

## ■ Features

The OST OTP-536A thermopile sensor is composed of 116 elements of thermocouple in series on a floating micro-membrane having an active diameter of 545  $\mu\text{m}$  and with blacken surface to absorb the incident thermal infrared radiation, which induces a voltage response at output terminals. The sensor chip is fabricated by a unique front-surface bulk micromachining technology, which results in smaller size and faster to response to ambient temperature change. The chip fabricated is hermetically sealed in TO-5 metal-can package with an infrared window on top to suppress any interference light from ambient, avoiding inaccuracy of measurement. The IR window is a bandpass filter having its cut-on wavelength at 5 ~ 5.5  $\mu\text{m}$ , and cut-down at 14  $\mu\text{m}$ . The sensor responses proportionally to the incident IR radiation and has a constant signal (flatband) response up to its cut-off frequency, which is limited by the sensor thermal time constant of tens millisecond range. OTP-536A thermopile sensor provides nearly Johnson-noise-limited performance, which can be calculated by its ohmic series resistance. A thermistor element, with a lead connected to ground, is also provided inside the TO package for ambient temperature reference.

## ■ Applications

- \* Tympanic (ear) thermometers
- \* Industrial non-contact infrared thermometers
- \* Thermal radiation monitoring & switch
- \* Energy-saving air-conditioning control
- \* Infrared security sensing
- \* Continuous temperature control in manufacturing processes
- \* Heat-flux- type flow meter

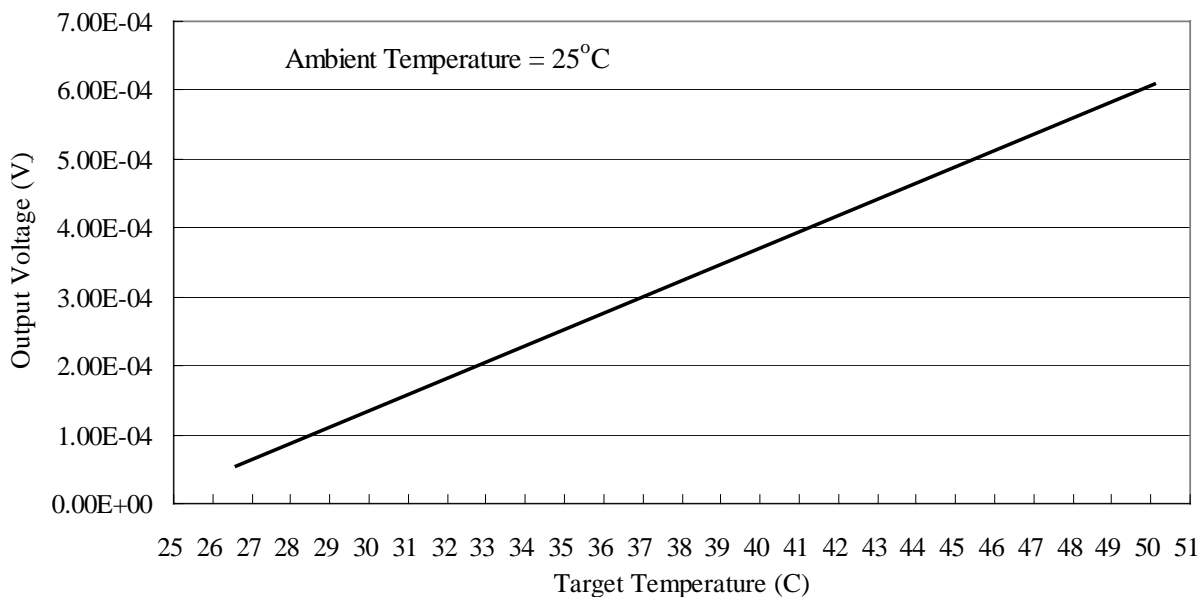
### ■ Electrical Characteristics (Ta = 25 °C)

