Kionix®	**± 40g Tri-axis Analog Accelerometer Specifications**	**PART NUMBER:** **KX220-1072** **Rev. 1.0** **31-Oct-2017**

Product Description

The KX220-1072 is a Tri-axis, silicon micromachined accelerometer with a full-scale output range of ±40g (392 m/s/s). 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 a 3 x 3 x 0.9 mm Land Grid Array (LGA) plastic package operating from a 1.8V – 3.6V DC supply. The KX220 features an internal low pass filter that can be disabled or factory programmed to 50Hz, 100Hz, 500Hz, 1kHz, or 2kHz.

There are 2 factory programmable modes of operation for the KX220:

Mode 00 – The Enable pin must be **HIGH** for normal operation and **LOW** for power shutdown.

Mode 01 – The Enable pin must be **LOW** for normal operation and **HIGH** for power shutdown.

The KX220-1072 is factory programmed to be in MODE 00 with no low pass filter

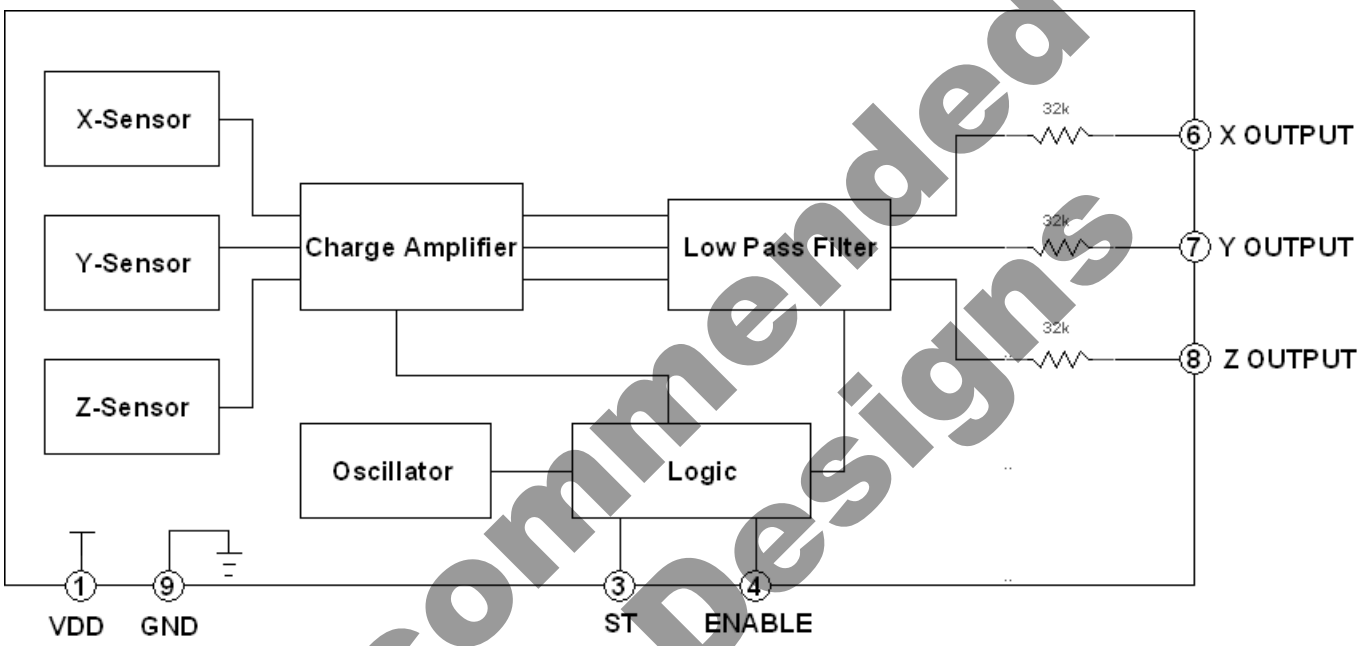
Features

- 3 x 3 x 0.9 mm LGA
- Wide signal bandwidth
- Factory-programmable internal low-pass filter (50Hz, 100Hz, 500Hz, 1kHz, 2kHz, no LPF)
- Analog outputs
- Good temperature performance
- Low current consumption: 5 µA in standby, 240 µA at full power
- Self-test function

