
Page 1 of 5

	<h1>Single (X) Axis Accelerometer Specifications</h1>	PART NUMBER: KXM60-1138
---	---	--

Product Description

The KXM60-1138 is a single-axis, analog-output, silicon micromachined accelerometer with a full-scale output range of $\pm 5g$ ($49.0m/s^2$). The sense element is fabricated using Kionix's proprietary plasma micromachining process technology. Acceleration sensing is based on the principle of a differential capacitance arising from acceleration-induced motion of the sense element, which further utilizes common mode cancellation to decrease errors from process variation, temperature, and environmental stress. The sense element is hermetically sealed at the wafer level by bonding a second silicon lid wafer to the device using a glass frit. A separate ASIC device packaged with the sense element provides signal conditioning and self-test. The accelerometer is delivered in an overmolded, 16 pin SOIC wide body plastic package operating from a 2.7 – 5.25V DC supply.

Product Specifications

Parameters	Units	Min	Target	Max
Operating Temperature Range	°C	-40	-	125
Supply Voltage (V_{dd})	V	4.75	5.00	5.25
Minimum Output Voltage ¹	V	$0.08 * V_{dd}$	$0.10 * V_{dd}$	$0.12 * V_{dd}$
Maximum Output Voltage ¹	V	$0.88 * V_{dd}$	$0.90 * V_{dd}$	$0.92 * V_{dd}$
Zero-g Offset @ RT (25°C) ²	V	$0.48 * V_{dd}$	$0.50 * V_{dd}$	$0.52 * V_{dd}$
Zero-g Offset Error (-40...125°C) ³	mg	-100	-	100
Sensitivity @ RT (25°C, $V_{dd} = 5V$)	mV/g	395	400	405
Sensitivity @ RT (25°C)	mV/g	$79 * V_{dd}$	$80 * V_{dd}$	$81 * V_{dd}$
Sensitivity Error (-40...125°C) ⁴	%	-1.25	-	1.25
Offset Ratiometric Error ($V_{dd} = 5V \pm 5\%$)	% of FS	-	0.4	1.0
Sensitivity Ratiometric Error ($V_{dd} = 5V \pm 5\%$)	% of FS	-	1.4	1.75
Non-Linearity	%	-	0.1	0.5
Mechanical Over Range Stop (x,y)	g	65	75	85
Cross Axis Sensitivity	%	-	2.0	3.0
Self Test Output on Activation	g	0.9	1.1	1.3
Bandwidth (-3dB) ⁵	Hz	-	250	3100
Noise Density	$\mu g/rtHz$	-	40	60
Current Consumption ($V_{dd} = 5V$)	mA	-	3.9	5.0
Output Resistance	k Ω	64	80	96
Load Resistance	k Ω	5	10	-
Load Capacitance	pF	-	-	1000
Storage Temperature Range	°C	-55	-	150
Mech. Shock (w/ & w/o power)	g	-	-	3500
Drop test to concrete	m	-	-	1.2
ESD (human body model)	V	-	-	3000

Notes

¹ Output saturates at these values – readings outside this range indicate fault.

² Zero-g offset target applies with vertical programming orientation.



Single (X) Axis Accelerometer Specifications

PART NUMBER:
KXM60-1138

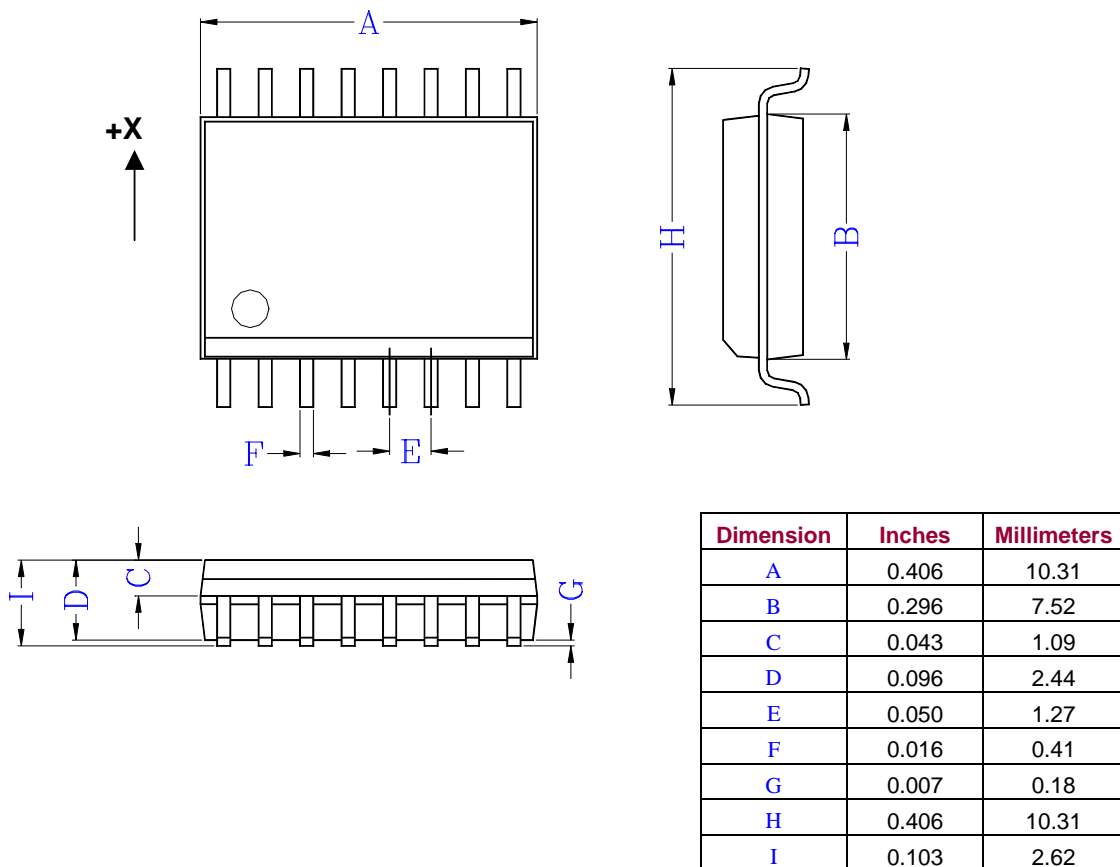
³ Zero-g offset error specified as $(V_{out}(0g) - V_{dd}/2) / V_{sens} [g]$ (room temp. error included); V_{sens} = Target sensitivity.

