

## ■ Features

The thermopile sensor consists of a series of 116 thermoelements, forming a sensitive region size of  $545\ \mu\text{m}$  (diameter). The sensor is hermetically sealed into a TO-5 metal housing, with an optical filter. This standard filter allows measurements to be made in the spectral range above  $5\ \mu\text{m}$  wavelength. The thermosensor exhibits an almost white noise, comparable to an ohmic resistance. It has a constant signal versus frequency up to its frequency limit, and is directly proportional to incident radiation. The thermopile sensors are featured with an additional temperature reference resistor on the same chip. The standard version of temperature reference resistor is housing connected to ground.

## ■ Applications

- \* Ear thermometers; clinic thermometers
- \* Infrared thermometers
- \* Consumer applications: hair dryer, micro-wave oven, air conditioner, refrigerator
- \* Continuous temperature control of manufacturing
- \* Security system
- \* Radiation monitor switch system
- \* Absorbing measurement for gas analysis
- \* Thermoelectric converter
- \* Heat flux flowmeter

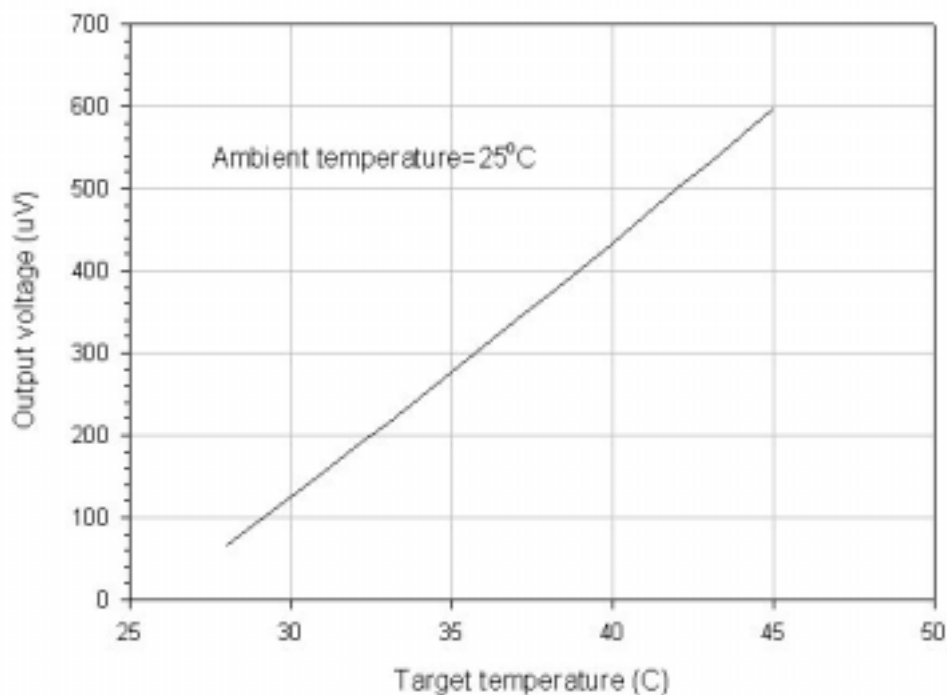
## ■ Electrical Characteristics

Parameter	Condition	Min.	Typ.	Max.	Unit
<b>Thermopile</b>					
Number of thermojunctions		—	116	—	
Chip size		—	1740*1740	—	$\mu\text{m}^2$
Active region size	Interference layer	—	Diameter 545	—	$\mu\text{m}$
Thickness of substrate	Silicon-substrate	600	625	650	$\mu\text{m}$
Resistance of thermopile	25°C	50	60	70	K $\Omega$
Sensitivity	With 5-14 $\mu\text{m}$ filter	70	85	100	V/W
Detectivity		$1.0 \times 10^8$	$1.3 \times 10^8$	$1.7 \times 10^8$	$\text{cm} \cdot \text{Hz}^{1/2} / \text{W}$
Time constant		—	16	—	ms
Noise voltage		28	31	33	$\text{nV}/\text{Hz}^{1/2}$
NEP		0.28	0.36	0.48	$\text{nW}/\text{Hz}^{1/2}$
Temperature range	Operation	-20	—	100	°C
<b>Temperature reference resistor</b>					
Resistance	25°C	29.1	30.0	30.9	K $\Omega$
Temperature coefficient of resistance	25°C	3773	3811	3849	K

