <sub>CCOSC_L</sub> | Additional I <sub>CC</sub> with OSC_IN<br>Floating. LOW Drive Mode                          | 4.5<br>5.5             | 0.6                    |                   | 0.6          |                                  | 6.5          | mA    | OSC_IN = Float                                    |
| I <sub>CCOSC_M</sub> | Additional I <sub>CC</sub> with OSC_IN<br>Floating. LOW Drive Mode                          | 4.5<br>5.5             | 1.7                    |                   | 1.7          |                                  | 12.4         | mA    | OSC_IN = Float                                    |
| I <sub>CCOSC_H</sub> | Additional I <sub>CC</sub> with OSC_IN<br>Floating. LOW Drive Mode                          | 4.5<br>5.5             | 5.5                    |                   | 5.5          |                                  | 31.5         | mA    | OSC_IN = Float                                    |
| I <sub>CC1</sub>     | Additional Maximum I <sub>CC</sub><br>per Input<br>(OE <sub>H</sub> , OE <sub>L</sub> Pins) | 5.5                    |                        |                   | 1.5          |                                  | 1.5          | mA    | V <sub>IN</sub> = V <sub>CC</sub> − 2.1V          |
| I <sub>CC3L</sub>    | Additional Maximum I <sub>CC</sub><br>per Input<br>(DIVB, OSC_DR Inputs)                    | 5.5                    |                        |                   | 1.5          |                                  | 1.5          | mA    | DIVB, OSC_DR<br>Inputs Equal to V <sub>CC/2</sub> |

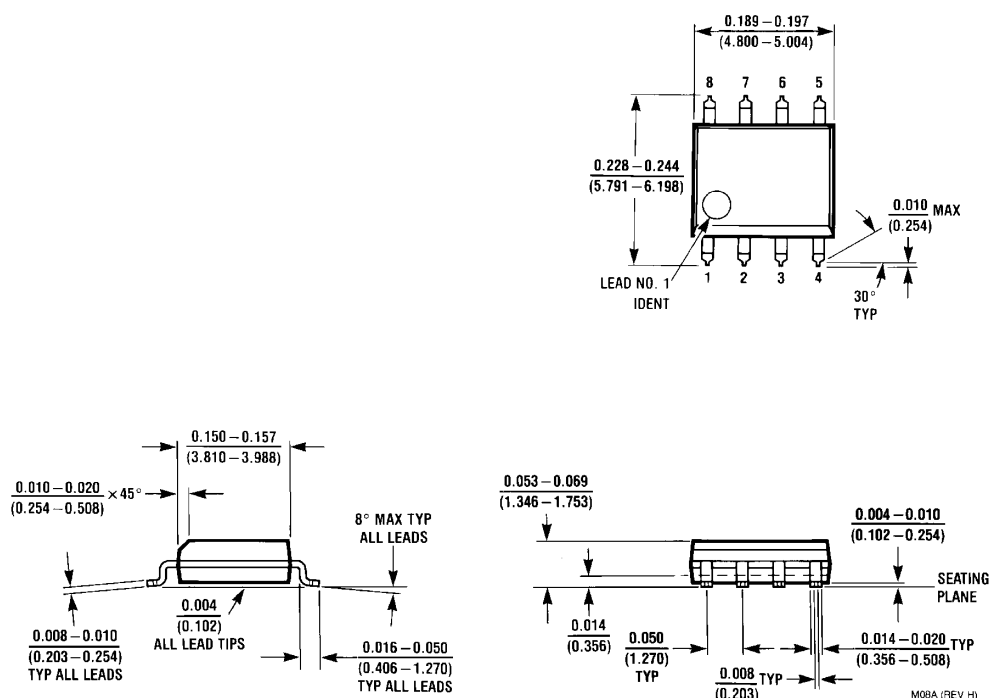
## AC Electrical Characteristics

Over recommended operating free air temperature range. All typical values are measured at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

| Symbol            | Parameter                | V <sub>CC</sub><br>(V)<br>(Note 2) | T <sub>A</sub> = -40°C to +85°C<br>C <sub>L</sub> = 50 pF |      |      | Units |
|-------------------|--------------------------|------------------------------------|-----------------------------------------------------------|------|------|-------|
|                   |                          |                                    | Min                                                       | Type | Max  |       |
| f <sub>MAX</sub>  | Frequency Maximum        | 5.0                                | 100                                                       |      |      | ns    |
| t <sub>PZH</sub>  | Output HIGH Enable Time  | 5.0                                | 1.0                                                       |      | 31.5 | ns    |
| t <sub>PZL</sub>  | Output LOW Enable Time   | 5.0                                | 1.0                                                       |      | 28.0 | ns    |
| t <sub>PHZ</sub>  | Output HIGH Disable Time | 5.0                                | 1.0                                                       |      | 21.5 | ns    |
| t <sub>PLZ</sub>  | Output LOW Disable Time  | 5.0                                | 1.0                                                       |      | 16.0 | ns    |
| t <sub>RISE</sub> | Rise/Fall Time           | 5.0                                |                                                           | 4.0  |      | ns    |
| t <sub>FALL</sub> | 30 pF (20% to 80%)       |                                    |                                                           |      |      |       |

Note 2: Voltage Range 5.0 is 5.0V ± 0.5V

# Physical Dimensions inches (millimeters) unless otherwise noted



8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body  
Package Number M08A

## LIFE SUPPORT POLICY

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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