



# Micromachined Accelerometer

## ±40g

The MMAS40G family of silicon capacitive, micro-machined accelerometers features integral signal amplification, signal conditioning, a 4-pole low-pass filter and temperature compensation. Zero-G offset, full scale span and filter roll-off are factory set and require no external passives. A calibrated self-test feature mechanically displaces the seismic mass with the application of a digital self-test signal.

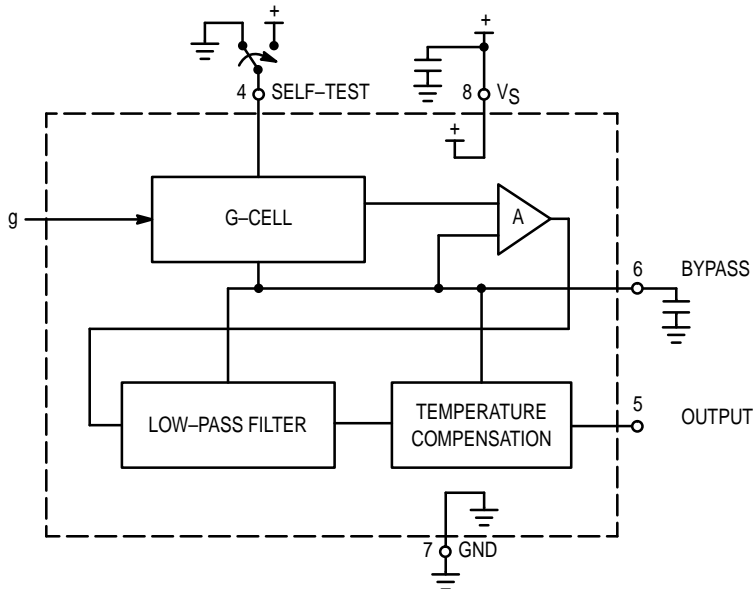
The MMAS40G incorporates a single polysilicon seismic mass, suspended between two fixed polysilicon plates (G-cell). The forces of acceleration move the seismic mass, thereby resulting in a change in capacitance. The G-cell is sealed at the wafer level, creating a particle-free environment. The G-cell features built-in damping and over-range stops to protect it from mechanical shock.

MMAS40G accelerometers are ideally suited for automotive crash detection and recording, vibration monitoring, automotive suspension control, appliance control systems, etc.

### Features

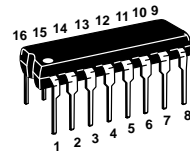
- Minimum Full Scale Measurement ±40g
- Calibrated, True Self-Test
- Standard 16-Pin Plastic DIP package
- Senses Perpendicular to the Printed Circuit Board
- Integral Signal Conditioning and 4-Pole Filter
- Linear Output
- Robust, High Shock Survivability

**SIMPLIFIED BLOCK DIAGRAM**



# MMAS40G10D

**MICROMACHINED  
ACCELEROMETER**  
±40g



**DIP PACKAGE**  
CASE 648C-03

**PIN NUMBER (DIP)**

|   |            |    |         |
|---|------------|----|---------|
| 1 | N/C (1)    | 9  | N/C (1) |
| 2 | N/C (1)    | 10 | N/C (1) |
| 3 | N/C (1)    | 11 | N/C (1) |
| 4 | Self-Test  | 12 | N/C (1) |
| 5 | Output     | 13 | N/C (1) |
| 6 | Bypass (2) | 14 | N/C (1) |
| 7 | GND        | 15 | N/C (1) |
| 8 | VS (2)     | 16 | N/C (1) |

**NOTES:**

1. Internal connections. All N/C should be tied to gnd, except pin 11 which must be tied to pin 8.
2. Bypass to ground with 0.1 μF ceramic capacitor for specified system performance.

## MMAS40G10D

### MAXIMUM RATINGS

| Rating                            | Symbol            | Value        | Unit |
|-----------------------------------|-------------------|--------------|------|
| Acceleration (biased each axis)   | G                 | ±500         | g    |
| Acceleration (unbiased each axis) | G                 | ±2000        | g    |
| Supply Voltage                    | V <sub>Smax</sub> | -0.3 to +7.0 | Vdc  |
| Storage Temperature               | T <sub>stg</sub>  | -40 to +105  | °C   |
| Operating Temperature(6)          | T <sub>A</sub>    | -40 to +85   | °C   |

