



# KXRB5 Series

## Accelerometers and Inclinometers

### FEATURES

- Very Small Package - 3x5x0.9mm LGA
- Low Power Consumption
- Multiplexed Analog or Digital SPI Interface
- Internal 1KHz Low Pass Filter
- Ultra Low Noise Density
- Lead-free Solderability
- Excellent Temperature Performance
- High Shock Survivability
- User Definable Bandwidth
- Factory Programmable Offset and Sensitivity
- A/D Converter and Auxiliary Input to Multiplexer
- Self-test Function

### PROPRIETARY TECHNOLOGY

These high-performance silicon micromachined linear accelerometers and inclinometers consist of a sensor element and an ASIC packaged in a 3x5x0.9 mm Land Grid Array (LGA). 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 at the wafer level.

The **KXRB5** series is designed to provide a high signal-to-noise ratio with excellent performance over temperature. These sensors can accept supply voltages between 2.5V and 5.25V. Sensitivity is factory programmable allowing customization for applications requiring from 1.5g to 6.0g ranges. Sensor bandwidth is user-definable. The auxiliary input to the A/D converter and multiplexer minimizes the need for external A/D converters.

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.

### MARKETS

#### APPLICATIONS

- Personal Navigation Devices*
  - Inertial Navigation and Dead Reckoning
- Cell Phones and Handheld PDAs*
  - Gesture Recognition
- Game Controllers & Computer Peripherals*
  - Inclination and Tilt Sensing
- Ultra-Mobile PCs/Laptops/Hard Disk*
  - Free-fall Detection
- Cameras and Video Equipment*
  - Image Stabilization
- Sports Diagnostic Equipment/Pedometers*
  - Static or Dynamic Acceleration



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### PERFORMANCE SPECIFICATIONS

The performance parameters below are programmed and tested at 3.0 and 3.3 volts respectively. However, the device can be factory programmed to accept supply voltages from 2.5 V to 5.25 V. Performance parameters will change with supply voltage variations.

| PERFORMANCE SPECIFICATIONS   |                                |                                      |                       |                                               |
|------------------------------|--------------------------------|--------------------------------------|-----------------------|-----------------------------------------------|
| PARAMETERS                   | UNITS                          | KXRB5-2042                           | KXRB5-2050            | CONDITION                                     |
| Range <sup>1</sup>           | g                              | ±2.0                                 |                       | Factory programmable                          |
| Sensitivity                  | mV/g                           | 600 typical (618 max)                | 660 typical (680 max) |                                               |
| 0g Offset vs. Temp.          | mg/°C                          | ±0.2 typical                         |                       |                                               |
| Sensitivity vs. Temp         | %/°C                           | ±0.01 (xy) typical ±0.02 (z) typical |                       |                                               |
| Noise                        |                                | 45 typical                           |                       |                                               |
| Bandwidth <sup>2</sup>       | $\mu\text{g} \sqrt{\text{Hz}}$ | 1000 typical                         |                       | -3dB                                          |
| Non-Linearity                | % of FS                        | 0.1 typical                          |                       | % of full scale output                        |
| Ratiometric Error            | %                              | 0.2 typical                          |                       | Vdd ± 5%                                      |
| Cross-axis Sensitivity       | %                              | 2.0 typical                          |                       |                                               |
| Power Supply                 | V                              | 3.0                                  | 3.3                   | Standard                                      |
| Current Consumption          | μA                             | 500 typical (700 max)                |                       | Operating                                     |
|                              | μA                             | 1 typical                            |                       | Standby                                       |
| ENVIRONMENTAL SPECIFICATIONS |                                |                                      |                       |                                               |
| PARAMETERS                   | UNITS                          | KXRB5-2042                           | KXRB5-2050            | CONDITION                                     |
| Operating Temperature        | °C                             | -40 to 85                            |                       | Powered                                       |
| Storage Temperature          | °C                             | -55 to 150                           |                       | Un-powered                                    |
| Mechanical Shock             | g                              | 5000                                 |                       | Powered or un-powered,<br>0.5 msec halversine |
| ESD                          | V                              | 3000                                 |                       | Human body model                              |

### NOTES

<sup>1</sup> Custom ranges from 1.5g to 6.0g available.

<sup>2</sup> Internal low pass filter. Lower frequencies are user definable with external capacitors.

### ORDERING GUIDE

| Product           | Output             | Axis(es) of Sensitivity | Range (g) | Sensitivity mV/g | Offset (V) | Operating Voltage (V) | Temperature (°C) | Package     |
|-------------------|--------------------|-------------------------|-----------|------------------|------------|-----------------------|------------------|-------------|
| <b>KXRB5-2042</b> | Multiplexed Analog | XYZ                     | 2         | 600              | 1.5        | 3.0                   | -40 to +85       | 3x5x0.9 LGA |
| <b>KXRB5-2050</b> | Multiplexed Analog | XYZ                     | 2         | 660              | 1.65       | 3.3                   | -40 to +85       | 3x5x0.9 LGA |

Contact Kionix for part number assignments with SPI output.