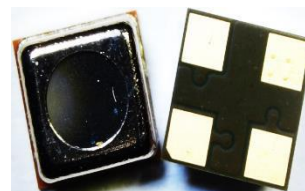


Infrared Thermopile Sensors

I. Characteristics:

- 1) SMD surface mounting
- 2) Small-sized package, with wide applied scope
- 3) Based on MEMS thermopile technology
- 4) NTC thermistor compensation
- 5) High infrared response ratio
- 6) Quick response
- 7) The configuration of a 5.5um normally-opened infrared optical filter window



II. Application:

- 1) Intelligent wearable devices
- 2) Smart phones
- 3) Industrial equipment temperature monitoring
- 4) Non-contact measurement of infrared body temperature such as ear temperature and forehead temperature
- 5) Household appliances and intelligent temperature sensing and control

III. Performance Parameters:

Table 1 Table of performance parameters of sensors

Parameters	Parameter values	Unit
Chip dimension	1120*1120	um ²
Device dimension	3500*3500	um ²
Sensitive area	700*700	um ²
Field angle	84	°
Resistance	295±30	kΩ
Response ratio	100	V/W
Time constant	27	ms
NEP	0.81	nW/Hz ^{1/2}
Detection rate	1.01E08	cmHz ^{1/2} /W
Resistance value of thermistors	100±2%	kΩ (25°C)
Beta value of thermistors	3950±1%	K(25°C/50°C)
Working temperature	-30~120	°C

Testing conditions:

1. Temperature=25°C ; 2. 500K , 5.5um normally opened ; 3. 500K , 1Hz

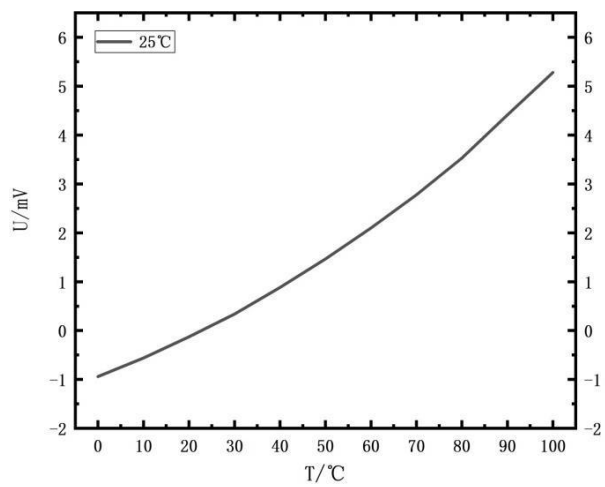


Figure 1 VT curve (25°C; the distance to the black body is 25mm)

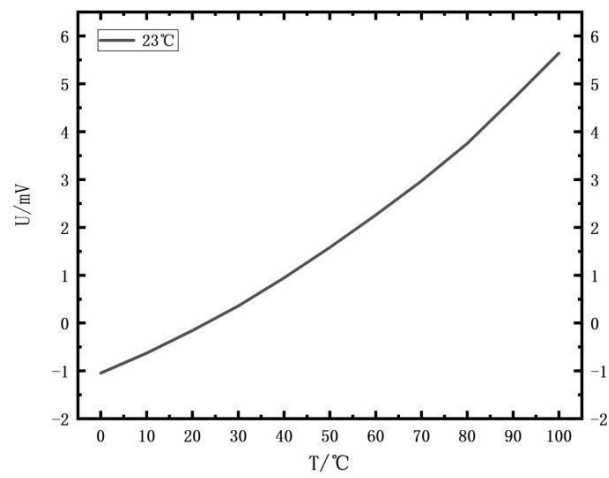


Figure 2 VT curve (23°C; the distance to the black body is 25mm)