Parameter	Condition	Min.	Typ.	Max.	Unit
<b>Thermopile</b>					
Number of junctions		---	116	---	
Chip size		---	1740*1740	---	$\mu\text{m}^2$
Active size in Diameter	Interference layer	---	545	---	$\mu\text{m}$
Thickness of substrate	Silicon-substrate	600	625	650	$\mu\text{m}$
Resistance of thermopile	25 °C	50	65	80	K $\Omega$
Sensitivity *	With 5-14 $\mu\text{m}$ filter	70	85	100	V/W
Normalized detectivity* (D*)		$1.0 \times 10^8$	$1.3 \times 10^8$	$1.7 \times 10^8$	$\text{cm} \cdot \text{Hz}^{1/2} / \text{W}$
TC of sensitivity		0.10	0.11	0.12	%/K
TC of resistance		---	0.09	---	%/K
Time constant *		---	16	---	ms
Noise voltage		28	32	36	$\text{nV}/\text{Hz}^{1/2}$
NEP		0.28	0.36	0.48	$\text{nW}/\text{Hz}^{1/2}$
Operation Temperature		-20	---	100	°C
<b>Packaged Thermopile</b>					
Output Voltage *	Ta=25°C, Tb=50°C	0.484	---	0.867	mV

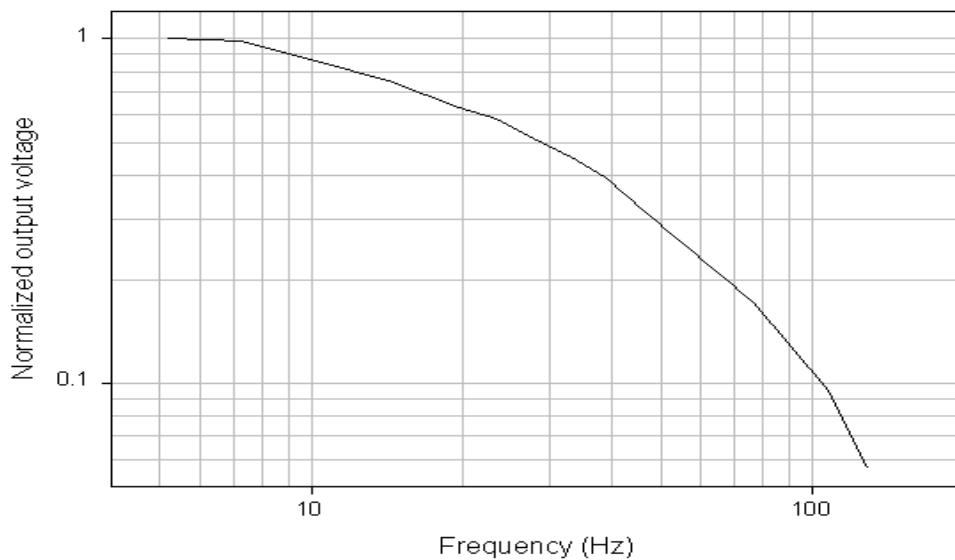
Notes : \* All optical performances are measured at 1 Hz chopper frequency using a blackbody radiator of 500K temperature with filtered spectrum ranging from 5 to 14  $\mu\text{m}$ . Distance between packaged thermopile and blackbody is 11cm.

\*\* Thermistor should be operated under 1mA.

## ■ Thermopile voltage vs. Blackbody temperature

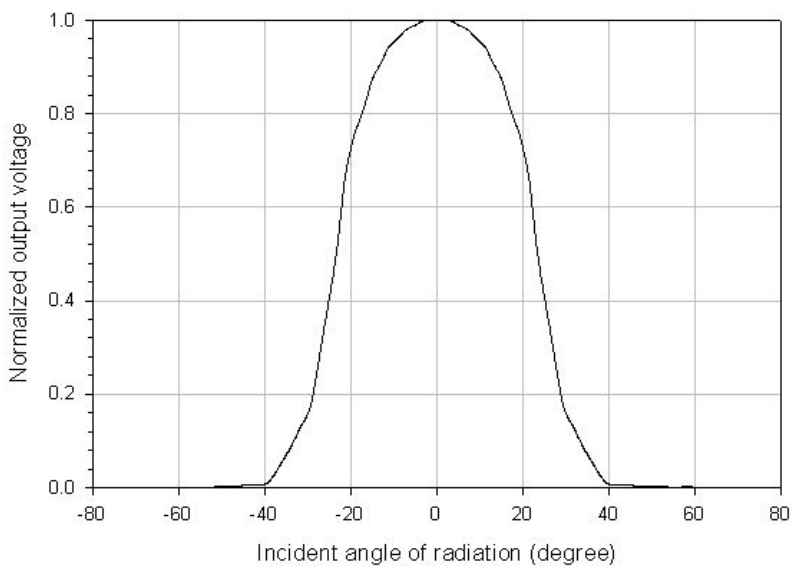


## ■ Frequency response



■ **Field of view**

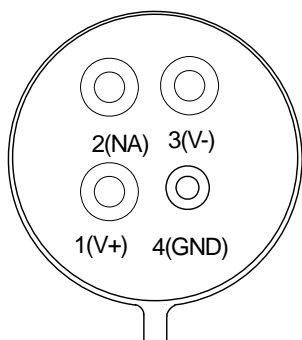
Window size of OTP-536A: 2.5mm in diameter



