Tempus
Lifecare Sensor

Data Sheet (Preliminary)

Rev. 0.2 / Aug. 2020

TU04

High-end Thermopile Detector

MEMS thermopile Sensor TU04

Brief Description

The "**TU04**" is the TEMPUS Far Infrared Thermopile unit sensor with small chip size. This sensor uses a thermopile to measure the Far Infrared energy emitted from the object being measured and uses the corresponding change in thermopile voltage to determine the object temperature. The sensor chip is fabricated by a unique backside-bulk micromachining technology, which result in smaller size and faster to response ambient temperature change. The TU04 offer the possibility to integrate an infrared Fresnel lens into a TO46 housing and to reduce the field of view accordingly. This sensor detects the object temperature from -20℃ to +120℃ to enable use in a wide range of application.

Features

- Non-Contact Temperature Detection
- 5~14um Infrared Filter
- High Sensitivity
- Fast Response Time
- Wide Detection Temperature Range

Applications

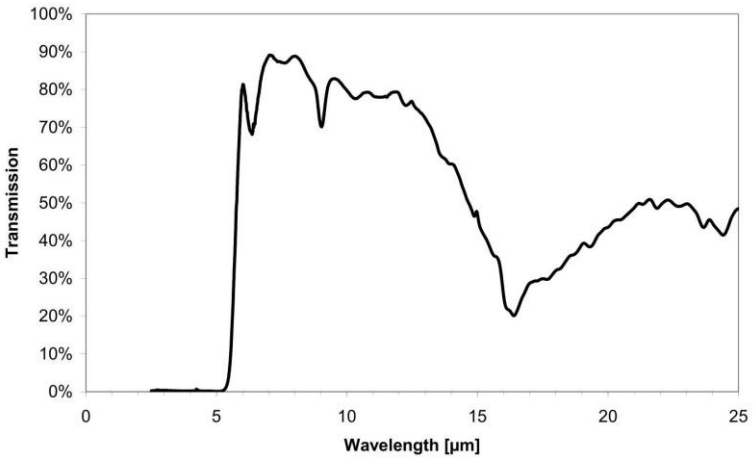
- Non-contact Temperature sensing
- Temperature monitoring
- Medical instrument
- Thermometric converter
- Consumer Application : Hair Dryer, Air-conditioner, Refrigerator
- Human Body Detection:
- Interactive Power control
- Agriculture
- Breeding Industry
- Security and Protection
- Pyrometry

1. Device Characteristics

1.1 Sensor Characteristics

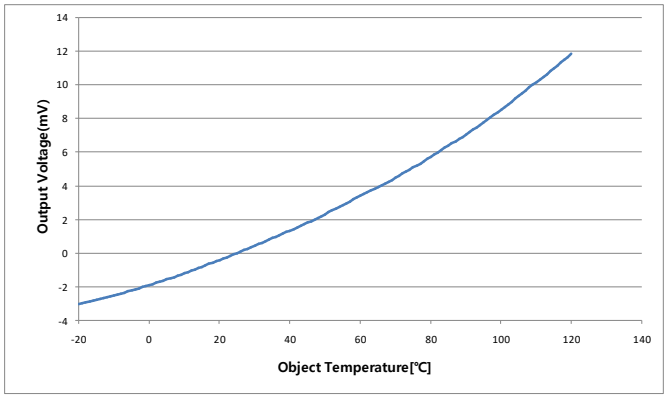
Parameter	Min.	Typ.	Max.	Unit	Conditions
Chip size		1.1 X 1.1		mm^2	
Sensitive area		0.35 X 0.35		mm^2	
Thermopile resistance	70	95	120	kΩ	temp=25℃
Noise voltage		38		$nV/Hz^{1/2}$	temp=25℃
NEP		0.23		$nW/Hz^{1/2}$	Blackbody=500K, 1Hz@25℃
Voltage Response		20.11		$V\ mm^2/W$	Blackbody=500K, 1Hz@25℃
Responsivity	120	164	210	V/W	Blackbody=500K, 1Hz@25℃
Temp. coefficient of resistance		0.06		%/℃	temp=25℃-75℃
Time constant		≤13		ms	
Specific detectivity		1.51 E08		$cmHz^{1/2}/W$	Blackbody=500K, 1Hz@25℃
Thermistor resistance		100 ± 3%		KΩ	25℃
Thermistor BETA-value		3950 ± 1%		K	25℃/50℃