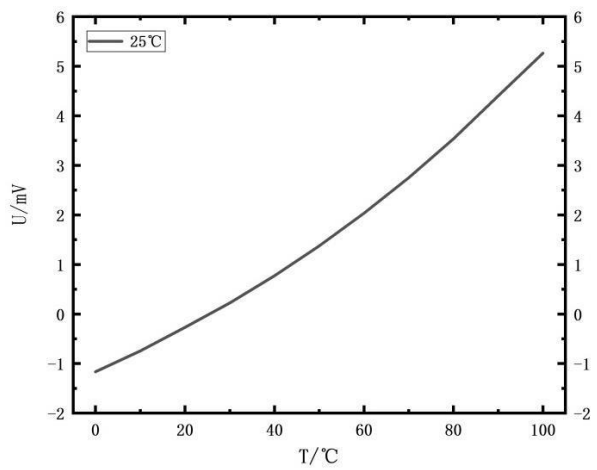


Figure 3 VT curve (25°C; the distance to the epoxy baffle is 1mm; the distance to the black body is 25mm)

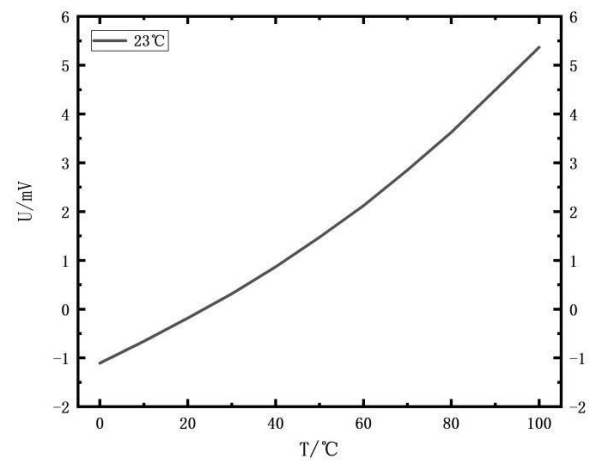


Figure 4 VT curve (23°C; the distance to the epoxy baffle is 1mm; the distance to the black body is 25mm)

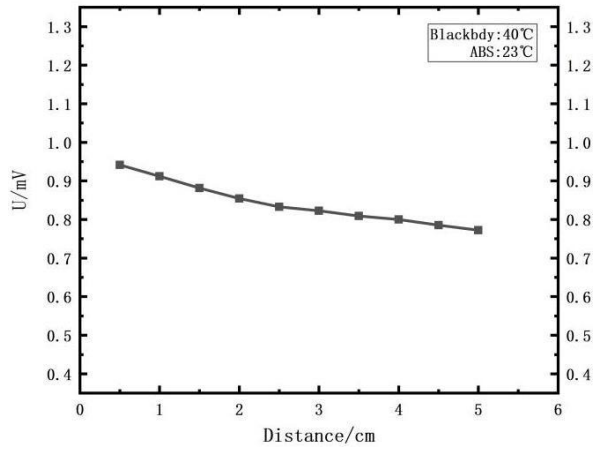


Figure 5 DT curve (environment temperature: 23°C; black body temperature: 40°C)

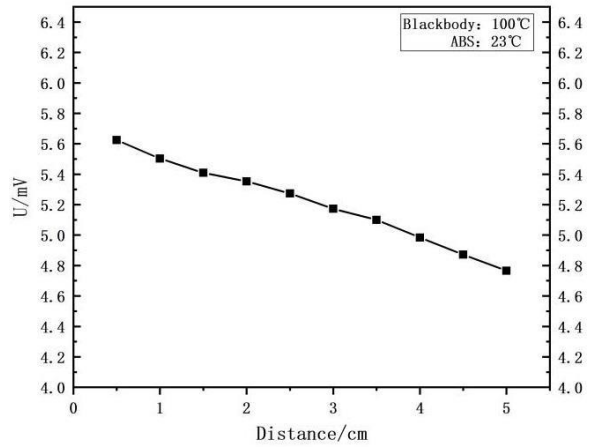


Figure 6 DT curve (environment temperature: 23°C; black body temperature: 100°C)

