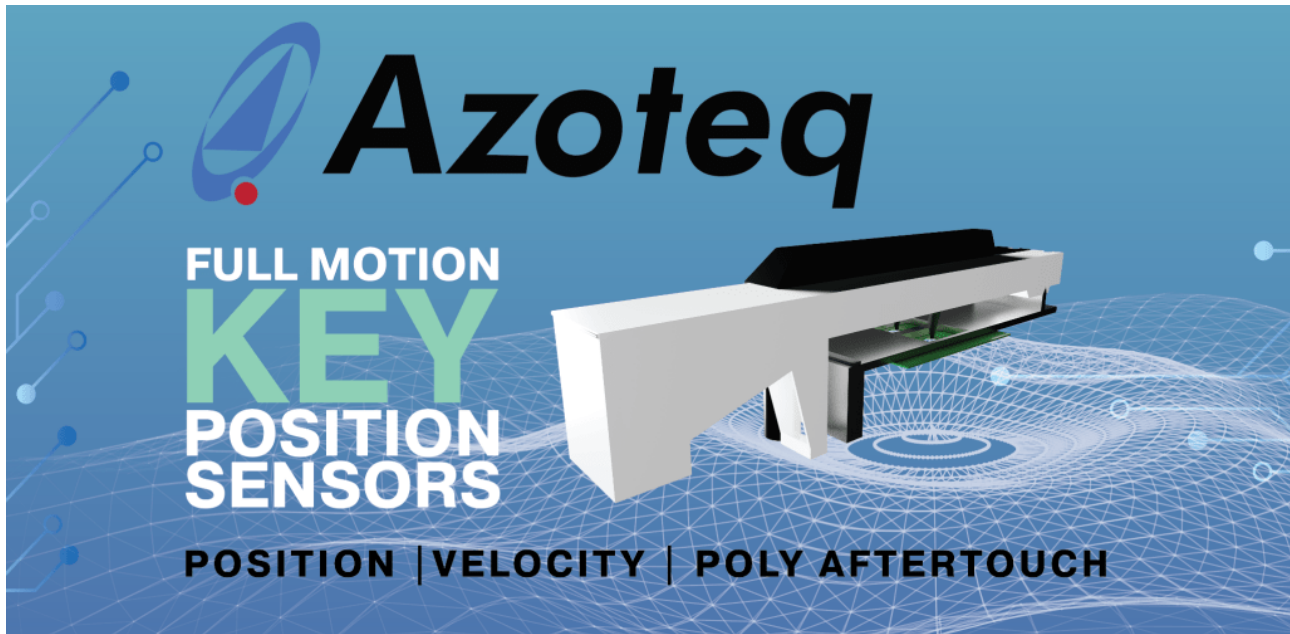




Azoteq Key Position Sensor Module

Azoteq is an IP-rich fabless semiconductor design house that pioneered multi-sensor technology on a single chip. It enables novel sensing applications for high-volume consumer goods. Azoteq sensor solutions are perfectly suited for integration in musical instruments.



1 Azoteq Full Motion Key Positional Sensor Module

- > High resolution key motion (position vs time) data output on SPI
- > Replaces traditional switch-based key sensors
- > Polyphonic (poly) aftertouch via the same sensor
- > Replaces the existing sensor module without modification to the key action
- > Provides note on/off trigger velocities and continuous position using one inductive sensor

2 Output: Key Position and Derived Data

- > Accurate position sampling, with clean, linear output
- > High accuracy velocity, measured through the full keystroke
- > Poly aftertouch available from the same sensor, no added cost
- > Programmable threshold-triggered events
- > Programmable lookup tables (LUTs) to transform position and derived data
- > Many configurable filter stages are available to balance resolution with response rate
- > Filter stages may be configured to derive instantaneous key velocities and accelerations (additional to "switch"-like trigger velocities)

3 Proven Technology

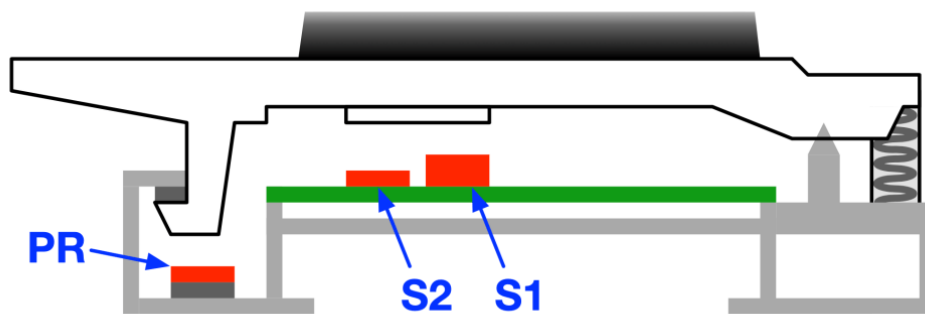
- > Azoteq inductive sensors are based on a mature sensing platform developed for the gaming keyboard market

4 Sensor Solutions

4.1 Traditional Key Action

Keyboards in digital pianos and synthesizers typically have two switches under each key to measure key velocity. Poly aftertouch requires an additional pressure sensor to be added for each key.

