

Preliminary Information

Micromachined Accelerometer

$\pm 500g$ Amplified

The MMAS500G 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 device is offered in either of two plastic packages, thereby accommodating various axis orientation requirements.

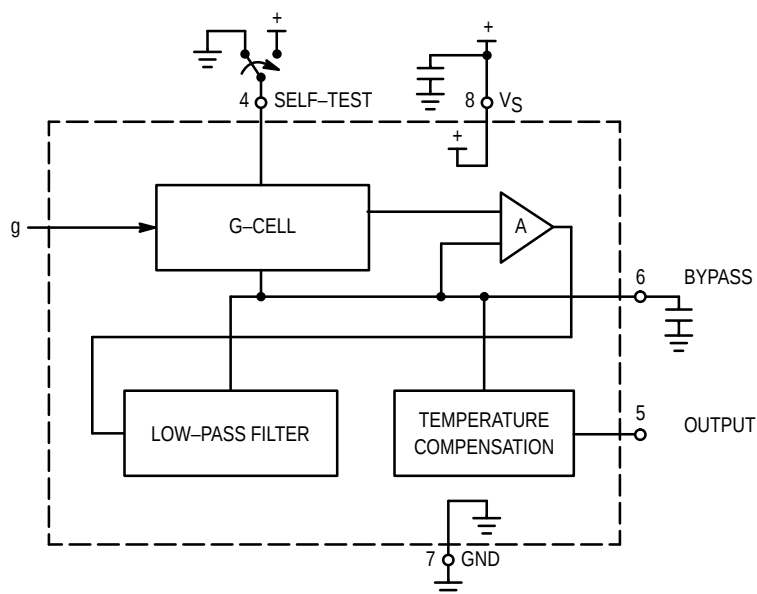
The MMAS500G incorporates a single polysilicon seismic mass, suspended between two fixed polysilicon plates (G-cell). The forces of acceleration move the seismic mass, thereby resulting in a change in capacitance. The G-cell is sealed at the die level, creating a particle-free environment. The G-cell features built-in damping and over-range stops to protect it from mechanical shock.

MMAS500G accelerometers are ideally suited for automotive crash detection and recording, vibration monitoring, automotive suspension control, appliance control systems, etc.

Features

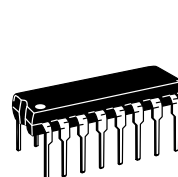
- Full Scale Measurement $\pm 500g$
- Calibrated, True Self-Test
- Standard 16-Pin Plastic DIP
- Integral Signal Conditioning and 4-Pole Filter
- Linear Output
- Robust, High Shock Survivability

SIMPLIFIED BLOCK DIAGRAM

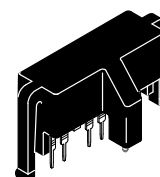


XMMAS500G10D
XMMAS500G10S

**MICROMACHINED
ACCELEROMETER**
 $\pm 500g$ AMPLIFIED



DIP PACKAGE
CASE 648C-03



SIP PACKAGE
CASE 447-01

PIN NUMBER

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 must remain floating, except DIP's pin 11 which must be tied to pin 8.
2. Bypass to ground with 0.1 μF ceramic capacitor to improve noise performance.

This document contains information on a product under development. Motorola reserves the right to change or discontinue this product without notice.

XMMAS500G10D XMMAS500G10S

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Acceleration (biased each axis)	G	±1000	g
Acceleration (unbiased each axis)	G	±2000	g
Supply Voltage	V _{Smax}	−0.3 to +7.0	Vdc
Storage Temperature	T _{stg}	−40 to +125	°C
Operating Temperature(6)	T _A	−40 to +85	°C

OPERATING CHARACTERISTICS (V_S = 5.0 Vdc, T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Acceleration Range	G	±500	—	—	g
Output Drive Capability	—	−0.2	—	0.2	mA
Supply Voltage	V _S	4.75	5.0	5.25	V
Supply Current	I _O	—	5.0	—	mA
Full Scale Output Range	V _{FSO}	0.3	—	4.7	V
Sensitivity (over temperature range) (1) (2) (3)	ΔV/ΔG	2.9	3.2	3.6	mV/g
Zero Acceleration Output (T _A = 25°C) (4)	V _{off}	2.3	2.5	2.7	V
Zero Acceleration Output (over temperature range) (3) (4)	V _{off}	2.1	2.5	2.9	V
Linearity	—	—	0.5	—	%FSO
Transverse Sensitivity	—	—	1.0	3.0	%FSO
Frequency Bandwidth	—	—	700	—	Hz
Noise	—	—	20	50	mV _{pk}
Self-Test Output Equivalent (5)	G _S	44	50	56	g
Self-Test Triggering Voltage	V _{TH}	1.6	—	3.4	V
Self-Test Input Current	—	—	10	—	μA