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

Kionix®	**± 40g Tri-axis Analog Accelerometer Specifications**	**PART NUMBER:** **KX220-1072** **Rev. 1.0** **31-Oct-2017**

Functional Diagram



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

Kionix®	**± 40g Tri-axis Analog Accelerometer Specifications**	**PART NUMBER:** **KX220-1072** **Rev. 1.0** **31-Oct-2017**

Product Specifications

Mechanical

(specifications are for operation at 3.3V and T = 25C unless stated otherwise)

Parameters		Units	Min	Typical	Max
Operating Temperature Range		ºC	-40	-	85
Zero-g Offset		V	1.609	1.65	1.691
Zero-g Offset Variation from RT over Temp.		mg/ºC		1 (xy) 2 (z)	
Sensitivity		mV/g	30	33	36
Sensitivity Variation from RT over Temp.		%/ºC		0.01	
Offset Ratiometric Error (VDD = 3.3V ± 5%)		%		0.2	
Sensitivity Ratiometric Error (VDD = 3.3V ± 5%)		%		0.3	
Self Test Output change on Activation		g		2.5 (x) 2.4 (y) 1.7 (z)	
Signal Bandwidth (-3dB)		Hz		8000 (xy) 5100 (z)	
Non-Linearity		% of FS		0.3	
Cross Axis Sensitivity		%		2	
Spectral Noise Density	10Hz	µg / √Hz		915	
	100Hz			845	
	1000Hz			815	
Broadband Resolution	1Hz-10kHz	mg - rms		70	

Table 1: Mechanical Specifications

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

Electrical

(specifications are for operation at 3.3V and T = 25C unless stated otherwise)

Parameters		Units	Min	Typical	Max
Supply Voltage (VDD)	Operating	V	1.8	3.3	3.6
Current Consumption	Operating (full power)	µA	170	240	310
	Standby	µA		5	
Analog Output Resistance(R_{out})		kΩ	24	32	40
Input Low Voltage[3]		V			0.2 * VDD
Input High Voltage[3]		V	0.8 * VDD		
Power Up Time[1]		ms	-	$5*R_{out}*C$	-
Factory Programmable Low Pass Filter[2]		Hz		no low pass	

Table 2: Electrical Specifications

Notes:

1. Power up time is determined by 5 times the RC time constant of the factory programmed or user defined low pass filter.
2. Factory programmable to either have *no low pass* filter or have a switched capacitor low pass filter with cutoff frequency (-3dB) at *2kHz*, *1kHz*, *500Hz*, *100Hz*, or *50Hz*. Optionally, the user can lower the bandwidth with external capacitors connected to output pins 6, 7, and 8. Note, maximum is defined by the frequency response of the sensor itself (see Table 1 for details).
3. Digital input pin specification (pins Enable, ST)

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

Power-On Procedure

Proper functioning of power-on reset (POR) is dependent on the specific **VDD, VDD_{LOW}**, **T_{VDD}** (rise time), and **T_{VDD_OFF}** profile of individual applications. It is recommended to minimize **VDD_{LOW}**, and **T_{VDD}**, and maximize **T_{VDD_OFF}**. It is also advised that the **VDD** ramp up time **T_{VDD}** be monotonic. Note that the outputs will not be stable until **VDD** has reached its final value.

To assure proper POR, the application should be evaluated over the customer specified range of VDD, VDD_{LOW}, T_{VDD}, T_{VDD_OFF} and temperature as POR performance can vary depending on these parameters.

Please refer to Technical Note ***TN002 Power-On Procedure*** for more information.

Environmental

Parameters		Units	Min	Typical	Max
Supply Voltage (VDD)	Absolute Limits	V	-0.3	-	6.0
Operating Temperature Range		ºC	-40	-	85
Storage Temperature Range		ºC	-55	-	150
Mech. Shock (powered and unpowered)		g	-	-	5000 for 0.5ms 10000 for 0.2ms
ESD	HBM	V	-	-	2000

Table 3: Environmental Specifications

Caution: ESD Sensitive and Mechanical Shock Sensitive Component, improper handling can cause permanent damage to the device.

