



# KXR94 Series

## Accelerometers and Inclinometers

### FEATURES

- Small Package - 5x5x1.2mm DFN
- Multiplexed Analog or Digital SPI Interface
- Internal 1KHz Low Pass Filter
- Low Noise
- Lead-free Solderability
- Excellent Temperature Performance
- High Shock Survivability
- Low Power Consumption
- 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 5x5x1.2mm Dual Flat No-lead (DFN). 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 **KXR94** series is designed to provide a high signal-to-noise ratio with integrated temperature compensation that provides 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  $\pm 1.0g$  to  $\pm 4.0g$  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. The sense element design utilizes common mode cancellation to decrease errors from process variation and environmental stress. Available in analog and multiplexed analog outputs and serial peripheral interface (SPI).

### MARKETS

#### APPLICATIONS

##### *Automotive*

- Stability Control
- Telematics/GPS
- Theft and Accident Alarms

##### *Personal Navigation Devices*

- Inertial Navigation and Dead Reckoning

##### *Cell Phones and Handheld PDAs*

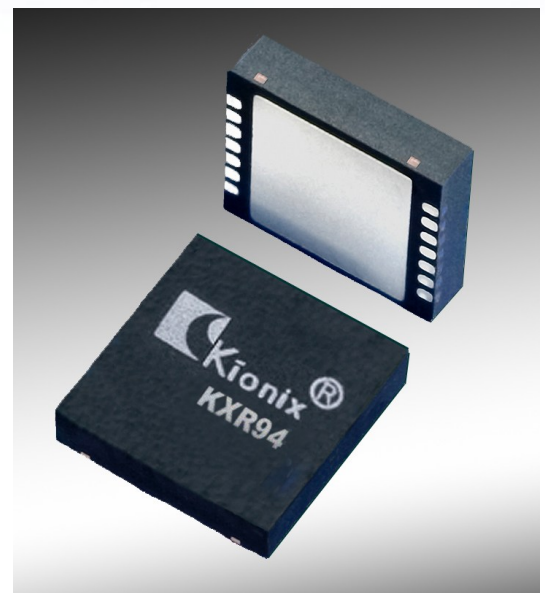
- Gesture Recognition

##### *Cameras and Video Equipment*

- Image Stabilization

##### *Industrial*

- Platform Stabilization
- Drill Orientation



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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	KXR94-2050	KXR94-2353	CONDITION
Range <sup>1</sup>	g	±2.0		Factory programmable
Sensitivity	mV/g	660 typical (673 max)	Not applicable	12-bit operation
	counts/g	Not applicable	819 target (835 max)	
0g Offset vs. Temp.	mg/°C	±0.2 typical		
Sensitivity vs. Temp	%/°C	±0.01 (xy) ±0.02 (z) typical		
Noise Density	$\mu\text{g} / \sqrt{\text{Hz}}$	45 typical		
Bandwidth <sup>2</sup>	Hz	800		-3dB
Non-Linearity	% of FS	0.1 typical		% of full scale output
Ratiometric Error	%	±1.25 (xy) ±0.2 (z) typical		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	1.03 typical	0.95 typical	Operating
	μA	5 max		Standby
ENVIRONMENTAL SPECIFICATIONS				
PARAMETERS	UNITS	KXR94-2050	KXR94-2353	CONDITION
Operating Temperature	°C	-40 to 85 (Consumer/Industrial)		Powered
		-40 to 125 (Automotive)		
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 1.0g to 4.0g available.

<sup>2</sup> Internal 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	Axis(es) of Sensitivity	Range (g)	Sensitivity	Offset	Operating Voltage (V)	Ouput	Temperature (°C)	Package
<b>KXR94-1050</b>	XYZ	2	560 (mV/g)	1.4 V	2.8	Mux Analog	-40 to +85	5x5x1.2 DFN
<b>KXR94-2050</b>	XYZ	2	660 (mV/g)	1.65V	3.3	Mux Analog	-40 to +85	5x5x1.2 DFN
<b>KXR94-2283</b>	XYZ	2	1000 (mV/g)	2.5V	5.0	Mux Analog	-40 to +85	5x5x1.2 DFN
<b>KXR94-2353</b>	XYZ	2	819 (counts/g)	2048 counts	3.3	Digital SPI	-40 to +85	5x5x1.2 DFN
<b>KXR94-7050</b>	XYZ	2	660 (mV/g)	1.65V	3.3	Mux Analog	-40 to 125	5x5x1.2 DFN