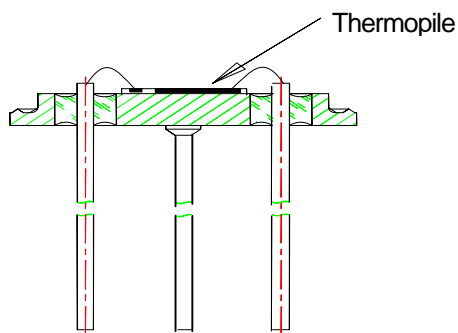
■ **Pin assignment & description**

Pin 1 : thermopile output pin (+) ;  
Pin 2 : NA;

Pin 3 : thermopile output pin (-) ;  
Pin 4 : GND pin.



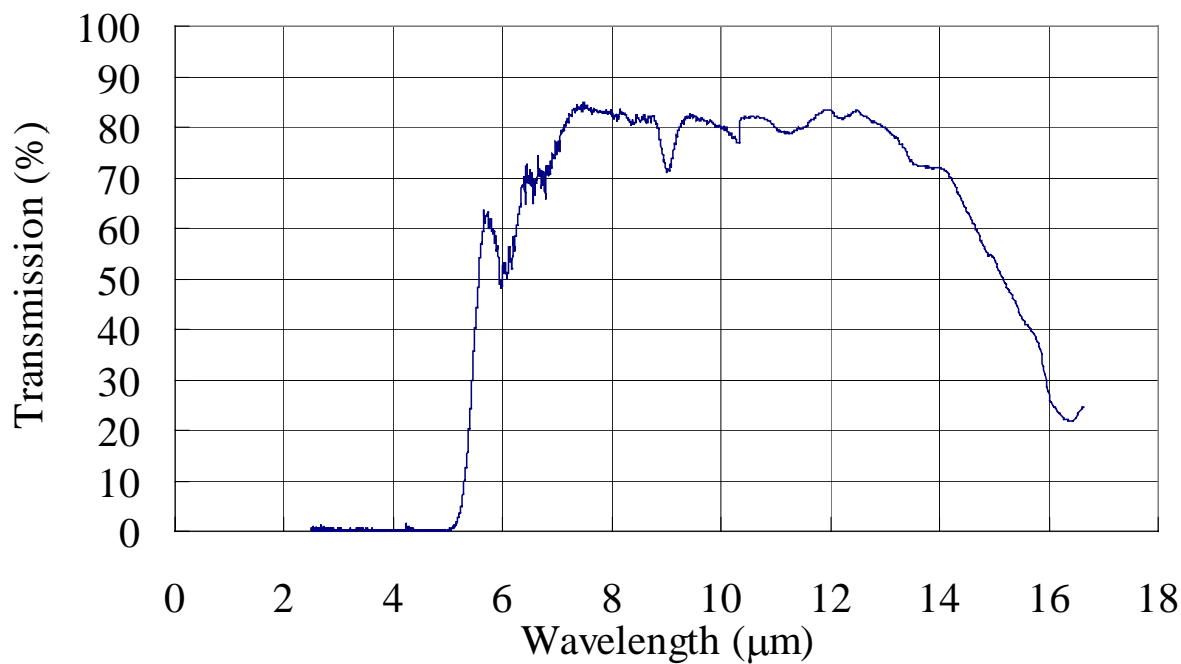
**BACKSIDE VIEW**



**SIDE VIEW**

**■ Transmission of filter**

The transmission of the infrared window has cut-on wavelength of 5.0 ~ 5.5  $\mu\text{m}$  at half magnitude of the averaged maximum transmission, which is ~ 80% in the range of 7.5 ~ 13.5  $\mu\text{m}$  as illustrated in the plot below. Transmission spectrum of the infrared is measured by a standard Infrared spectrometer starting from 2.5  $\mu\text{m}$  up.



■ Package

The OTP-536A sensor is hermetically sealed in a TO-5 metal housing with an infrared filter as the window on top. This standard filter allows measurements to be made in the spectral range above 5  $\mu\text{m}$  wavelength. The dimensions of header and cap are shown below.



Outline dimensions: (unit: mm)