These products conform to RoHS Directive 2011/65/EU of the European Parliament and of the Council of the European Union that was issued June 8, 2011. Specifically, these products do not contain any non-exempted amounts of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE) above the maximum concentration values (MCV) by weight in any of its homogenous materials. Homogenous materials are “of uniform composition throughout”. The MCV for lead, mercury, hexavalent chromium, PBB, and PBDE is 0.10%. The MCV for cadmium is 0.010%.

Applicable Exemption: *7C-I - Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors (piezoelectronic devices) or in a glass or ceramic matrix compound.*

These products are also in conformance with REACH Regulation No 1907/2006 of the European Parliament and of the Council that was issued Dec. 30, 2011. They do not contain any Substances of Very High Concern (SVHC-174) as identified by the European Chemicals Agency as of 12 July 2017.

HF

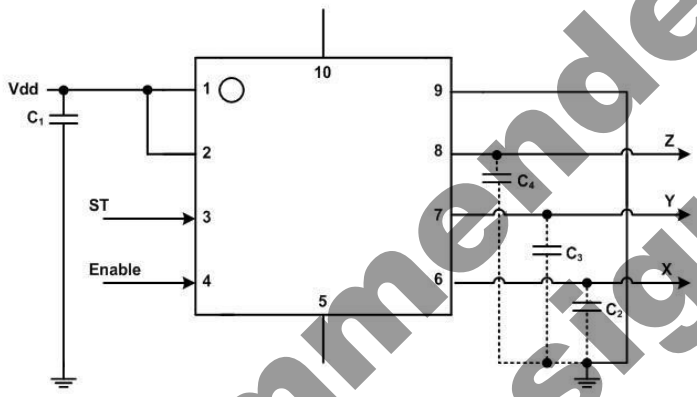
This product is halogen-free per IEC 61249-2-21. Specifically, the materials used in this product contain a maximum total halogen content of 1500 ppm with less than 900-ppm bromine and less than 900-ppm chlorine.

Soldering

Soldering recommendations are available upon request or from www.kionix.com.

Application Schematic and Pin Description

Application Schematic



Pin Description

Pin	Name	Description
1	VDD	The power supply input. Decouple this pin to ground with a 0.1uF ceramic capacitor (C1).
2	Res	Reserved. Connect to VDD or GND
3	ST	Self-Test: Logic LOW for Normal operation; Logic HIGH for self-test mode. Connect to GND if not used.
4	Enable	Enable (Logic HIGH for Normal Mode, Logic LOW for Power Down Mode).
5	NC	Not Connected Internally. Can be connected to VDD, GND, or leave floating.
6	X Output	Analog output of the x-channel. Optionally, a capacitor (C2) placed between this pin and GND will form a low pass filter.
7	Y Output	Analog output of the y-channel. Optionally, a capacitor (C3) placed between this pin and GND will form a low pass filter.
8	Z Output	Analog output of the z-channel. Optionally, a capacitor (C4) placed between this pin and GND will form a low pass filter.
9	GND	Ground
10	NC	Not Connected Internally. Can be connected to VDD, GND, or leave floating.

