



# KXTC9 Series

## Accelerometers and Inclinometers

### FEATURES

- Ultra-small Package - 3x3x0.9mm LGA
- Analog Output
- Low Power Consumption
- Factory-programmable Internal Low Pass Filter
- Low Noise
- Lead-free Solderability
- Excellent Temperature Performance
- High Shock Survivability
- User-definable Bandwidth
- Factory-programmable Offset and Sensitivity
- Self-test Function

### MARKETS

#### APPLICATIONS

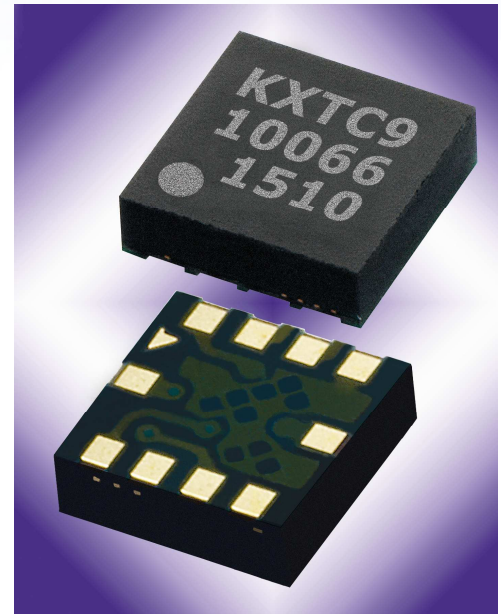
- Cell Phones and Handheld PDAs*
  - Gesture Recognition
- Ultra-mobile PCs/Laptops/Hard Disk Drives*
  - Free-fall Detection
- Game Controllers & Computer Peripherals*
  - Inclination and Tilt Sensing
- Cameras and Video Equipment*
  - Image Stabilization
- Sports Diagnostic Equipment/Pedometers*
 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

### PROPRIETARY TECHNOLOGY

The **KXTC9** 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 3.6V. Sensitivity is factory programmable allowing customization for applications requiring from  $\pm 1.5g$  to  $\pm 6g$  ranges. Several pre-set internal low pass filters can eliminate the need for external filter capacitors. If the pre-set values are not optimal for an application, the sensor bandwidth is user-definable with the use of external capacitors.

These high-performance silicon micromachined linear accelerometers and inclinometers consist of a sensor element and an ASIC packaged in a 3x3x0.9mm Land Grid Array Dual (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 sensor element functions on the principle of differential capacitance. Acceleration causes displacement of a silicon structure resulting in a change in capacitance. An ASIC, fabricated 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.



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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 1.8V to 3.6V. Performance parameters will change with supply voltage variations.

| PERFORMANCE SPECIFICATIONS        |                     |                                                                       |                                     |
|-----------------------------------|---------------------|-----------------------------------------------------------------------|-------------------------------------|
| PARAMETERS                        | UNITS               | KXTC9-2050                                                            | CONDITION                           |
| Range <sup>1</sup>                | g                   | ±2.0                                                                  | Factory programmable                |
| Sensitivity                       | mV/g                | 660 typical                                                           |                                     |
| 0g Offset vs. Temp                | mg/°C               | ±0.7 (xy) ±0.4 (z) typical                                            | -40°C to +85°C                      |
| Sensitivity vs. Temp              | %/°C                | ±0.01 (xy) ±0.04 (z) typical                                          | -40°C to +85°C                      |
| Noise Density (on filter pins)    | $\mu g / \sqrt{Hz}$ | 125 typical                                                           |                                     |
| Mechanical Resonance <sup>2</sup> | Hz                  | 3500 (xy) 1800 (z)                                                    | -3dB                                |
| LPF Bandwidth                     | Hz                  | 50 default<br>100, 500, 1000, 2000, no filter<br>(available settings) | Factory programmable                |
| Non-Linearity                     | % of FS             | 0.1 typical                                                           | % of full scale output              |
| Ratiometric Error                 | %                   | ±0.3 (x,y) typical ±0.15 (z)                                          | 3.3V ± 5%                           |
| Cross-axis Sensitivity            | %                   | 2.0 typical                                                           |                                     |
| Power Supply                      | V                   | 3.3                                                                   | Standard                            |
| Current Consumption               | μA                  | 240 typical                                                           | Operating                           |
|                                   | μA                  | 5 typical                                                             | Standby                             |
| ENVIRONMENTAL SPECIFICATIONS      |                     |                                                                       |                                     |
| PARAMETERS                        | UNITS               | KXTC9-2050                                                            | CONDITION                           |
| Operating Temperature             | °C                  | -40 to +85 (consumer)                                                 | Powered                             |
| Storage Temperature               | °C                  | -55 to 150                                                            | Un-powered                          |
| Mechanical Shock                  | g                   | 5,000 for 0.5 ms<br>10,000 for 0.2 ms                                 | Powered or un-powered<br>halversine |
| ESD                               | V                   | 2,000                                                                 | Human body model                    |

### NOTES

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

<sup>2</sup> Resonance as defined by the dampened mechanical sensor.

### ORDERING GUIDE

| Product    | Axis(es) of Sensitivity | Range (g) | Sensitivity (mV/g) | Offset (V) | Operating Voltage (V) | Temperature (°C) | Package       |
|------------|-------------------------|-----------|--------------------|------------|-----------------------|------------------|---------------|
| KXTC9-2050 | XYZ                     | 2         | 660                | 1.65       | 3.3                   | -40 to +85       | 3x3x0.9mm LGA |