⁴ Sensitivity error specified as $(([V_{out}(+1g) + V_{out}(-1g)] / 2) - V_{sens}) / V_{sens} * 100\% [\%]$ (room temp. error included); V_{sens} = Target sensitivity.

⁵ User definable with external capacitors. Maximum bandwidth limited by the mechanical natural frequency of the sensor = 3100 ± 200 Hz.

Package Dimensions

Package Type: Overmolded 16-pin SOIC wide body package



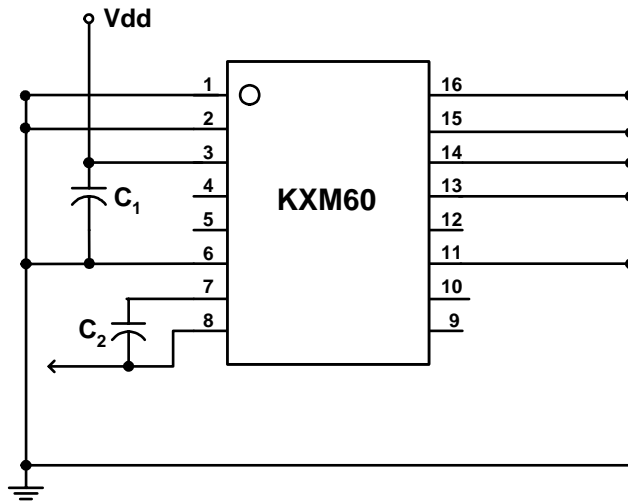
Note: When the device is accelerated in the +X direction, the output will increase.



Single (X) Axis Accelerometer Specifications

PART NUMBER:
KXM60-1138

Application Schematic



Pin	Internal Function	Recommended Connection
1	N/C	GND
2	GND	GND
3	Vdd	Vdd
4	Reserved	DNC
5	Self Test	Self Test
6	Reserved	GND
7	X filter	X filter
8	Output X	Output X
9	Reserved	DNC
10	Reserved	DNC
11	Reserved	GND
12	Parity	Parity
13	Reserved	GND
14	Reserved	GND
15	N/C	GND
16	N/C	GND


Performance Notes

- Recommend using 0.1 μF for the decoupling capacitor (C_1).
- A 1000 pF capacitor from the output to ground will reduce high frequency noise.
- Pin 2 must be power supply ground. Recommend grounding pins 1, 6, 11, 13, 14, 15, and 16.
- N/C – Not Connected, DNC – Do Not Connect
- Parity – Checks EEPROM for parity error. Output high on this pin indicates a parity error.
- The output of a properly functioning part will increase when 5V is applied to the self test pin (#5).
- The bandwidth can be adjusted with a capacitor (C_2) across pins 7 and 8. The response is single pole. Given a desired bandwidth, f_{BW} , the filter capacitor, C_{BW} , is determined by:

$$C_2 = C_{BW} = \frac{1.99 \times 10^{-6}}{f_{BW}}$$

- The startup time and self test response time are governed by the filter capacitor chosen and the output resistance of the accelerometer (R_{out}). The following equation can be used to calculate startup time, t_{start} (in seconds):

$$t_{start} = 5 * R_{out} * C_{BW}$$

	<h1>Single (X) Axis Accelerometer Specifications</h1>	PART NUMBER: KXM60-1138
---	---	--

Test Specifications



Special Characteristics:

These characteristics have been identified as being critical to the customer. Every part is tested to verify its conformance to specification prior to shipment.

Parameters	Specification	Test Conditions
Zero-g Offset @ RT	$2.5 \pm 0.1 \text{ V}$	25°C , $V_{dd} = 5.0\text{V}$
Zero-g Offset Error ($-40\dots125^{\circ}\text{C}$)	$\pm 100 \text{ mg}$	-40°C , 25°C , 125°C ; $V_{dd} = 5.0\text{V}$
Sensitivity @ RT	$400 \pm 5 \text{ mV/g}$	25°C , $V_{dd} = 5.0\text{V}$
Sensitivity Error ($-40\dots125^{\circ}\text{C}$)	$\pm 1.25\%$	-40°C , 25°C , 125°C ; $V_{dd} = 5.0\text{V}$
Offset Ratiometric Error	$< 1\% \text{ of FS}$	$V_{dd} = 5\text{V} \pm 5\%$
Sensitivity Ratiometric Error	$< 1.75\% \text{ of FS}$	$V_{dd} = 5\text{V} \pm 5\%$
Self Test Output on Activation	$1.1 \pm .2 \text{ g}$	25°C , $V_{dd} = 5.0\text{V}$
Non-Linearity	$< 0.5\%$	25°C , $V_{dd} = 5.0\text{V}$