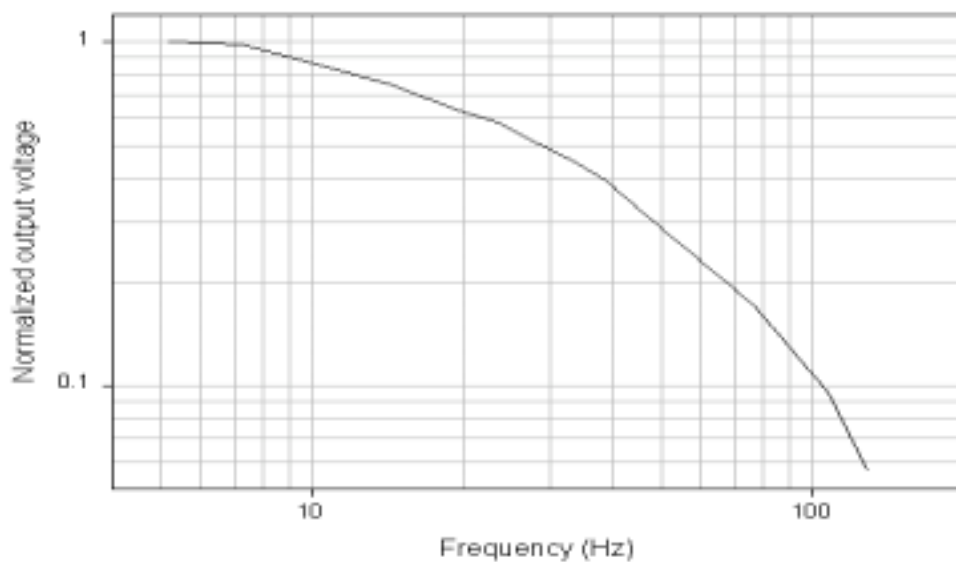
Measured at 1 Hz chopper frequency, within spectral range 5-14  $\mu\text{m}$ , using a blackbody radiator of 500K temperature.

Note : Thermistor should be operated under 1mA.

