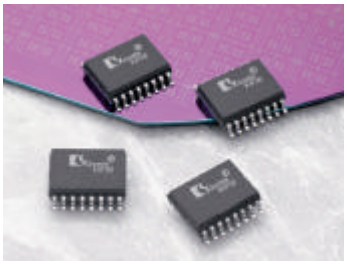
KXM60 Series

Accelerometers and Inclinometers
Analog Output

KXM60-1120 — Single Axis X

KXM60-1130 — Dual Axis XY



APPLICATIONS

Inclination and Tilt Sensing

Vibration Analysis

Static or Dynamic Acceleration

Inertial Navigation and Ded(uctive) Reckoning

Vehicle Stability Control

Vehicle Roll Detection

Vehicle Hill Hold

Vehicle Suspension Systems

Theft and Accident Alarms

GPS Recognition Assist

Platform Stabilization

Guidance Systems

FEATURES

Lead-free Solderability

High Shock Survivability

Excellent Temperature Performance

Very Low Noise Density

Low Power Consumption

User Definable Bandwidth

Factory Programmable Offset and Sensitivity

Self-test Function

PROPRIETARY TECHNOLOGY

These high-performance silicon micromachined linear accelerometers and inclinometers consists of a sensor element and an ASIC packaged in a standard 16-pin SOIC wide-body package. The sensor element is fabricated from single-crystal silicon with proprietary Deep Reactive Ion Etching (DRIE) processes, and is protected from the environment by a hermetically-sealed silicon cap wafer at the wafer level.

The KXM60 series is designed to provide a high signal-to-noise ratio with excellent performance over temperature. These sensors can accept supply voltages between 2.7V and 5.25V. Sensitivity is factory programmable allowing customization for applications requiring ±1to ±6g ranges. Sensor bandwidth is user-definable.

The sensor element functions on the principle of differential capacitance. Acceleration causes displacement of a silicon structure resulting in a change in capacitance. An ASIC, using a standard CMOS manufacturing process, detects and transforms changes in capacitance into an analog output voltage, which is proportional to acceleration. The sense element design utilizes common mode cancellation to decrease errors from process variation and environmental stress.

Precision in Motion

Kionix®

36 Thornwood Dr. - Ithaca, NY 14850 USA tel: 607-257-1080 - fax: 607-257-1146 - www.kionix.com - info@kionix.com

KXM60 Series

PRODUCT SPECIFICATIONS

PERFORMANCE SPECIFICATIONS [1]			
PARAMETERS	**UNITS**	**KXM60-1120 (x) KXM60-1130 (xy)**	**CONDITION**
Range [2]	g	±1.5	Factory programmable
Sensitivity	mV/g	1333	@5V
0g Offset vs. Temp.	mV	±133	Over temp range
	°C	-40 to 125 [3]	
Sensitivity vs. Temp	%	±2.0 typical (±3.0 max)	Over temp range
Span	mV	±2000	@ 5 V
Noise Density	$mg/\sqrt{Hz}$	40 typical (60 max)	
Bandwidth [4]	Hz	3000	-3dB
Non-Linearity	%	±0.1 typical (±0.5 max)	
Offset Ratiometric Error	% of FS	±0.4 typical (±1.5 max)	
Sensitivity Ratiometric Error	% of FS	±1.4 typical (±2.0 max)	
Cross-axis Sensitivity	%	±2.0 typical (±3.0 max)	
Power Supply	V	2.7 to 5.25	
	V	-0.3 (min) 7.0 (max)	Absolute min/max
	mA	3.9 typical (5.0 max)	Current draw @ 5V

ENVIRONMENTAL SPECIFICATIONS			
PARAMETERS	**UNITS**	**KXM60-1120 (x) KXM60-1130 (xy)**	**CONDITION**
Operating Temperature	°C	-40 to 125	Powered
Storage Temperature	°C	-55 to 150	Unpowered
Mechanical Shock	g	4600	Powered or unpowered, 0.5 msec halversine
ESD	V	3000	Human body model

Notes

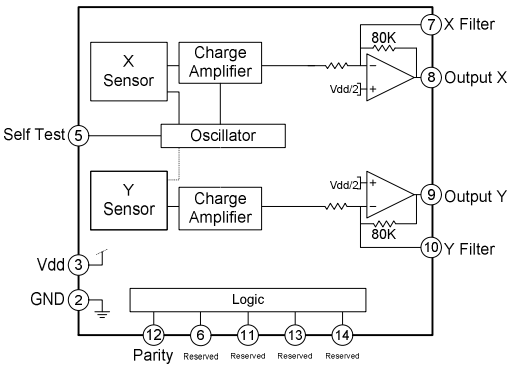
[1] The performance parameters are programmed and tested at 5 volts. However, the device can be powered from 2.7 V to 5.25 V. Performance parameters will change with supply voltage variations.