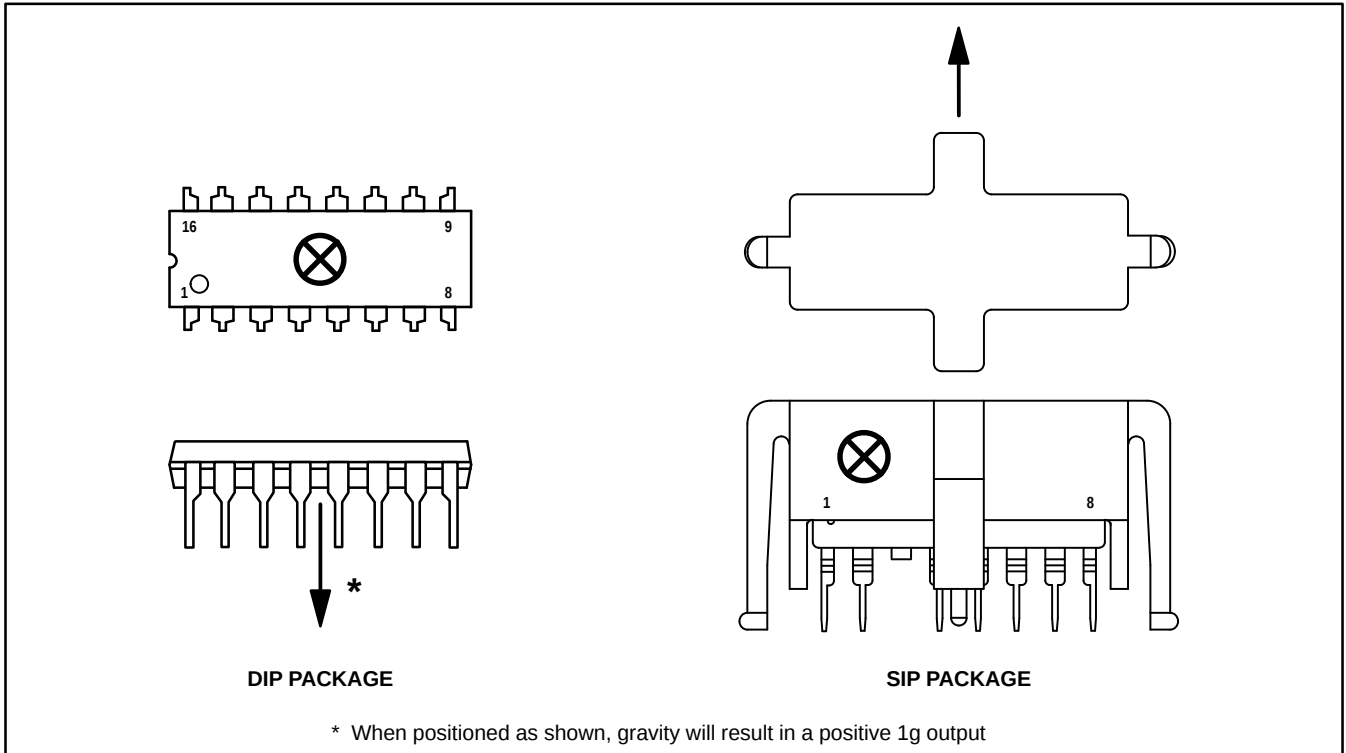
NOTES:

1. The output voltage increases from the Zero Acceleration Output for positive acceleration and decreases for negative acceleration. The typical sensitivity is 3.2 mV/g. For example, with V_S = 5.0 V, a +250g input will result in a 3.3 V output. (V_{output} = 2.5 + 0.0032 × 250) and a −250g 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 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.

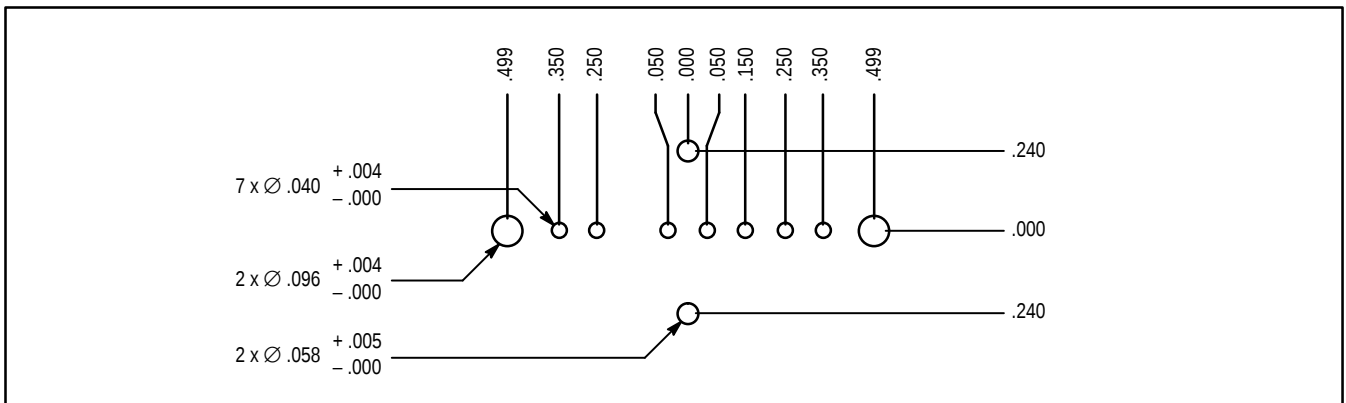
ORDERING INFORMATION

Device	Temperature Range	Case No.	Package
XMMAS500G10D	−40 to +85°C	Case 648C−03	Plastic DIP
XMMAS500G10S	−40 to +85°C	Case 447−01	Plastic SIP

