

# Thermal Radiation Microsensor (Thermoelectric Micro Pillars)

## Application

- Applications in infra-red radiation such as thermopiles, bolometers, pyroelectric sensors
- Applicable for high-resolution, high-speed IR imaging
- Thermal Sensor Market size exceeded USD 7 billion in 2019 and is estimated to grow at around 4% CAGR between 2020 and 2026. (Global Market Insights, Apr. 2020)

## Technology

- A thermal radiation microsensor comprising thermoelectric micro pillars, in which multiple vertically standing thermoelectric micro pillars acting as thermoelectric pairs and mechanical support of an absorption layer. Radiation absorbed by the absorption layer can produce a temperature difference driving the thermocouple comprising p-type and n-type micro pillars to output a voltage. Multiple thermocouples can be connected in series to improve the signal output.

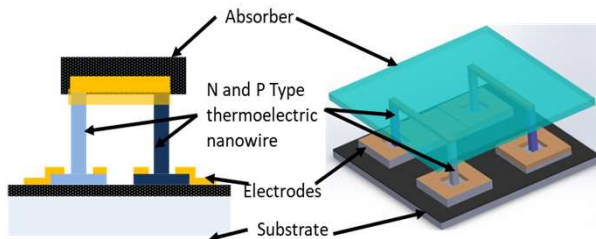


Fig 1. Thermal radiation sensor on the vertical design with micro pillars of enlarged end contacts



## Talk to Us

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## Advantages

- IC/MEMS-style fabrication process allowing for mass and low-cost production
- Good potential performance with high responsivity, short response time and miniaturized dimension
- Excellent scalability
- Extendable for other applications such as visible light detection and chemical sensing

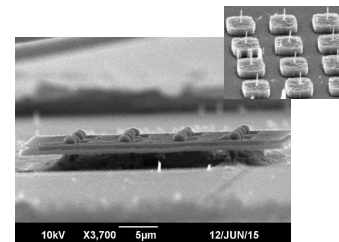


Fig 2. The SEM pictures of devices with nanowires of a diameter of 300nm

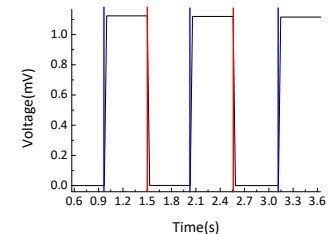


Fig 3. Response measurement of the device with diameter in 300nm

Summary of fabricated results
Series device: 300nm
With absorber size: $21 \times 21 \mu\text{m}^2 \sim 35 \times 35 \mu\text{m}^2$
Responsivity: $\sim 600 \text{V/W}$
Dimension: $< 10 \mu\text{m}$
Response time: $< 10 \text{ms}$

Table 1. Summary of the fabricated results of device with diameter in 300nm



## Intellectual Properties

- US Patent No. US9978926B2