[2] Custom ranges from 1g to 6g available.

[3] Temperature range for specified offset.

[4] Lower bandwidth can be achieved by using the external C_2 and C_3. See application note on page 3.

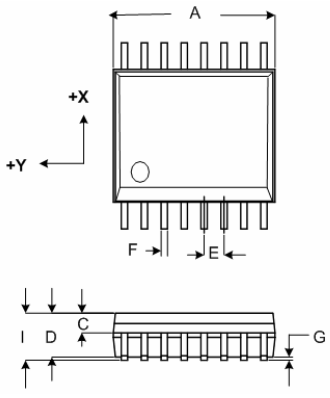
FUNCTIONAL DIAGRAM



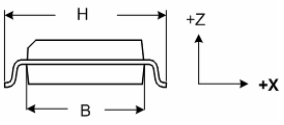
Notes

1. Acceleration in the sensitive axis(es) will cause a corresponding increase in output.
2. The packaged device weighs less than .44g gram.

16-PIN SOIC OVERMOLDED PACKAGE



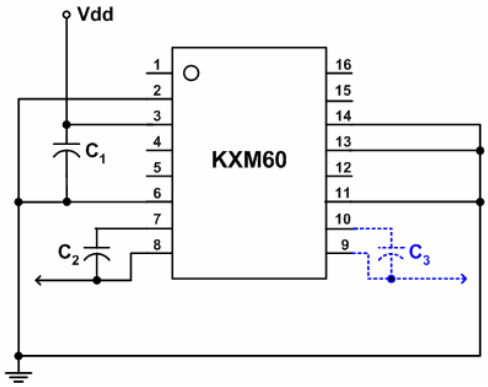
Dimension	Inches	Millimeters
A	0.406	10.31
B	0.296	7.52
C	0.043	1.09
D	0.096	2.44
E	0.050	1.27
F	0.016	0.41
G	0.007	0.18
H	0.406	10.31
I	0.103	2.62



KXM60 Series

APPLICATION SCHEMATIC & PIN FUNCTION TABLES

Pin	Single– Axis Function
1	DNC
2	GND
3	Vdd (+5V)
4	DNC
5	Self Test
6	Reserved
7	X Filter
8	Output X
9	DNC
10	DNC
11	Reserved
12	Parity
13	Reserved
14	Reserved
15	DNC
16	DNC



Pin	Dual-Axis Function
1	DNC
2	GND
3	Vdd (+5V)
4	DNC
5	Self Test
6	Reserved
7	X Filter
8	Output X
9	Output Y
10	Y Filter
11	Reserved
12	Parity
13	Reserved
14	Reserved
15	DNC
16	DNC

Definitions

C_2, C_3 An external capacitor is used to set the -3dB filter point for each sensor output.

DNC Do not connect.

f_{BW} Sensor bandwidth frequency needed in application (typ. 10Hz to 1500Hz).

Parity Checks EEPROM for parity error.

Reserved For factory use; recommend grounding.

Self Test The output of a properly functioning part will increase when 5V is applied to the self-test pin (#5).

Application Design Equations

The bandwidth can be adjusted with appropriate capacitors (C_2 and/or C_3) across pins 7 and 8 and across pins 9 and 10 respectively. The response is single pole. Given a desired bandwidth, f_{BW} (in Hertz), the filter capacitor, C_{BW} (in Farads), is determined by:

$$C_2 = C_3 = C_{BW} = \frac{1.99\ x10^{-6}}{f_{BW}}$$

Notes

1. Recommend using 0.1 µF for decoupling capacitor C_1.
2. Do not connect pins #9 and #10 on the single-axis device.
3. An evaluation board is available upon request.

ORDERING GUIDE

Product	Axis(es) of Sensitivity	Range	Sensitivity (mV/g)	Offset (V)	Operating Voltage (V)	Temperature	Package
KXM60-1120*	X	1.5g	1333	2.5	5	-40 to +125 °C	16-pin SOIC Overmolded
KXM60-1130**	XY	1.5g	1333	2.5	5	-40 to +125 °C	16-pin SOIC Overmolded

*The KXM60-1120 supercedes the KXB61 and KXB01.

**The KXM60-1130 supercedes the KXG61 and KXG11.

