

Development of Piezoelectric Flow Sensor For Wake-up Switch

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Abstract

Keywords: Event-Driven, Power Management, Flow Sensor, PZT, Micro-Cantilever

We propose a flow sensor for wake-up switch to realize a novel low power consumption event-driven wireless sensor node. The flow sensor comprises three parts, including a flow channel, a sensor and a bypass channel.

Introduction

Recently, wireless sensor networks are used for environmental monitoring, power consumption monitoring and so on. The wireless sensor node, however, has a problem of the lifetime of the battery. We propose a sensor to wake-up the wireless sensor node on change of the airflow to realize event-driven wireless sensor node for clean room.

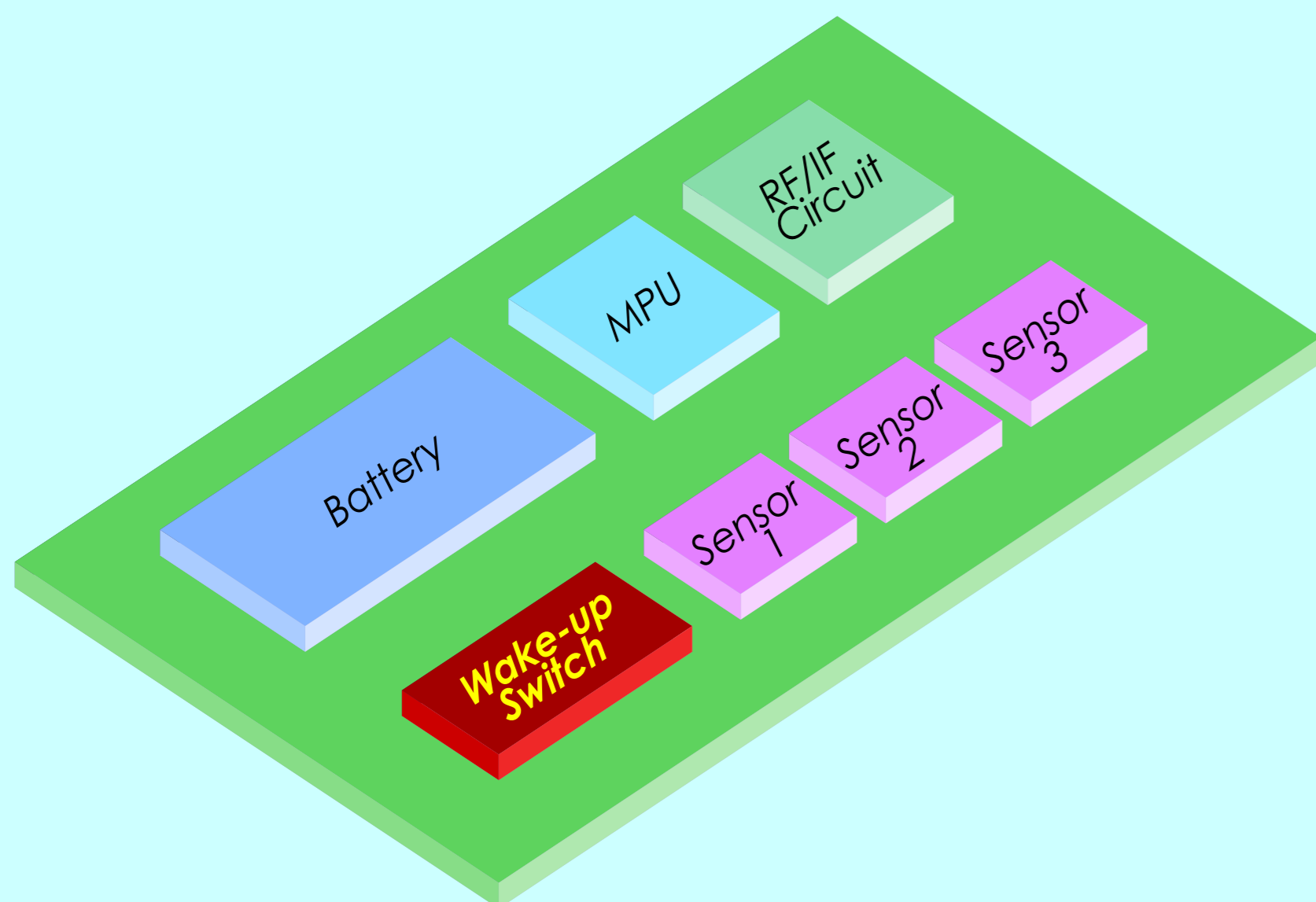


Fig. 1. Conceptual illustration of event-driven wireless sensor node

Methods

This flow sensor comprises a flow channel, a sensor, and a bypass channel. The sensor has a cantilever with $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$ (PZT) as the piezoelectric thin film and a hole as an entrance of the bypass. (100)-oriented PZT thin film was deposited by sol-gel process. When the air flows into the flow channel, the pressure difference is generated between the inlet and the outlet. The pressure difference bends the cantilever. Then, charge appears on both surfaces of PZT.