### OPERATING CHARACTERISTICS (V<sub>S</sub> = 5.0 Vdc, T<sub>A</sub> = 25°C unless otherwise noted)

| Characteristic  | Symbol           | Min  | Typ | Max                  | Unit             |
|---|------------------|------|-----|----------------------|------------------|
| Acceleration Range  | G                | ±40  | ±55 | —                    | g                |
| Output Drive Capability                                   | —                | -0.2 | —   | 0.2                  | mA               |
| Supply Voltage  | V <sub>S</sub>   | 4.75 | 5.0 | 5.25                 | V                |
| Supply Current  | I <sub>O</sub>   | —    | 5.0 | 7.0                  | mA               |
| Full Scale Output Range                                   | V <sub>FSO</sub> | 0.3  | —   | V <sub>S</sub> - 0.3 | V                |
| Sensitivity (over temperature range) (2) (3)              | ΔV/ΔG            | 36   | 40  | 44                   | mV/g             |
| Zero Acceleration Output (over temperature range) (3) (4) | V <sub>off</sub> | 2.2  | 2.5 | 2.8                  | V                |
| Linearity   | —                | —    | 0.5 | 2.0                  | %FSO             |
| Transverse Sensitivity                                    | —                | —    | 1.0 | 3.0                  | %FSO             |
| Frequency Bandwidth                                       | —                | 300  | 400 | 500                  | Hz               |
| Noise   | —                | —    | 15  | 25                   | mV <sub>pk</sub> |
| Self-Test Output Equivalent (5)                           | G <sub>S</sub>   | 20   | 25  | 30                   | g                |
| Self-Test Input Low                                       | V <sub>STL</sub> | —    | —   | 1.6                  | V                |
| Self-Test Input High                                      | V <sub>STH</sub> | 3.4  | —   | —                    | V                |
| Self-Test Input Current                                   | —                | 10   | 70  | 200                  | μA               |

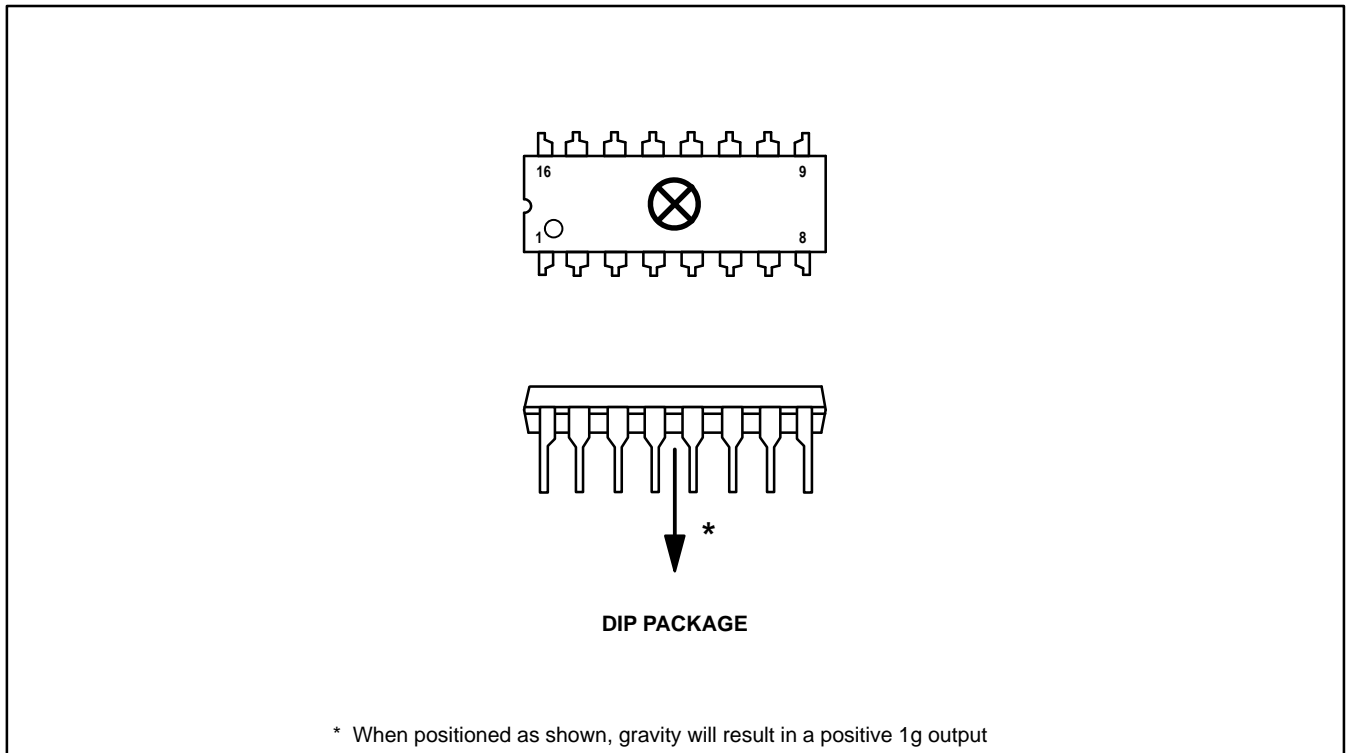
#### NOTES:


1. The output voltage increases from the Zero Acceleration Output for positive acceleration and decreases for negative acceleration. The typical sensitivity is 40 mV/g. For example, with V<sub>S</sub> = 5.0 V, a +20g input will result in a 3.3 V output. (V<sub>output</sub> = 2.5 + 0.040 x 20) and a -20g input will result in a 1.7 V output.
2. Sensitivity is a ratiometric parameter:  $\Delta V/\Delta G(V_S) = \Delta V/\Delta G(5\text{ V}) \times (V_S/5\text{ V})$ .
3. The compensated temperature operating range is -40 to +85°C.
4. Zero Acceleration Output is a ratiometric parameter:  $V_{\text{off}}(V_S) = V_{\text{off}}(5\text{ V}) \times (V_S/5\text{ V})$ .
5. Equivalent output in response to a Logic Level One on the self-test pin.
6. Additional temperature range available. Consult factory.