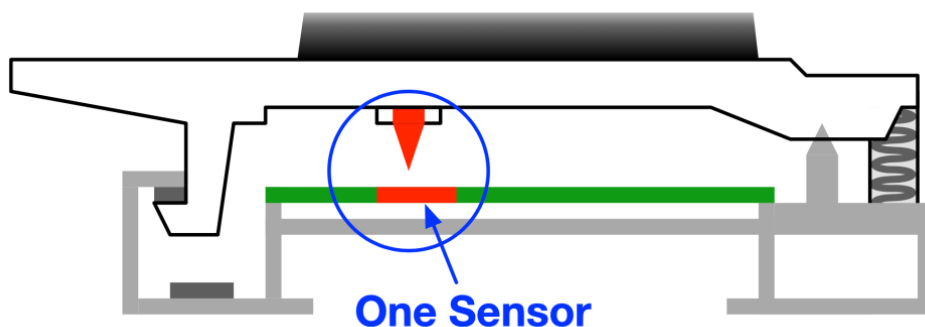
The velocity of the musician's touch is measured when the key moves down. The key first hits the S1 switch and then the S2 switch. A processor measures the time between these two events to determine the key velocity for musical dynamics.



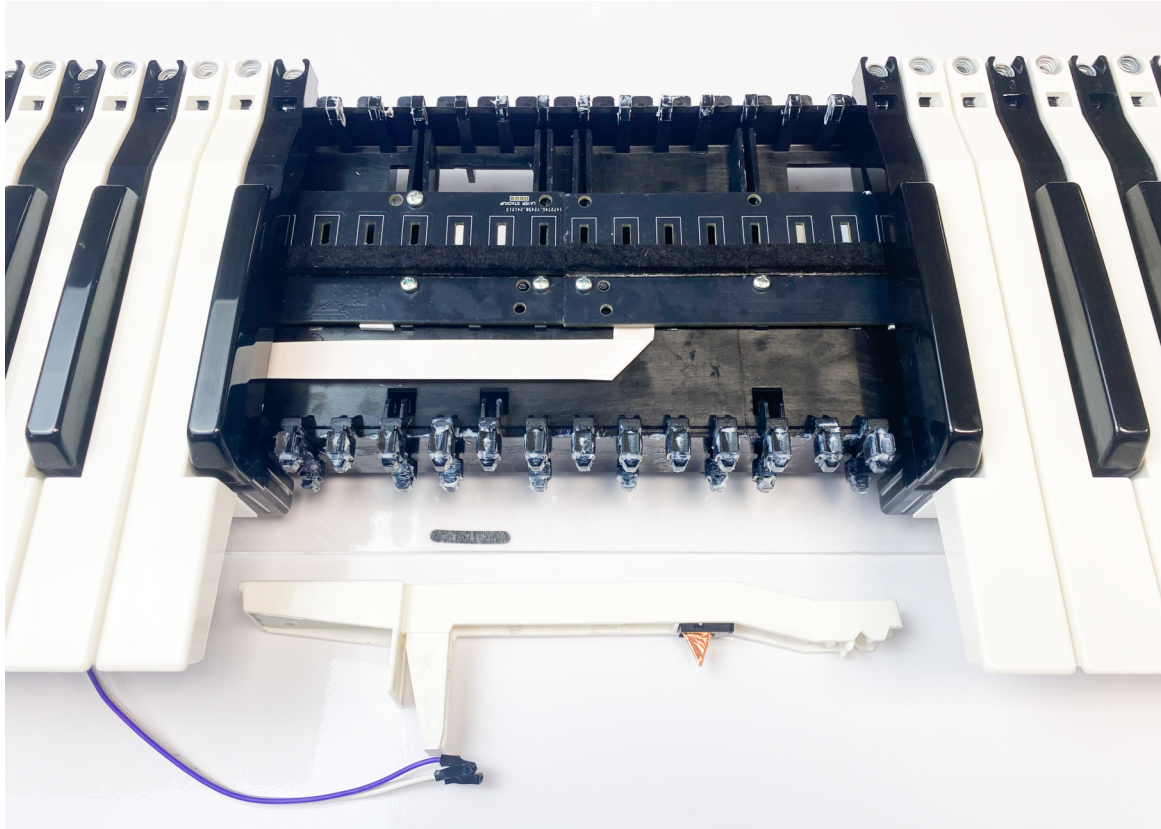
Some keyboards also add a pressure sensor (PR), used to capture “aftertouch”. This is most often a single sensor shared by all keys across the keyboard. Sometimes, each key has a pressure sensor for more expressive polyphonic aftertouch, adding more complexity and cost.

4.2 Azoteq Key Position Sensor

Using inductive sensing technology from Azoteq, a single key position sensor replaces traditional switches and pressure sensors, providing velocity sensing and positional awareness over the full down and up strokes, together with poly aftertouch.



A single sensor measures key position and instantaneous velocity over the full keystroke, capturing the musician's musical expression more accurately.



The thresholds at which notes are triggered are programmable. Multiple independent threshold triggers are possible. For example, key velocity may be determined at multiple places in the keystroke to assist with the emulation of hammer momentum on an acoustic piano action. Low-placed trigger points may be used for synthesizer control, whereas high-placed trigger points may be preferred for organ keyboards. Or, all three trigger ranges may be combined and used simultaneously.

The key position sensor also replaces the per-key pressure sensors required for polyphonic aftertouch, with no added components or cost.

Unlike traditional switches, the inductive sensor is a non-contact mechanism. There is no physical contact between mechanical parts and electronics. Therefore, the sensor is not susceptible to wear and tear, and is minimally affected by dust, light, fluids, or the environment.





5 Key Position Sensor Evaluation Kit

A two-octave keyboard sensor evaluation kit is available:

- > SPI Output provides direct access to active key position and derived data output.
- > USB Output provides several MIDI output modes for immediate evaluation and testing.





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