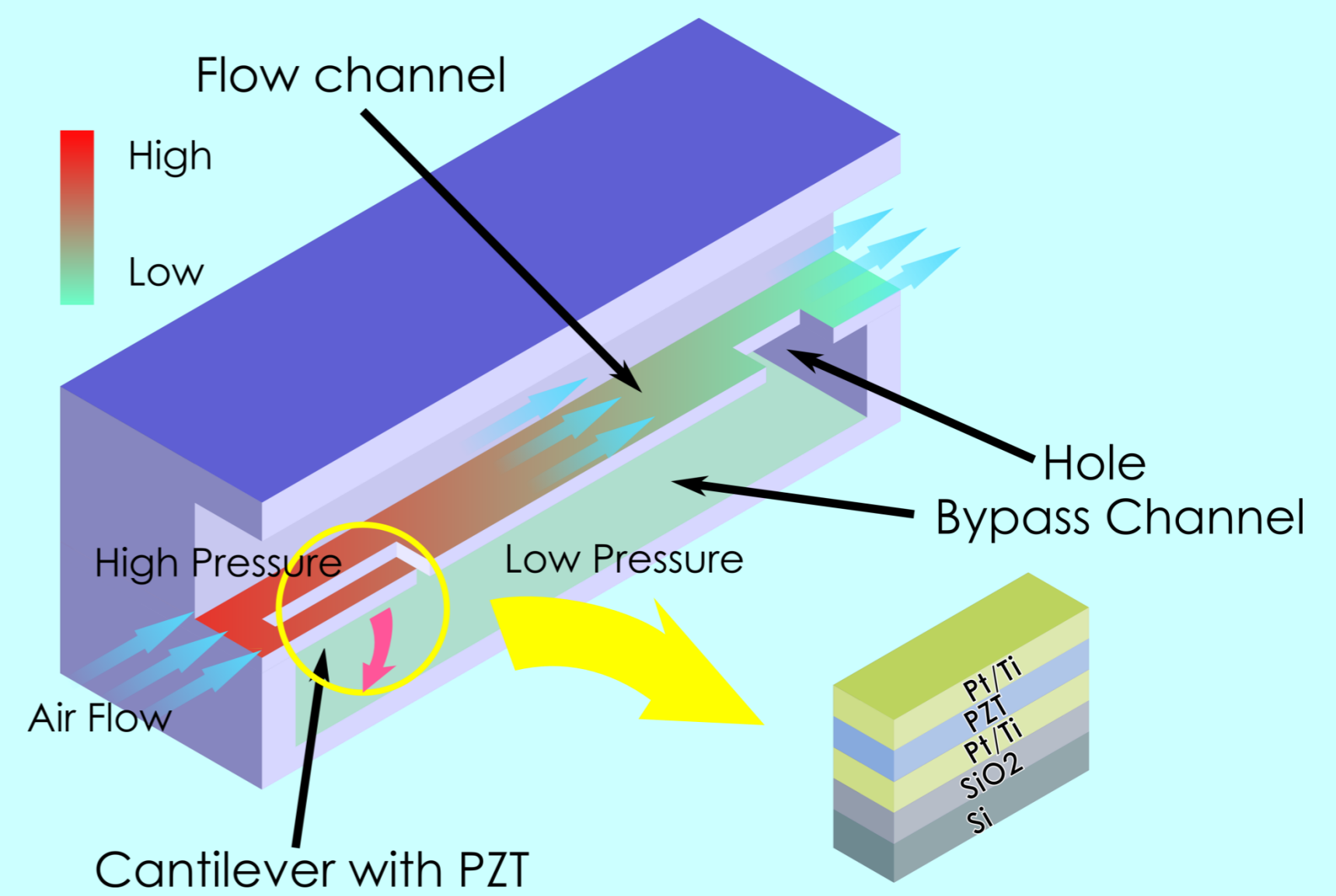


Fig. 2. Schematic illustration of the flow wake-up switch

Results

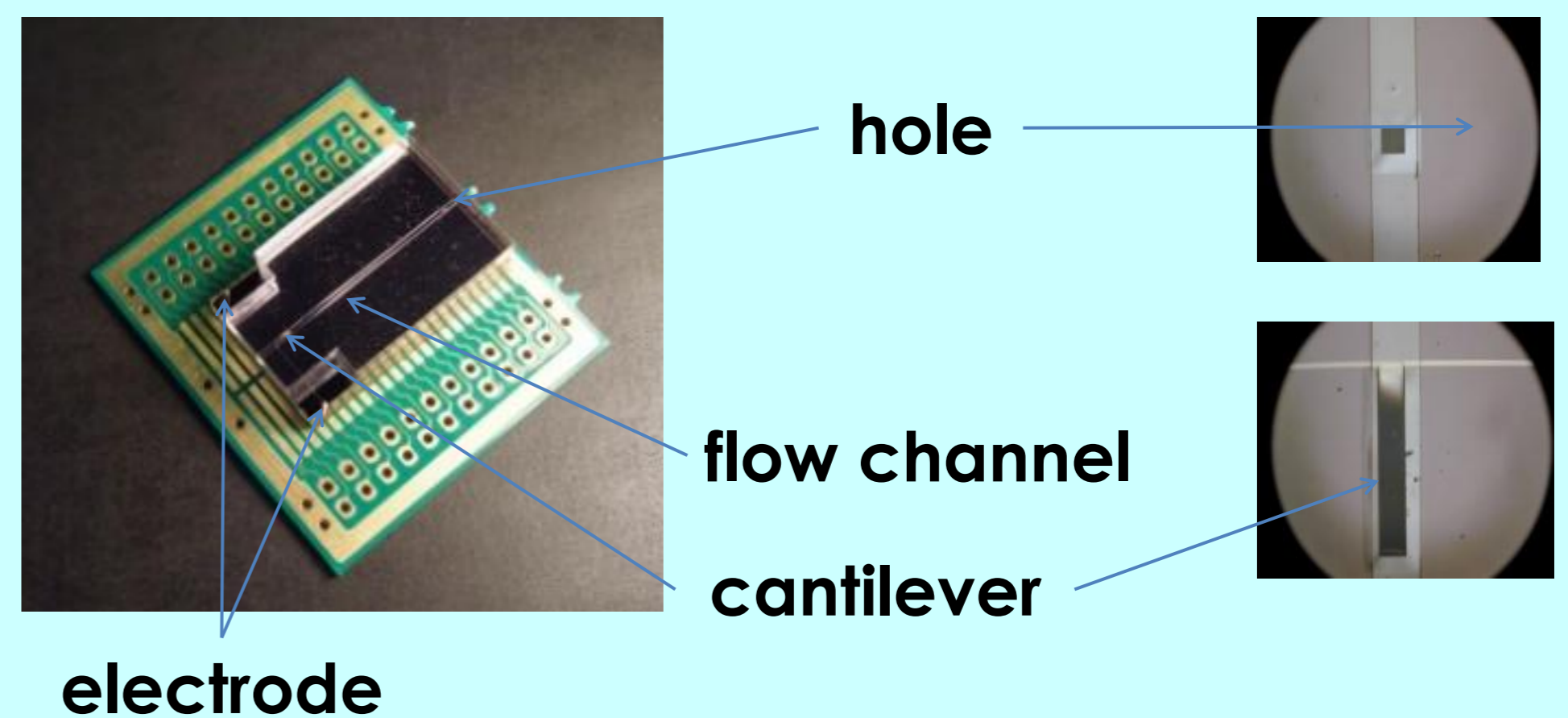


Fig. 3. The fabricated piezoelectric flow sensor