## ■ Thermopile voltage vs. blackbody temperature

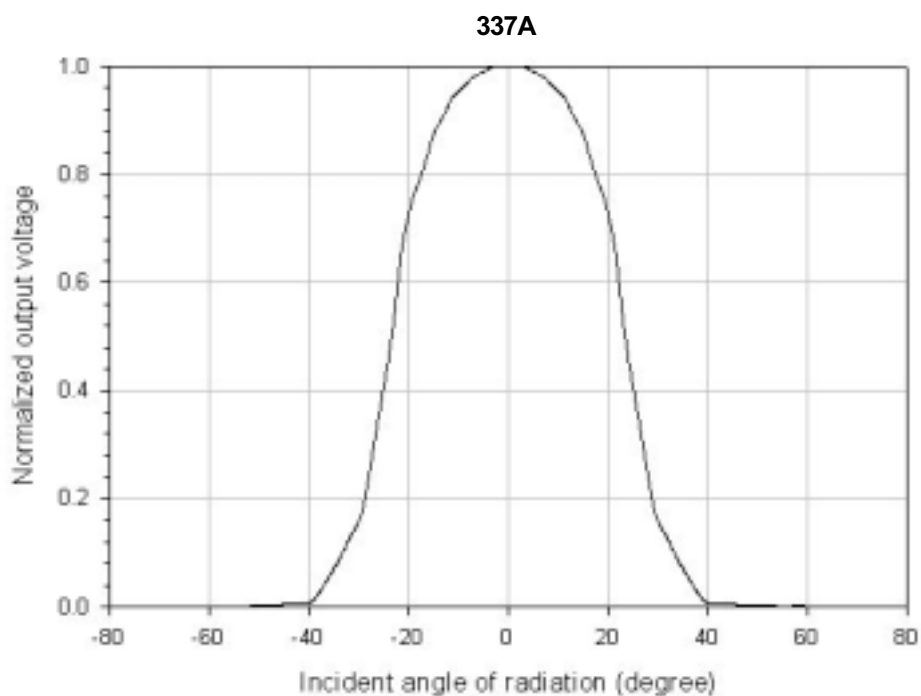


## ■ Frequency response

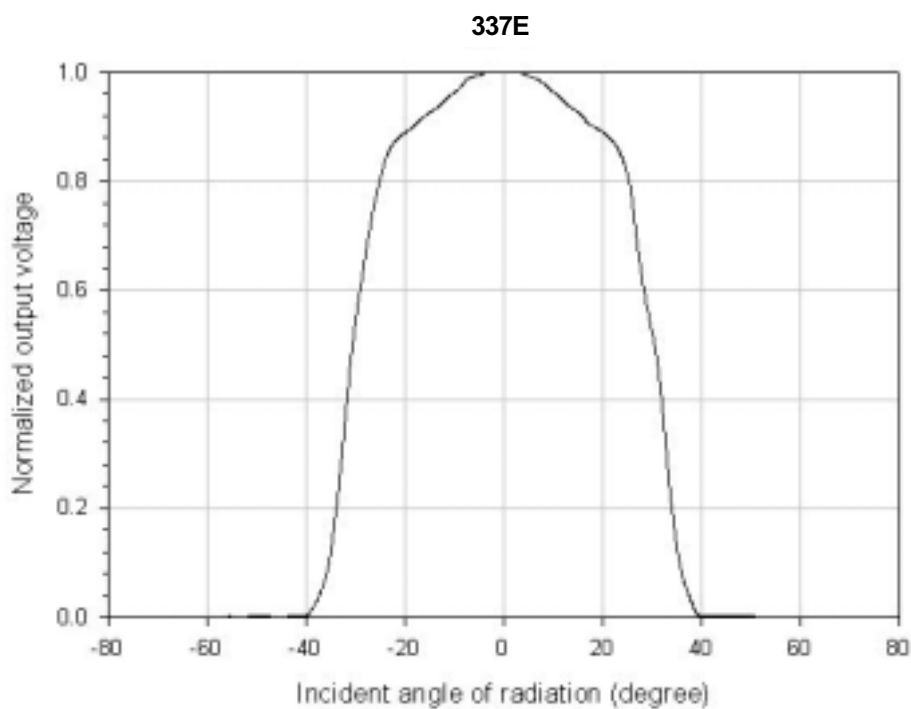


## Field of view

1) window size: 2.57mm (diameter)

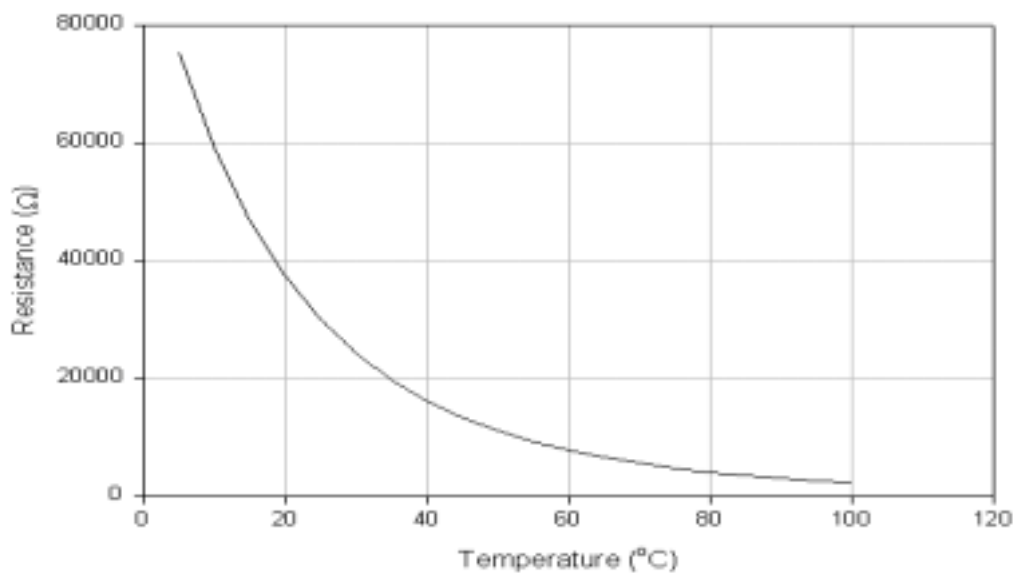


2) window size: 3.80mm (diameter)



## ■ Thermistor vs. temperature

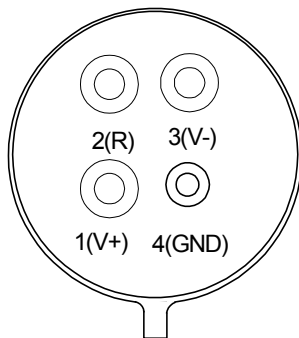
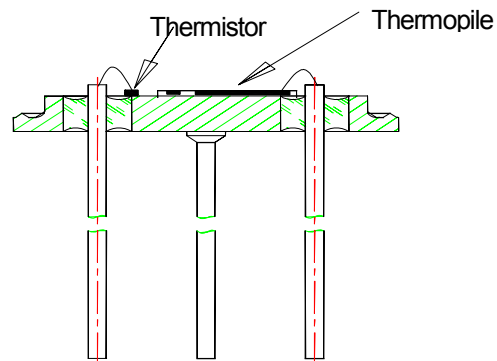
The resistance of the temperature reference resistor varies with temperature and the behaviour is illustrated in the following figure.