Table 4: Pin Description

Application Design Equations

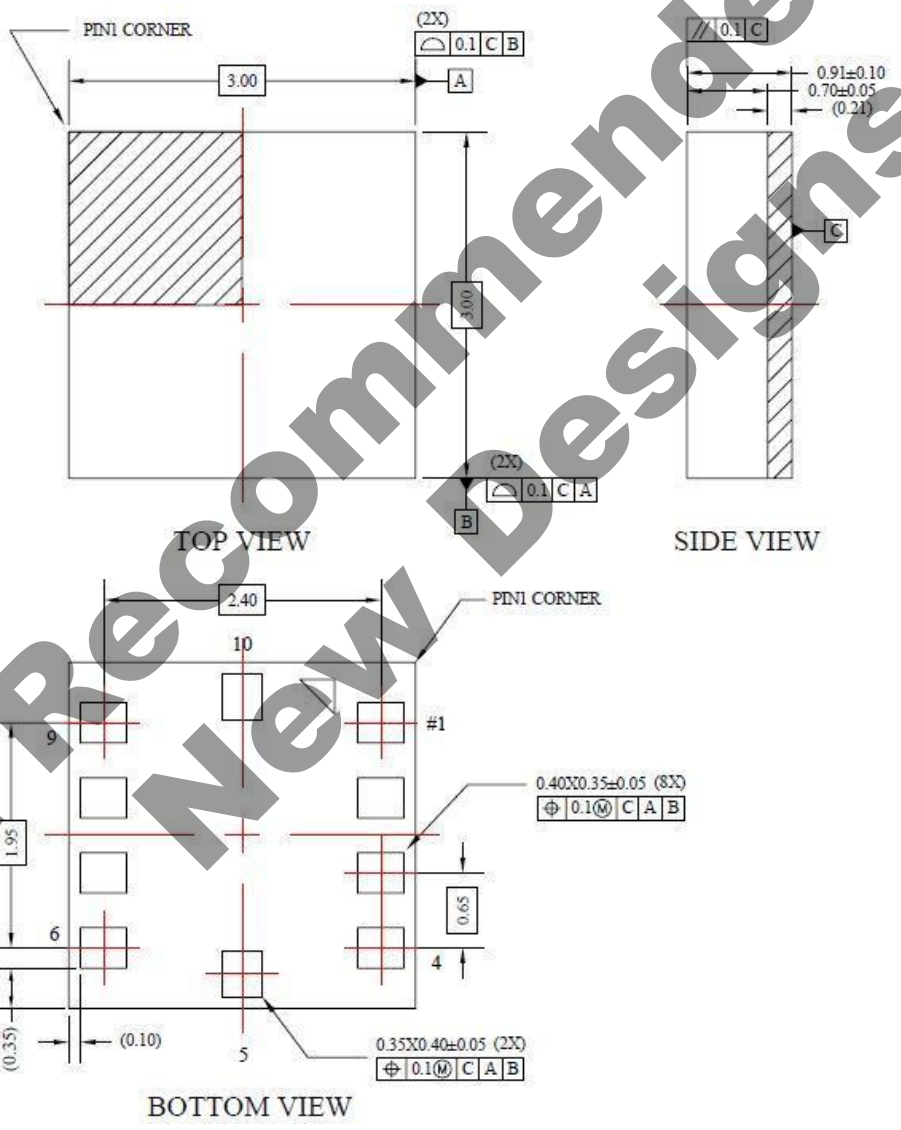
The bandwidth is determined by a factory programmable switched capacitor filter. The filter can be set at the factory to be 2kHz, 1kHz, 500Hz, 100Hz, 50Hz, or no low pass filter. Alternatively, bandwidth can be reduced by addition of a capacitor on the output pins 5, 6, and 7 according to the equation:

$$C_2 = C_3 = C_4 = \frac{4.97x10^{-6}}{f_{BW}}$$

Package Dimensions and Orientation

Dimensions

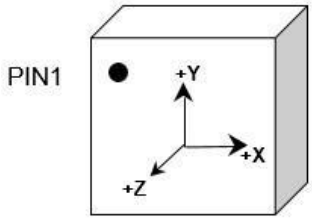
3 x 3 x 0.9 mm LGA



All dimensions and tolerances conform to ASME Y14.5M-1994

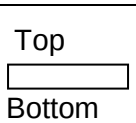
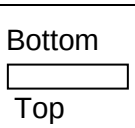
Kionix®	**± 40g Tri-axis Analog Accelerometer Specifications**	**PART NUMBER:** **KX220-1072** **Rev. 1.0** **31-Oct-2017**

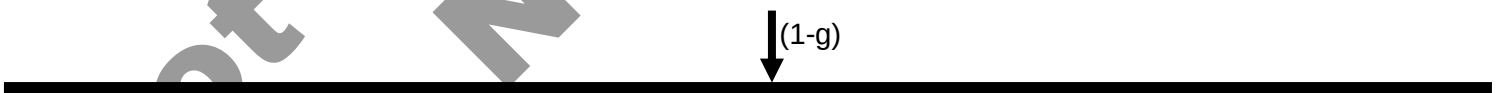
Orientation



When device is accelerated in +X, +Y or +Z direction, the corresponding output will increase.