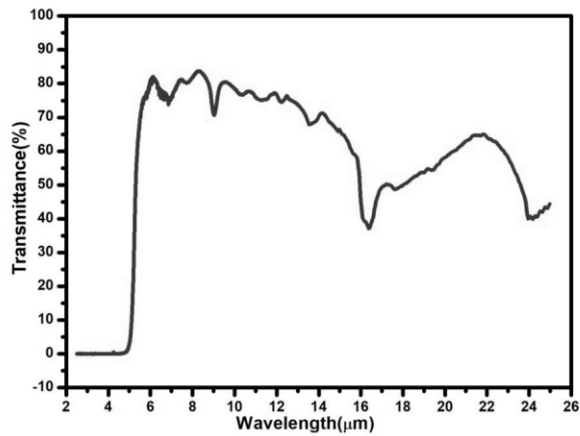


Figure 7 Transmittance spectrum of the optical filter

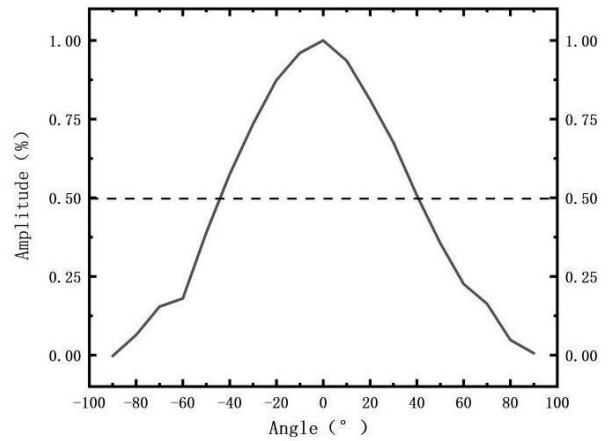


Figure 8 Field angle of the sensor

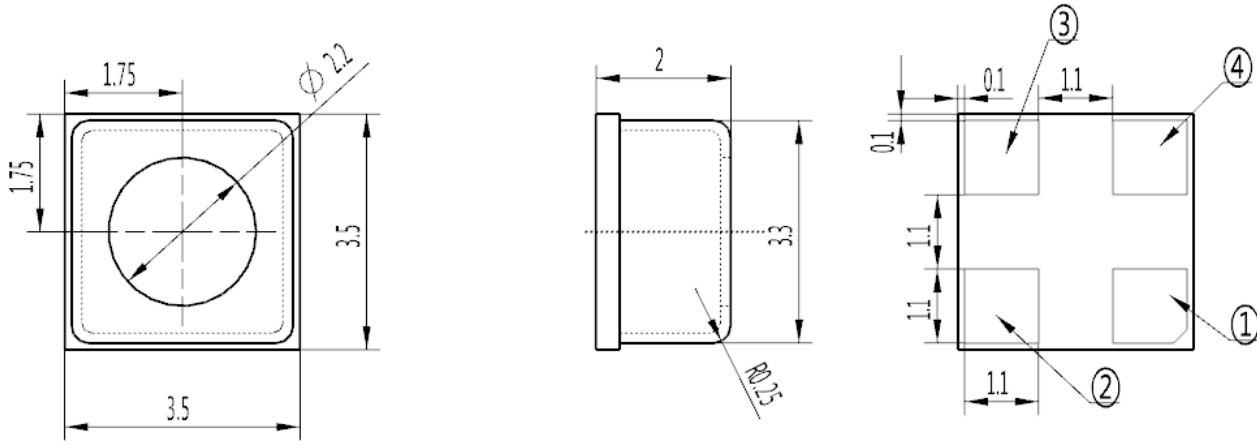
IV. Table of Temperature and Resistance Value of Thermistors:

Table 2 Table of RT of NTC

T(°C)	Rnom(KΩ)	T(°C)	Rnom(KΩ)	T(°C)	Rnom(KΩ)	T(°C)	Rnom(KΩ)	T(°C)	Rnom(KΩ)
-40	3324.301	-11	605.410	18	137.909	47	40.125	76	14.066
-39	3119.086	-10	573.605	19	131.589	48	38.608	77	13.602
-38	2927.677	-9	544.152	20	125.601	49	37.158	78	13.155
-37	2749.070	-8	516.307	21	119.925	50	35.770	79	12.725
-36	2582.337	-7	489.977	22	114.544	51	34.428	80	12.311
-35	2426.625	-6	465.075	23	109.439	52	33.142	81	11.913
-34	2281.145	-5	441.516	24	104.596	53	31.911	82	11.529
-33	2145.170	-4	419.226	25	100.000	54	30.732	83	11.159
-32	2018.027	-3	398.131	26	95.637	55	29.602	84	10.803
-31	1899.096	-2	378.162	27	91.510	56	28.520	85	10.459
-30	1787.802	-1	359.257	28	87.587	57	27.482	86	10.120
-29	1683.674	0	341.355	29	83.856	58	26.487	87	9.794
-28	1586.152	1	323.531	30	80.308	59	25.533	88	9.479
-27	1494.782	2	306.762	31	76.931	60	24.618	89	9.175
-26	1409.145	3	290.980	32	73.717	61	23.740	90	8.882
-25	1328.852	4	276.120	33	70.657	62	22.897	91	8.600
-24	1253.542	5	262.122	34	67.742	63	22.089	92	8.327
-23	1182.879	6	248.932	35	64.966	64	21.313	93	8.064
-22	1116.555	7	236.496	36	62.320	65	20.568	94	7.811
-21	1054.280	8	224.768	37	59.798	66	19.852	95	7.566
-20	995.786	9	213.702	38	57.393	67	19.165	96	7.330
-19	941.187	10	203.257	39	55.099	68	18.505	97	7.102
-18	889.832	11	193.394	40	52.911	69	17.871	98	6.882
-17	841.514	12	184.078	41	50.823	70	17.261	99	6.669
-16	796.039	13	175.273	42	48.829	71	16.675	100	6.464
-15	753.227	14	166.950	43	46.926	72	16.112	101	6.266
-14	712.910	15	159.078	44	45.108	73	15.570	102	6.074
-13	674.931	16	151.631	45	43.371	74	15.049	103	5.889
-12	639.143	17	144.583	46	41.712	75	14.548	104	5.711

Testing conditions: 25°C 100 KΩ , B25/50 = 3950K ±1%

V. Definition of Pins:



Top view

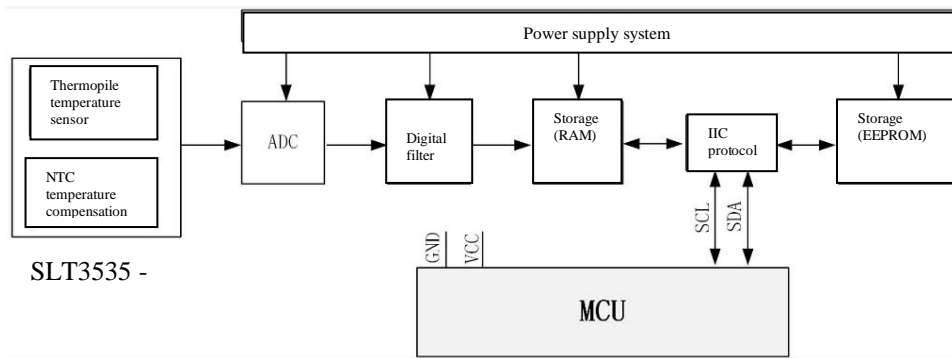
Side view

Bottom view

Parameters	Dimension	Tolerance	Unit
Length	3.50	± 0.10	mm
Width	3.50	± 0.10	mm
Height	2.00	± 0.10	mm
Diameter of transoms	$\Phi 2.2$	± 0.05	mm