At temperature  $25^{\circ}\text{C}$ ,  $R(T)=R_{25}e^{\beta\left[\frac{1}{T}-\frac{1}{T_{25}}\right]}$  describes the resistance vs. temperature, where  $R_{25}$  is the resistance at ambient temperature  $25^{\circ}\text{C}$  and  $T, T_{25}$  are the ambient temperatures in unit of kelvin degrees.

**Pin assignment & description**

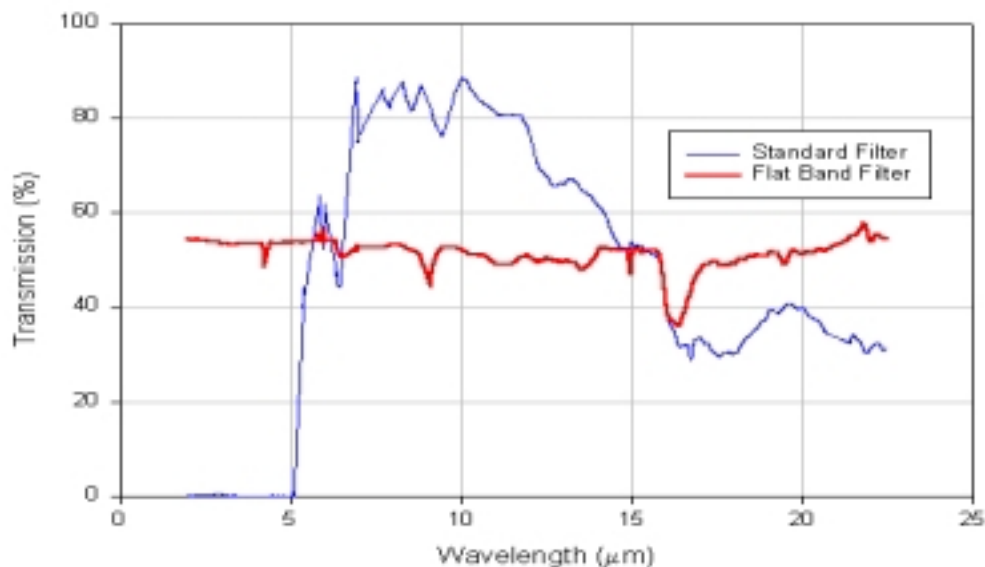
- 2 thermistor pin
- 4 thermistor pin (GND)
- 1 thermopile output pin (+)
- 3 thermopile output pin (-)

**BACKSIDE VIEW****SIDE VIEW****Order information : TP337□**

- : A : Standard filter (5-14  $\mu$ m), window size=2.57mm (diameter).
- B : Silicon filter with flat band transmission, window size=2.57mm (diameter).
- E : Standard filter (5-14  $\mu$ m), window size=3.80mm (diameter).
- F : Silicon filter with flat band transmission, window size=3.80mm (diameter).