Static X/Y/Z Output Response versus Orientation to Earth's surface (1g):

Position	1	2	3	4	5	6
Diagram						
X (V)	1.65 V	1.683 V	1.65 V	1.617 V	1.65 V	1.65 V
Y (V)	1.683 V	1.65 V	1.617 V	1.65 V	1.65 V	1.65 V
Z (V)	1.65 V	1.65 V	1.65 V	1.65 V	1.683 V	1.617 V
X-Polarity	0	+	0	-	0	0
Y-Polarity	+	0	-	0	0	0
Z-Polarity	0	0	0	0	+	-



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

Kionix®	**± 40g Tri-axis Analog Accelerometer Specifications**	**PART NUMBER:** **KX220-1072** **Rev. 1.0** **31-Oct-2017**

Revision History

Revision	Description	Date
1.0	Initial release	31-Oct-2017

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

Appendix

The following Notice is included to guide the use of Kionix products in its application and manufacturing processes. Kionix, Inc., is a ROHM Group company. For purposes of this Notice, the name “ROHM” would also imply Kionix, Inc.

Notice

Precaution on using ROHM Products

1. Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment (Note 1), transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASSⅡb	CLASSⅢ
CLASSⅣ		CLASSⅢ	

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
   [a] Installation of protection circuits or other protective devices to improve system safety
   [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

3. Our Products are designed and manufactured for use under standard conditions and not under any special or extraordinary environments or conditions, as exemplified below. Accordingly, ROHM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any ROHM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc, prior to use, must be necessary:
   [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
   [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
   [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
   [b] the temperature or humidity exceeds those recommended by ROHM
   [c] the Products are exposed to direct sunshine or condensation
   [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

Precaution for Foreign Exchange and Foreign Trade act

Since concerned goods might be fallen under listed items of export control prescribed by Foreign exchange and Foreign trade act, please consult with ROHM in case of export.

Precaution Regarding Intellectual Property Rights

1. All information and data including but not limited to application example contained in this document is for reference only. ROHM does not warrant that foregoing information or data will not infringe any intellectual property rights or any other rights of any third party regarding such information or data.

2. ROHM shall not have any obligations where the claims, actions or demands arising from the combination of the Products with other articles such as components, circuits, systems or external equipment (including software).

3. No license, expressly or implied, is granted hereby under any intellectual property rights or other rights of ROHM or any third parties with respect to the Products or the information contained in this document. Provided, however, that ROHM will not assert its intellectual property rights or other rights against you or your customers to the extent necessary to manufacture or sell products containing the Products, subject to the terms and conditions herein.

Other Precaution

1. This document may not be reprinted or reproduced, in whole or in part, without prior written consent of ROHM.

2. The Products may not be disassembled, converted, modified, reproduced or otherwise changed without prior written consent of ROHM.

3. In no event shall you use in any way whatsoever the Products and the related technical information contained in the Products or this document for any military purposes, including but not limited to, the development of mass-destruction weapons.

4. The proper names of companies or products described in this document are trademarks or registered trademarks of ROHM, its affiliated companies or third parties.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Accelerometers ***category:***

Click to view products by Kionix ***manufacturer:***

Other Similar products are found below :

AD22372Z-RL7 ADXL313WACPZ-RL 805M1-0050-01 MXC6655XA MMA7455LT 805M1-0200-01 810M1-0025X 832M1-0200 AIS328DQTR 832M1-0050 805-0050 AD22301 BMA253 ADXL354BEZ SCA620-EF8H1A-1 MC3413 MXC6244AU 3038-0500 ACH-01-04/10 4692 ADXL372BCCZ-RL7 735T 787-500 787AM8 793-6 793L 997-M4 HV101 HV102 HV200 PC420AR-10 PC420VP-50 PC420VR-10 786A 786A-IS 787A 787A-IS HT786A HT787A PC420VP-10 ADCMXL1021-1BMLZ ADIS16003CCCZ ADIS16006CCCZ ADIS16228CMLZ ADXL700WBRWZ-RL ADXL1003BCPZ ADXL103CE-REEL ADXL203CE-REEL ADXL206HDZ ADXL213AE