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A high-sensitive current-mode pressure/force detector based on piezoelectric polymer PVDF

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Highlights

- Programmable sensor with detection of achieved level of the applied pressure/force.
- Accurate [transient responses](#), with immunity to noise and disturbances.
- Sensor can be realized in form of current-mode IC with much greater autonomy.
- The [dynamic pressure](#) response of the sensor was experimentally verified.
- The sensor sensitivity was 0.08 mV/Pa over a frequency range of 5 Hz – 1 kHz.

Abstract

This paper introduces new electronic sensor circuits based on the usage of a piezoelectric Polyvinylidene fluoride-PVDF pressure detector coupled with a current-mode instrumentation amplifier, Schmitt comparator, and only grounded resistors. Pressure/force is measured in terms of the charge generated by the PVDF element as a result of the direct piezoelectric effect. The experimental test results demonstrated that the dynamic pressure response, the sensitivity and

linearity of the designed sensor were higher than the sensitivity and linearity of a traditional piezoelectric sensor. The sensitivity of the PVDF sensor was 0.08 mV/Pa. The detector is calibrated over a frequency range of 1 Hz–1 kHz. The proposed signal conditioning electronics offer a potential for future miniaturization in order to be integrated with different commercial devices, for detecting certain tiny activities including finger movements, robotics and smart electronic devices.

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Keywords

Pressure sensor; PVDF; Current-mode processing; Schmitt comparator; Simulation; Experimental results

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