## ■ Transmission of filter

Transmission of optical filter is measured by FTIR from 2  $\mu\text{m}$

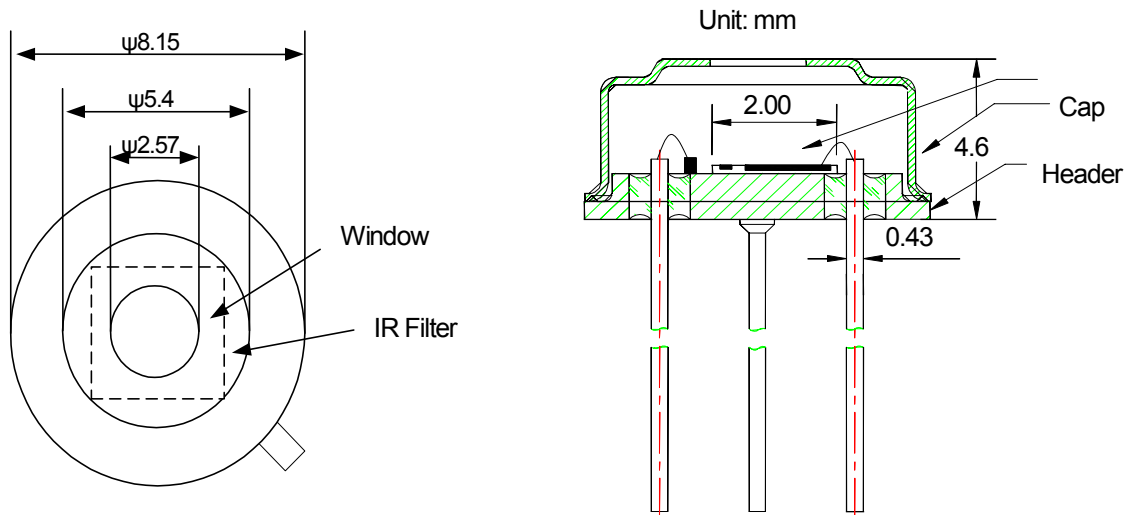


## ■ Package

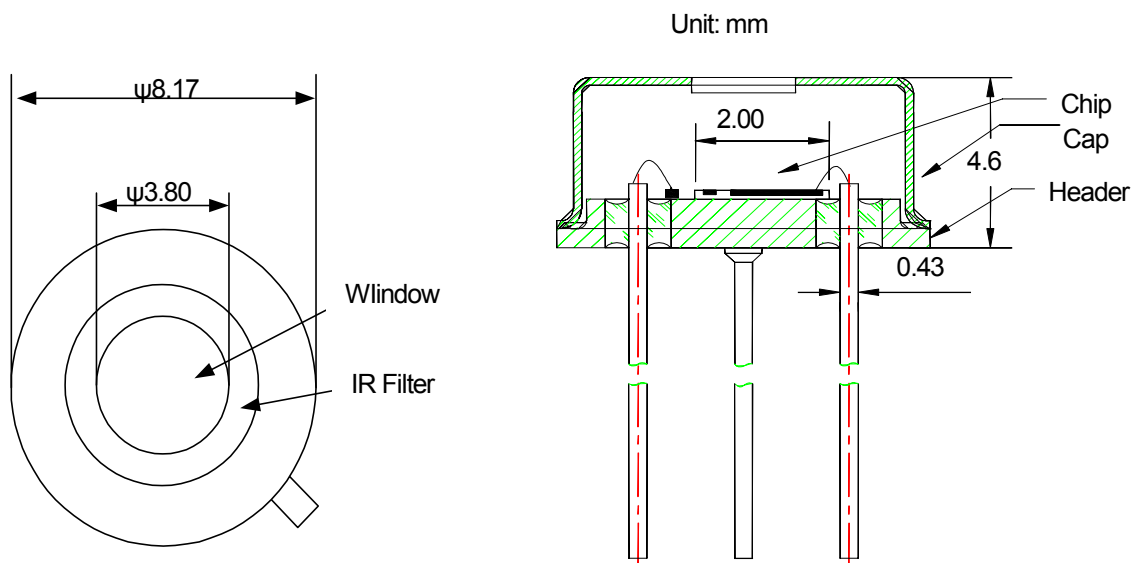
The sensor is hermetically sealed into a TO-5 metal housing, with an optical filter. This standard filter allows measurements to be made in the spectral range above 5  $\mu\text{m}$  wavelength. The dimensions of header and cap are shown below.



### TP337A



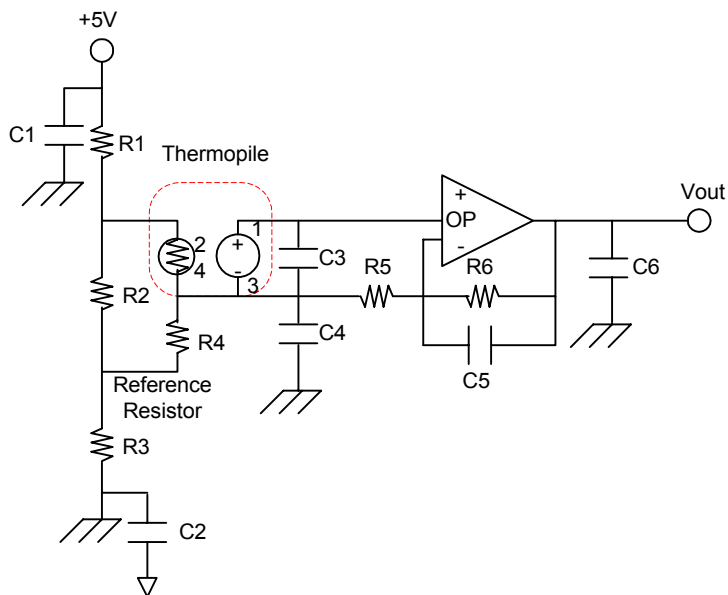
### TP337E





## Application circuit

Circuit 1 :



Circuit 2 :

