



# KXPB5 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
- Low Noise
- Lead-free Solderability
- Excellent Temperature Performance
- High Shock Survivability
- Selectable Power Reduction Modes
- User Definable Bandwidth
- Factory Programmable Offset and Sensitivity
- 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 KXPB5 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  $\pm 1.5g$  to  $\pm 6.0g$  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. This voltage is digitized by an on-board A/D converter and is accessed via a serial peripheral interface (SPI).

### MARKETS

#### APPLICATIONS

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



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### PERFORMANCE SPECIFICATIONS

The performance parameters below are programmed and tested at 3.3 volts. 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	KXPB5-2050	KXPB5-2353	CONDITION
Range <sup>1</sup>	g	±2.0		Factory programmable
Sensitivity	mV/g	660 typical (680 max)	Not applicable	
	counts/g	Not applicable	819 target (844 max)	12-bit operation
0g Offset vs. Temp.	mg/°C	±0.6 typical		
Sensitivity vs. Temp	%/°C	±0.005 typical		
Noise	$\mu\text{g} / \sqrt{\text{Hz}}$	175 typical		
Bandwidth <sup>2</sup>	Hz	1000		-3dB
Non-Linearity	%	0.1 typical		% of full scale output
Ratiometric Error	%	0.3 typical (1.5 max)	0.4 typical (1.5 max)	3.3V ± 5%
Cross-axis Sensitivity	%	2.0 typical		
A/D Conversion Time	μS	Not applicable	40 typical	
SPI Communication Rate <sup>3</sup>	MHz	Not Applicable	5 typical	
Power Supply	V	3.3		Standard
Current Consumption	mA	0.5 typical (0.7 max)		Operating
	nA	1.2 typical		Standby
ENVIRONMENTAL SPECIFICATIONS				
PARAMETERS	UNITS	KXPB5-2050	KXPB5-2353	CONDITION
Operating Temperature	°C	-40 to 85		Powered
Storage Temperature	°C	-55 to 150		Un-powered
Mechanical Shock	g	5000		Powered or un-powered, 0.5 msec halversine
ESD	V	3000		Human body model

### NOTES

<sup>1</sup> Custom ranges from 1.5g to 6g available.

<sup>2</sup> Internal 1 kHz low pass filter. Lower frequencies are user definable with external capacitors.

<sup>3</sup> SPI communication rate can be optimized for faster communication.

### ORDERING GUIDE

Product	Output	Axis(es) of Sensitivity	Range (g)	Sensitivity	Offset (V)	Operating Voltage (V)	Temperature (°C)	Package
<b>KXPB5-2050</b>	Multiplexed Analog	XYZ	2	660 (mV/g)	1.65 (V)	3.3	-40 to +85	3x5x0.9 LGA
<b>KXPB5-2353</b>	Digital SPI	XYZ	2	819 (counts)	2048 (counts)	3.3	-40 to +85	3x5x0.9 LGA