



KXPS5 Series

Accelerometers and Inclinometers

FEATURES

- Very Small Package - 3x5x0.9mm LGA
- I²C/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

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 $\pm 1.5g$ to $\pm 6.0g$ 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 (I²C) bus or serial peripheral interface (SPI).

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



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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.

PERFORMANCE SPECIFICATIONS			
PARAMETERS	UNITS	KXPS5-3157	CONDITION
Range ¹	g	±3.0	Factory programmable
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	$\mu\text{g} / \sqrt{\text{Hz}}$	175 (typical) 250 (max)	
Bandwidth ²	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 ³	MHz	1 typical	
I ² C Communication Rate	KHz	400 typical	
Power Supply	V	3.3	Standard
Current Consumption	μA	800 typical (1000 max)	Operating
	μA	0.0012 typical	Standby
ENVIRONMENTAL 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-powered, 0.5 msec halversine
ESD	V	2000	Human body model

NOTES

¹ Custom ranges from 1.5g to 6g available.

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

³ SPI communication rate can be optimized for faster communication.

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