



Thermopile Gas Sensor (Model: RTGA7111)

User's Manual

Version: 1.0

Valid from: 2023-04-21

Zhengzhou Winsen Electronics Technology Co., Ltd

Statement

This manual copyright belongs to Zhengzhou Winsen Electronics Technology Co., LTD. Without the written permission, any part of this manual shall not be copied, translated, stored in database or retrieval system, also can't spread through electronic, copying, record ways.

Thanks for purchasing our product. In order to let customers use it better and reduce the faults caused by misuse, please read the manual carefully and operate it correctly in accordance with the instructions. If users disobey the terms or remove, disassemble, change the components inside of the sensor, we shall not be responsible for the loss.

The specific such as color, appearance, sizes &etc, please in kind prevail.

We are devoting ourselves to products development and technical innovation, so we reserve the right to improve the products without notice. Please confirm it is the valid version before using this manual. At the same time, users' comments on optimized using way are welcome.

Please keep the manual properly, in order to get help if you have questions during the usage in the future.

Zhengzhou Winsen Electronics Technology CO., LTD.

RTGA7111 Thermopile Gas Sensor

Production Description

RTGA7111 sensor is a single-channel thermopile gas sensor, which contains a thermopile chip based on MEMS technology and connects hundreds of pairs of thermocouples in series, by the light-heat-electrical conversion process that converts absorbed infrared radiation into a voltage signal. There is a narrow-band filter in the front of the sensor, it make the sensor can be used for the detection of carbon dioxide concentration, and meanwhile, the sensor NTC itself has temperature compensation, it can improve the measurement accuracy under different temperature.



Figure 1: Sensor physical image

Features

- TO-46 metal package
- High sensitivity
- Quick response, Good stability
- High transmittance of narrowband filter
- High precision NTC

Applications

- NDIR (CO₂) Gas Detection equipment
- Indoor air quality detection and HVAC system control
- CO₂ gas control in industrial workshop
- CO₂ emission control of combustion furnace
- Human breath detection
- Interior air quality monitoring of automotive

Table 2 RTGA7111 thermopile parameters

Parameter	Value	Unit	Remarks
Chip size	1.85×1.85	mm	/
Field of view	95	Degree	Above 50%
Filter center wavelength	4.26	um	Deviation ±40nm
Thermopile resistor	76±15	KΩ	25°C,1V
Response voltage signal	≥200	mV	Surface source blackbody temperature: 500K; Ambient temperature: 25±1°C; Distance between sensor and blackbody: 10cm
Temperature coefficient of resistance	0.06	%/°C	25°C~75°C
Noise voltage	38	nV/Hz ^{1/2}	25°C
Noise equivalent power	0.23	nW/Hz ^{1/2}	500K, 1Hz, 25°C
Response rate	120±40	V/W	500K, 1Hz, 25°C
Time constant	≤20	ms	
NTC resistance	100 ± 1%	KΩ	25°C
NTC(β)	3950 ± 1%	/	25°C/50°C

Sensor diagram(unit:mm)

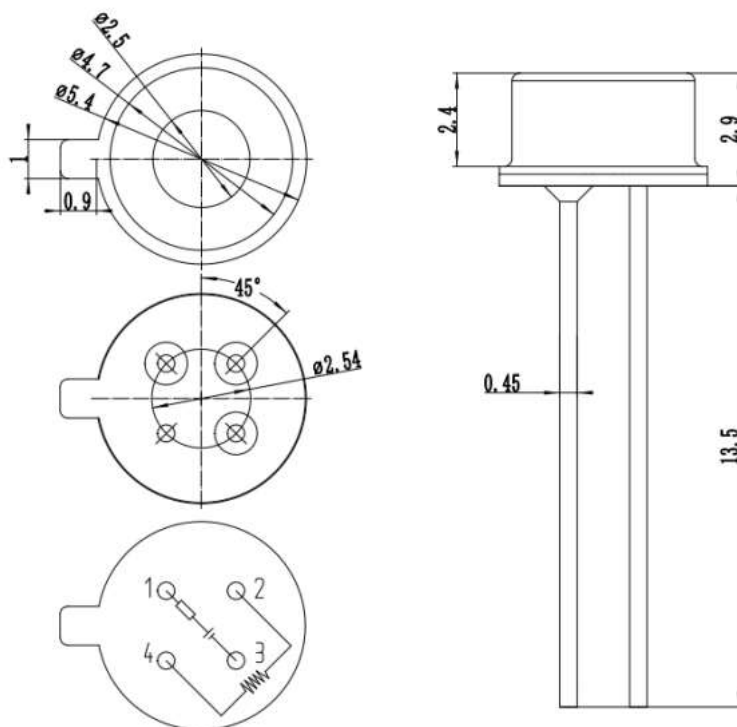


Figure 2: Sensor package size

Pin	1	2	3	4
Definition	Thermopile positive	NTC	Thermopile negative	GND

Filter Performance Curve

1. Filter performance curve:

center wavelength 4.26μm; peak wavelength transmittance is greater than 80%, and half-width is 180nm