Definition of lead feet	
No.	Definitions
1	TP+
2	TP-
3	GROUND
4	NTC+

VI. Connection Diagram of Application Modules:



VII. Recommended Design for Bonding Pads and Steel Meshes:

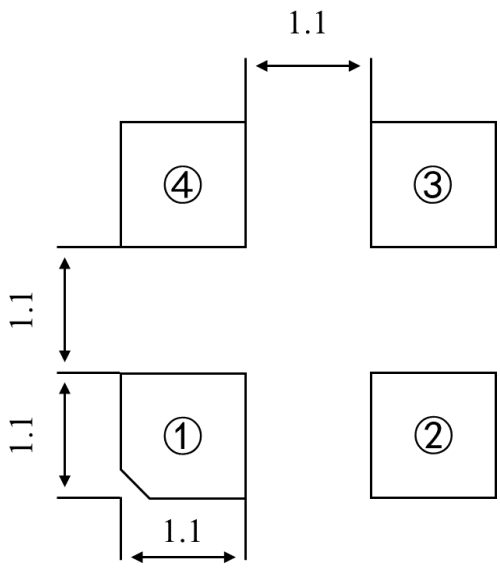


Figure 5 Recommended design for bonding pads

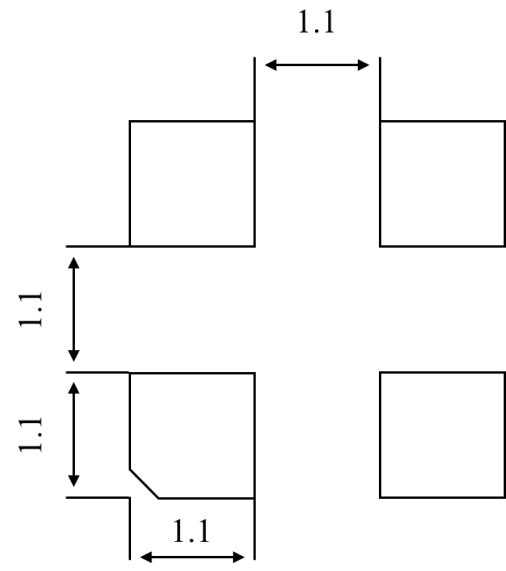
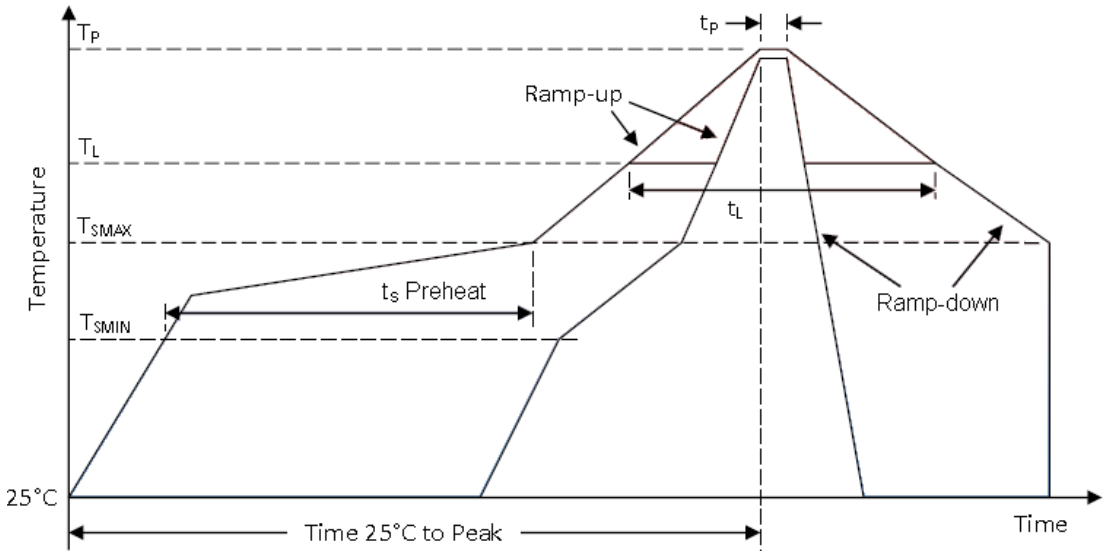


Figure 6 Recommended design for steel meshes

VIII. Reflow Profile:



Profile Feature	Pb-Free
Average Ramp-up rate (T_{SMAX} to T_P)	3°C/second max.
Preheat	
Temperature Min (T_{SMIN})	150°C
Temperature Max (T_{SMAX})	200°C
Time (T_{SMIN} to T_{SMAX}) (ts)	60-180 seconds
Time maintained above:	
Temperature (T_L)	217°C
Time (t_L)	60-150 seconds
Peak Temperature (T_P)	260°C
Time within 5°C of actual Peak Temperature (t_P)	20-40 seconds
Ramp-down rate(T_P to T_{SMAX})	6°C/second max
Time 25°C to Peak Temperature	8 minutes max

Figure 7 Distribution diagram for curve of recommended reflow temperature of lead-free solder

IX. Other Suggestions:

- (1) It is required to perform thermal isolation between lead feet of sensors when fabricating PCB, to reduce the thermal disturbance between lead feet.
- (2) Since the output voltage signal of sensors is uV magnitude, with relatively high requirements on noises of circuits (operational amplifier, ADC, etc.), it is suggested to measure temperature with professional MCU.