1.2 Filter Characteristic



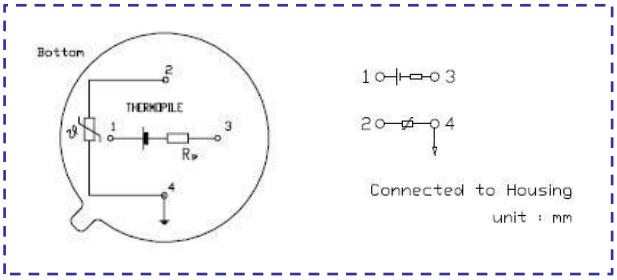
1.3 Sensitivity Output Characteristics

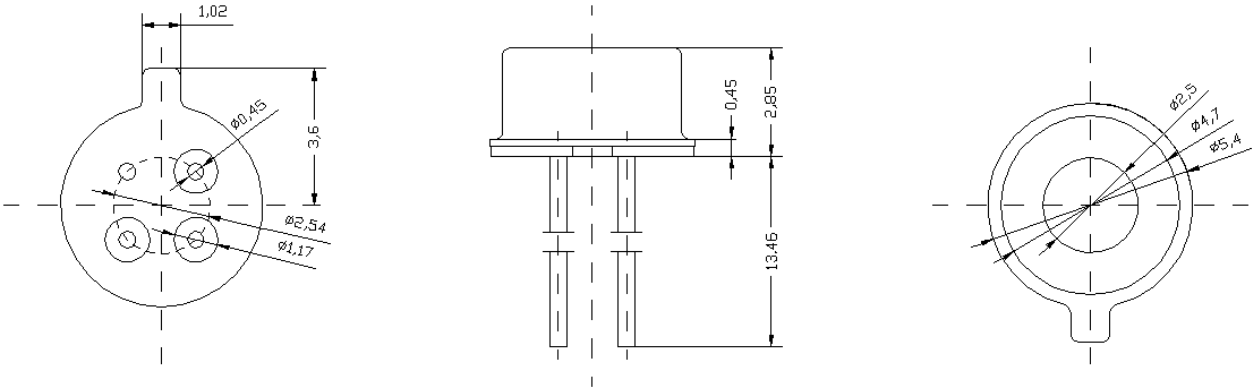
Typical thermopile's output voltage vs object temperature with sensor at 25℃



Temp (℃)	V out (mV)	Temp (℃)	V out (mV)	Temp (℃)	V out (mV)	Temp (℃)	V out (mV)	Temp (℃)	V out (mV)
-20	-3.046	10	-1.196	40	1.334	70	4.477	100	8.508
-19	-2.983	11	-1.131	41	1.426	71	4.606	101	8.667
-18	-2.929	12	-1.051	42	1.526	72	4.73	102	8.839
-17	-2.879	13	-0.973	43	1.624	73	4.845	103	9.001
-16	-2.829	14	-0.888	44	1.725	74	4.962	104	9.172
-15	-2.777	15	-0.806	45	1.81	75	5.081	105	9.335
-14	-2.724	16	-0.723	46	1.892	76	5.205	106	9.499
-13	-2.673	17	-0.646	47	1.995	77	5.321	107	9.664
-12	-2.619	18	-0.572	48	2.094	78	5.455	108	9.83
-11	-2.569	19	-0.494	49	2.199	79	5.587	109	9.991
-10	-2.514	20	-0.417	50	2.306	80	5.724	110	10.15
-9	-2.461	21	-0.33	51	2.42	81	5.848	111	10.32
-8	-2.399	22	-0.248	52	2.53	82	5.981	112	10.48
-7	-2.338	23	-0.164	53	2.635	83	6.116	113	10.64
-6	-2.275	24	-0.083	54	2.753	84	6.251	114	10.81
-5	-2.214	25	0	55	2.865	85	6.376	115	10.98
-4	-2.144	26	0.086	56	2.969	86	6.514	116	11.15
-3	-2.084	27	0.174	57	3.08	87	6.641	117	11.33
-2	-2.022	28	0.258	58	3.185	88	6.767	118	11.5
-1	-1.964	29	0.346	59	3.299	89	6.907	119	11.66
0	-1.899	30	0.446	60	3.401	90	7.043	120	11.84
1	-1.829	31	0.544	61	3.508	91	7.19		
2	-1.754	32	0.623	62	3.608	92	7.33		
3	-1.689	33	0.709	63	3.715	93	7.468		
4	-1.629	34	0.798	64	3.808	94	7.604		
5	-1.555	35	0.892	65	3.91	95	7.751		
6	-1.479	36	0.974	66	4.019	96	7.9		
7	-1.416	37	1.062	67	4.123	97	8.051		
8	-1.349	38	1.149	68	4.239	98	8.191		
9	-1.275	39	1.246	69	4.354	99	8.344		

1.4 TO46 Package Dimensions





Packing Information

(It may differ depending on the situation and it is subject to change without notice)

Tube	Inner Packing	Box
50pcs	500pcs	20,000pcs