POSITIVE ACCELERATION SENSING DIRECTION



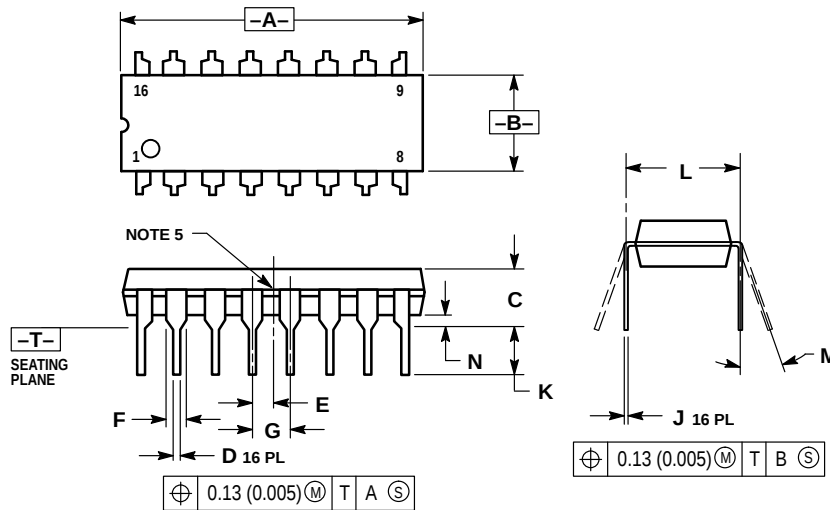
SIP PACKAGE DRILLING PATTERN



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XMMAS500G10D XMMAS500G10S

PACKAGE DIMENSIONS

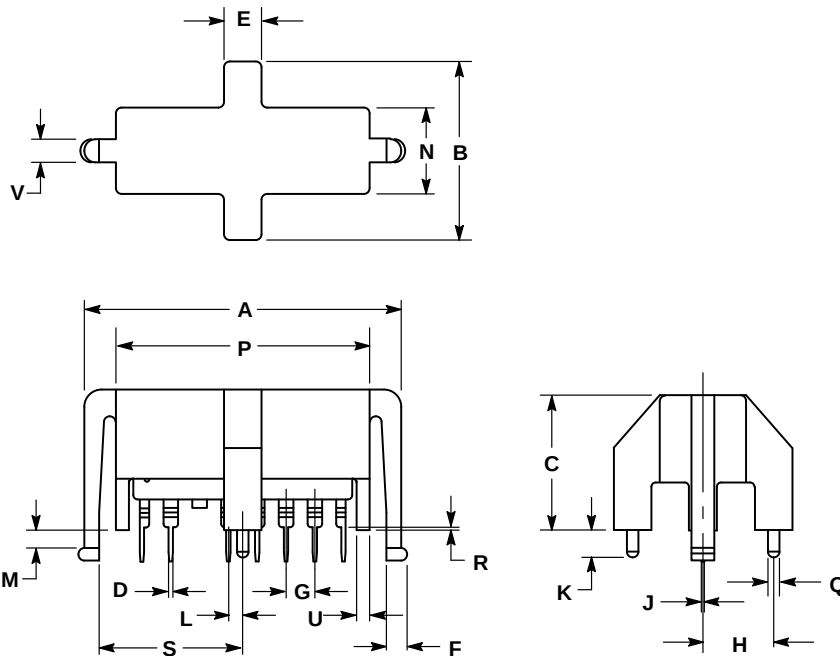


NOTES:

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	
H	0.008	0.015	0.20	0.38
J	0.115	0.135	2.92	3.43
K	0.300 BSC		7.62 BSC	
L	0°	10°	0°	10°
M	0.015	0.040	0.39	1.01

CASE 648C-03 ISSUE C DIP PACKAGE



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.095	1.110	27.18	28.19
B	0.600	0.640	15.24	16.26
C	0.428	0.434	10.87	11.02
D	0.016	0.020	0.41	0.51
E	0.125	0.135	3.18	3.43
F	0.063	0.068	1.60	1.73
G	0.095	0.105	1.65	2.67
H	0.236	0.244	5.99	6.20
J	0.009	0.011	0.23	0.28
K	0.114	0.124	2.90	3.15
L	0.045	0.055	1.14	1.40
M	0.058	0.065	1.47	1.65
N	0.295	0.305	7.49	7.75
P	0.875	0.885	22.22	22.48
Q	0.051	0.055	1.30	1.40
R	0.000	0.007	0.00	0.18
S	0.480	0.490	12.19	12.45
U	0.040	0.050	1.02	1.27
V	0.075	0.085	1.90	2.16

CASE 447-01 ISSUE A

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XMMAS500G/D