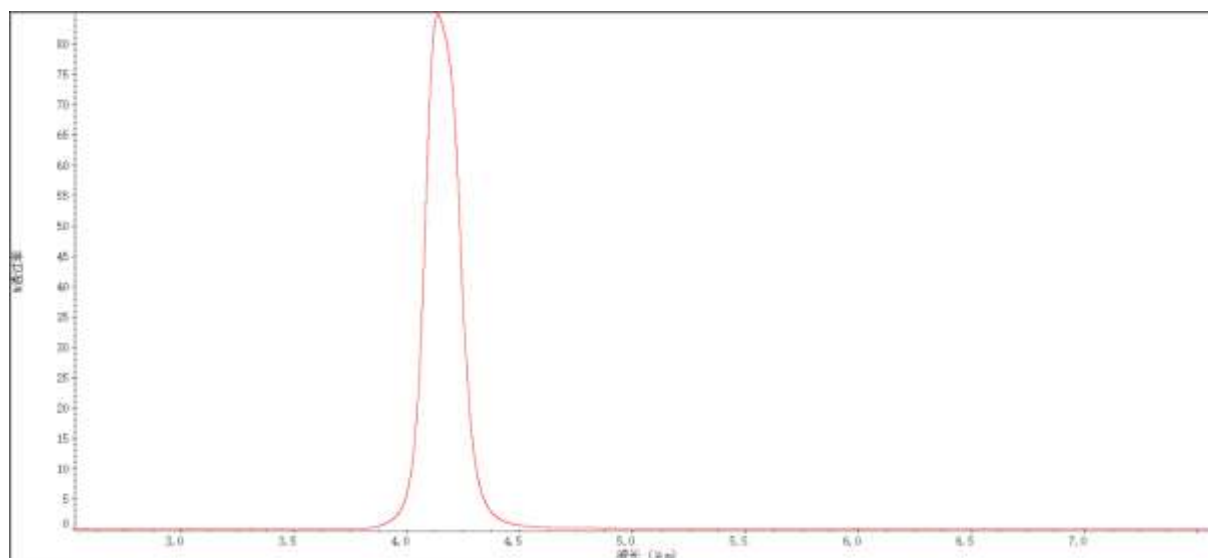


Figure 3: Filter performance curve

2. Sensor field of view angle

The sensor aperture is facing the heat source and rotates the window of the sensor around the same axis. The

sensor signal response is within the range covered by 50% of the maximum signal response of the sensor.