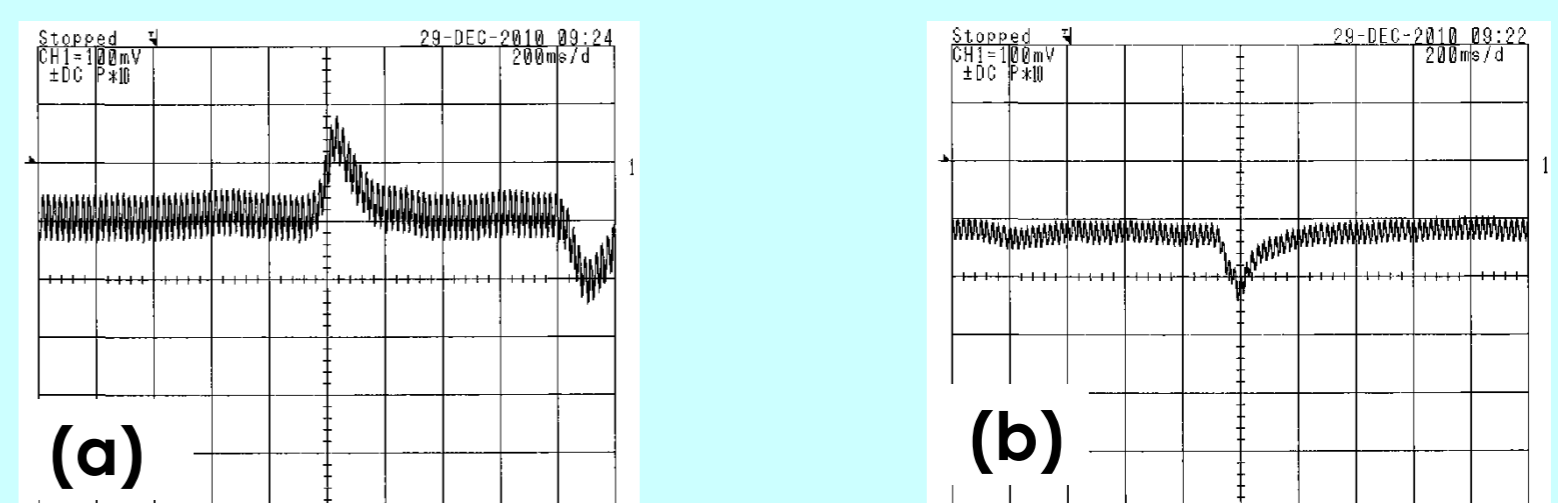


Fig. 4. Amplified output voltage of the sensor (a)air-flow comes from cantilever side (b)air-flow comes from hole side

Summary

Our sensor can obtain output voltage when the air flows into the channel. Output voltage, however, is too small for a wake-up switch. We will improve the sensitivity of the sensor by changing the shape of the flow channel.