New development: Thermal sensors for human detection.
Thermal Sensor for Human Detection – internal structure

- Small
- Digital output – UART INTERFACE
- High sensitivity and Low Noise
- High precision

Thermopile array
1 × 8 element  4 × 4 element

Connector
Microcomputer
Lens
PWB
Thermal Sensor for Human Detection – internal structure

- **Silicon Lens**: Gather radiated infrared on the thermopile
- **MEMS Thermopile Array** (photo: 1x8 array 3.2x0.8mm)
- **Infrared Ray**: Transduce infrared light into electrical signal
- **Temperature Conversion Algorithm**: Convert sensor signal to digital temperature output

Achieve High SNR fast response speed by MEMS, IC and optical design
Thermal Sensor for Human Detection: Outline

Sensing area is 5m x 5m by 8 x 8 elements. Using 4 sensors with 4 x 4 elements IR sensor.

4 x 4 elements IR sensor (x4 sensors)

Human detecting sensor

Sensing area 1 sensor (=4 x 4 elements)
Examples 1 × 8 Type

Accurate detection - Floor temperature and detect Human detection.

Even if there are Human, Floor temperature can be measured correctly.

IR MEMS 1 x 8 Array Sensor

Measurement performance
IR MEMS 4 x 4 Array Sensor

Condition

Sensor

2m

4m

63.5°

17.6°

Examples 4 x 4 Type

Measurement performance

IR MEMS 4 x 4 Array Sensor
IR MEMS 1 x 8 and 4 x 4 Array Sensor

<table>
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<tr>
<th>Temperature detection</th>
<th>Human detection</th>
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<tr>
<td></td>
<td>move</td>
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<tr>
<td>IR sensor</td>
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<td>Pyro sensor</td>
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Besides detecting people not in movement, it is also possible to have an indication of where a person is located into the room.

**Principle: Pyroelectric effect**
- Detected
- Not detected

**Principle: Thermoelectromotive**
- Detected

**OUTPUT**

Pyro-Sensor

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**OUTPUT**

IR MEMS human detection and temperature detection.
Pyroelectric sensors, microwave sensors. Both are passive, pyroelectric is generally not precise and can be easily affected by temperature fluctuation.

Due to price reason, IR MEMS is not a direct replacement of pyro and microwave sensor.

Need to sell benefit of detection of people not in movement, possibility to locate position of a person in a room, to detect temperature of an environment.

We have to target high end applications!!!!!

Direct competition:

Panasonic GRID EYE.

Lower resolution compared to Omron:

- Omron IR MEMS D6T accuracy +/- 0.2 Degrees;
- Panasonic Grid Eye accuracy: +/- 0.8 Degrees.
Other possible applications for IR MEMS Sensor out of lighting:

- Thermostats: possibility to have a direct measurement of the real temperature in a room; possibility to adapt warming and cooling on real conditions, and depending if a person is present or not in a room.

- Air conditioning: already in use to define a thermal image of a room and optimize cooling according to temperature and people present in a room;

- Security: possibility to detect people not in movement in high level security control;

- People counters: possibility to have a reliable measurement of people passing in a corridor/entrance

- Elevators: possibility to detect people inside and outside the elevator; especially for the outside elevators will only stop not only if the calling button has been pressed, but also if there is still a person waiting for it.
Thank you for your attention

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