### ORDERING INFORMATION

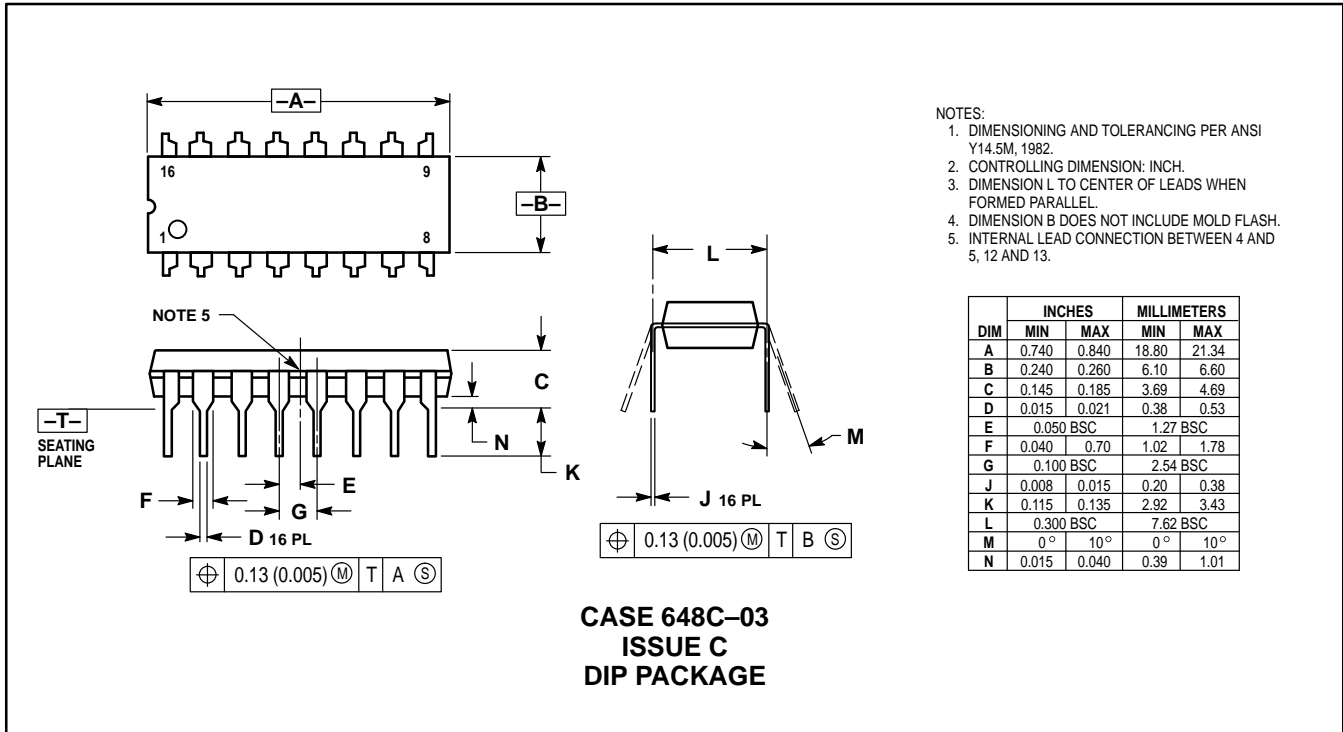
| Device     | Temperature Range | Case No.     | Package     |
|------------|-------------------|--------------|-------------|
| MMAS40G10D | -40 to +85°C      | Case 648C-03 | Plastic DIP |

## POSITIVE ACCELERATION SENSING DIRECTION



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PACKAGE DIMENSIONS



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
  4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
  5. INTERNAL LEAD CONNECTION BETWEEN 4 AND 5, 12 AND 13.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.740     | 0.840 | 18.80       | 21.34 |
| B   | 0.240     | 0.260 | 6.10        | 6.60  |
| C   | 0.145     | 0.185 | 3.69        | 4.69  |
| D   | 0.015     | 0.021 | 0.38        | 0.53  |
| E   | 0.050 BSC |       | 1.27 BSC    |       |
| F   | 0.040     | 0.70  | 1.02        | 1.78  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| J   | 0.008     | 0.015 | 0.20        | 0.38  |
| K   | 0.115     | 0.135 | 2.92        | 3.43  |
| L   | 0.300 BSC |       | 7.62 BSC    |       |
| M   | 0°        | 10°   | 0°          | 10°   |
| N   | 0.015     | 0.040 | 0.39        | 1.01  |

**CASE 648C-03  
ISSUE C  
DIP PACKAGE**

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