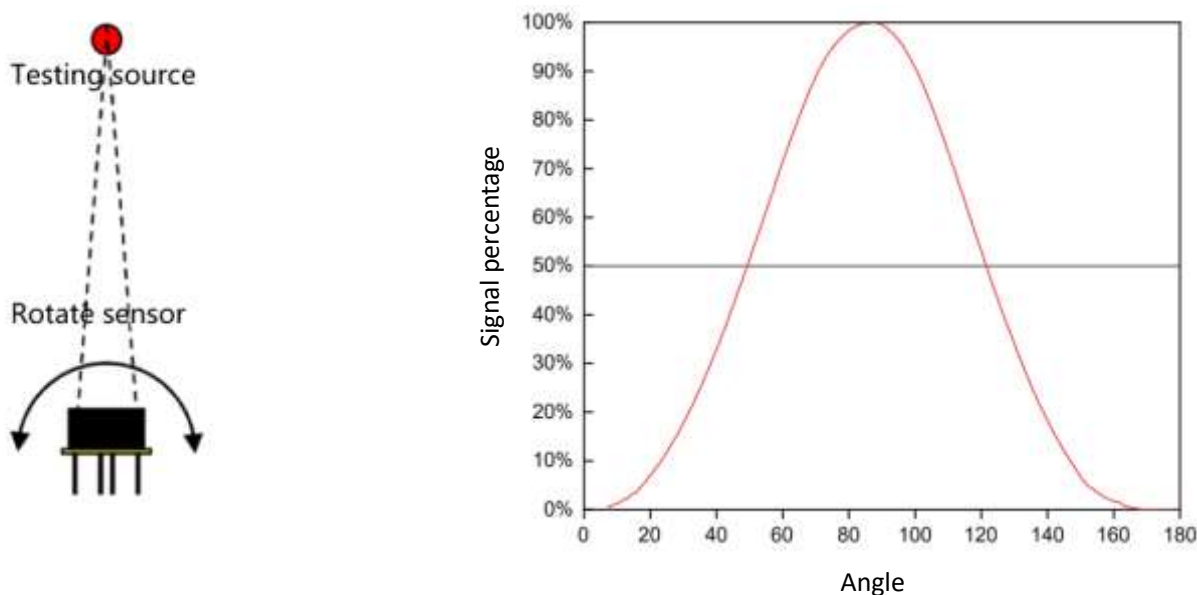


Figure 4: Sensor field Angle data diagram

2. Thermistor (NTC) R-T Table

T(°C)	R(KΩ)	T(°C)	R(KΩ)	T(°C)	R(KΩ)	T(°C)	R(KΩ)	T(°C)	R(KΩ)
-40	3179.00	-6	439.56	28	87.80	62	22.66	96	6.97
-39	2980.73	-5	417.22	29	84.11	63	21.83	97	6.75
-38	2796.06	-4	396.14	30	80.59	64	21.05	98	6.53
-37	2623.95	-3	376.25	31	77.24	65	20.29	99	6.33
-36	2463.46	-2	357.47	32	74.04	66	19.56	100	6.13
-35	2313.73	-1	339.73	33	70.99	67	18.86	101	5.94
-34	2173.97	0	322.98	34	68.07	68	18.19	102	5.75
-33	2043.44	1	307.14	35	65.29	69	17.54	103	5.58
-32	1921.48	2	292.17	36	62.64	70	16.92	104	5.40
-31	1807.49	3	278.02	37	60.11	71	16.33	105	5.24
-30	1700.89	4	264.63	38	57.68	72	15.76	106	5.08
-29	1601.17	5	251.96	39	55.37	73	15.21	107	4.92
-28	1507.85	6	239.96	40	53.16	74	14.68	108	4.77
-27	1420.48	7	228.61	41	51.05	75	14.17	109	4.63
-26	1338.66	8	217.85	42	49.03	76	13.68	110	4.49
-25	1262.00	9	207.66	43	47.10	77	13.21	111	4.36
-24	1190.15	10	198.00	44	45.25	78	12.76	112	4.23
-23	1122.79	11	188.84	45	43.49	79	12.32	113	4.10
-22	1059.61	12	180.16	46	41.79	80	11.90	114	3.98
-21	1000.34	13	171.92	47	40.18	81	11.50	115	3.86
-20	944.72	14	164.10	48	38.63	82	11.11	116	3.75
-19	892.50	15	156.68	49	37.15	83	10.74	117	3.64
-18	843.46	16	149.63	50	35.88	84	10.38	118	3.54

-17	797.38	17	142.94	51	34.37	85	10.03	119	3.43
-16	754.09	18	136.58	52	33.06	86	9.70	120	3.34
-15	713.38	19	130.54	53	31.81	87	9.38	121	3.24
-14	675.11	20	124.79	54	30.62	88	9.07	122	3.15
-13	639.10	21	119.33	55	29.47	89	8.77	123	3.06
-12	605.22	22	114.13	56	28.37	90	8.48	124	2.97
-11	573.33	23	109.19	57	27.32	91	8.21	125	2.89
-10	543.30	24	104.48	58	26.31	92	7.94		
-9	515.01	25	100.00	59	25.34	93	7.69		
-8	488.36	26	95.73	60	24.41	94	7.44		
-7	463.24	27	91.67	61	23.51	95	7.20		

Note:

1. The sensor cannot directly measure gas, and must be combined with light sources and gas chambers to achieve gas concentration measurement using NDIR technology;
2. The NTC value of sensors generally does not require calibration, but calibration is required after the sensor is installed in the finished product/module to determine the relationship between the sensor output signal and concentration;
3. The sensor test is affected by factors such as black body temperature, distance, and environment, some parameters may have small deviations;
4. In order to reduce the thermal interference between the sensor pins, the sensor pins should be thermally isolated when making a PCB;
5. Hand soldering temperature should be $330\pm 20^{\circ}\text{C}$, and single pin soldering time should not exceed 3s;
6. Frequent, excessive vibration, strong impact or collision will cause resonance inside the sensor to break.

Zhengzhou Winsen Electronics Technology Co., Ltd

Add: No.299, Jinsuo Road, National Hi-Tech Zone, Zhengzhou
450001 China

Tel: +86-371-67169097/67169670

Fax: +86-371-60932988

E-mail: sales@winsensor.com

Website: www.winsen-sensor.com

