

# **KXPS5 Series**

### Accelerometers and Inclinometers

### **FEATURES**

Very Small Package - 3x5x0.9mm LGA I<sup>2</sup>C/SPI Interface and Analog Outputs Free-fall Interrupt Output High-g Motion Interrupt Output Low Noise

Lead-free Solderability
Excellent Temperature Performance
High Shock Survivability
Low Power Consumption
Selectable Power Reduction Modes
User Definable Bandwidth
Factory Programmable Offset and Sensitivity
Self-test Function

### **MARKETS**

### **APPLICATIONS**

Hard Disk Drives/Laptops

Free-fall Detection

Cell Phones and Handheld PDAs

Gesture Recognition

Game Controllers and Computer Peripherals

Inclination and Tilt Sensing

Cameras and Video Equipment

Image Stabilization

Sports Diagnostic Equipment/Pedometers

Static or Dynamic Acceleration

Personal Navigation Devices

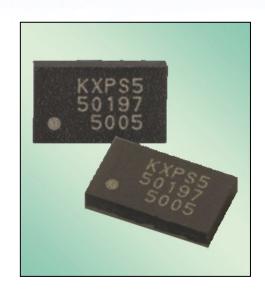
Inertial Navigation and Dead Reckoning

#### PROPRIETARY TECHNOLOGY

These high-performance silicon micromachined linear accelerometers and inclinometers consist of a sensor element and an ASIC packaged in a 3x5x0.9mm 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 KXPS5 series is designed to provide a high signal-to-noise ratio with excellent performance over temperature. These sensors can accept supply voltages between 1.8V and 5.25V. Sensitivity is factory programmable allowing customization for applications requiring from  $\pm 1.5$ g to  $\pm 6.0$ g ranges. Sensor bandwidth is user-definable. Interrupts can be generated for acceleration on any axis above a threshold value (Motion Interrupt) or for acceleration on all three axes below a threshold value (Free-fall Interrupt).

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 an inter-integrated circuit ( $I^2C$ ) bus or serial peripheral interface (SPI).



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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 1.8 V to 5.25 V. Performance parameters will change with supply voltage variations.

	PERFORMAN	ICE SPECIFICATIONS		
PARAMETERS	UNITS	KXPS5-3157	<b>CONDITION</b> Factory programmable	
Range <sup>1</sup>	g	±3.0		
Sensitivity	mV/g	440 typical (449 max)	12 bit operation	
0g Offset vs. Temp.	mg/°C	±1 max		
Sensitivity vs. Temp	%/°C	±0.03 max		
Noise	$\mu g / \sqrt{Hz}$	175 (typical) 250 (max)		
Bandwidth <sup>2</sup>	Hz	1000	-3dB	
Non-Linearity	% of FS	0.1 typical (0.5 max)	% of full scale output	
Ratiometric Error	%	3.5 max	Vdd=3.3V ± 10%	
Cross-axis Sensitivity	%	2.0 typical (3.0 max)		
A/D Conversion Time	μS	200 typical		
SPI Communication Rate <sup>3</sup>	MHz	1 typical		
I <sup>2</sup> C Communication Rate	KHz	400 typical		
Power Supply	V	3.3	Standard	
Current Consumption	μΑ	800 typical (1000 max)	Operating	
Current Consumption	μΑ	0.0012 typical	Standby	
	ENVIRONMEN	NTAL SPECIFICATIONS		
PARAMETERS	UNITS	KXPS5-3157	CONDITION	
Operating Temperature	°C	-40 to 85	Powered	
Storage Temperature	°C	-55 to 150	Un-powered	
Mechanical Shock	g	5000 Powered or un-po 0.5 msec halve		
ESD	V	2000 Human body m		

### **NOTES**

### **ORDERING GUIDE**

Product	Axis(es) of Sensitivity	Range (g)	Sensitivity (mV/g)	Offset (V)	Operating Voltage (V)	Temperature (°C)	Package
KXPS5-1050	XYZ	2	560	1.40	2.8	-40 to +85	3x5x0.9 LGA
KXPS5-2050	XYZ	2	660	1.65	3.3	-40 to +85	3x5x0.9 LGA
KXPS5-3157	XYZ	3	440	1.65	3.3	-40 to +85	3x5x0.9 LGA
KXPS5-4457	XYZ	3	240	0.90	1.8	-25 to +70	3x5x0.9 LGA

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