Temperature Sensor

BM43THA80C

Bestow Mascot

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CONTENT

1. Description

1.1 General Description

The BM43THA80C is a CMOS compatible thermopile temperature sensor based on MEMS (micro-electromechanical systems) technology. This thermopile detector consists of thermopile MEMS chip, 5-14um infrared band pass filter, a NTC thermistor for temperature compensation and a small size TO Package.

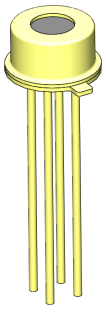
1.2 Features

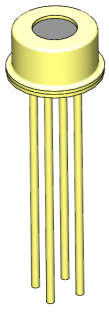
- Non-contact surface temperature measuring
- TO housing with an 5-14um infrared filter
- Using NTC thermistor for ambient temperature compensation
- High sensitivity
- Fast response time
- Wide working temperature: -40℃~+120℃(Temperature range can be extended to +1000℃by using specific infrared lens)

1.3 Applications

- Non-contact human body temperature infrared thermometer
- Microwave oven
- Automatic induction equipment
- Heating, Ventilation and Air Conditioning(HVAC)
- Appliance

1.4 Package





2 Pin Descriptions

Table1 Pin Descriptions

Pin	Function	Description
1	GND Thermistor	Ambient temperature compensation resistance- pin and GND.
2	Thermopile-	Output DC voltage- pin.
3	Thermistor	Ambient temperature compensation resistance+ pin.
4	Thermopile+	Output DC voltage+ pin.

3 Characteristics

3.1 Thermopile Parameter

Table 2 Thermopile Parameter

Parameter	Specification	Unit	Condition
Chip Size	1.28X1.28	mm	-
Active Area	0.9X0.9	mm	-
Responsivity	135	V/W	Black body=500K,1HZ @temp=25℃
Detectivity	6.3E07	cm·$Hz^{1/2}$/W	Black body=500K,1HZ @temp=25℃
Thermopile Res	225±10	kΩ	@temp=25℃
Time Constant	15	ms	-
Field of View(FOV)	80	°	Degree at 50% signal level
Operating Temp	-40~120	℃	-
Storage Temp	-40~150	℃	-
Thermistor for Temperature Compensation			
Thermistor Resistance	100	kΩ	+2% tolerance, @temp=25℃
TC of Thermistor(B)	3950	K	±1% tolerance, Defined at 25/50℃

3.2 NTC Temperature VS Resistance Table

Table 3 NTC Temperature VS Resistance Table

Temp.(℃)	R_{min}(kΩ)	R_{nor}(kΩ)	R_{max}(kΩ)	Temp.(℃)	R_{min}(kΩ)	R_{nor}(kΩ)	R_{max}(kΩ)
-40	3062.1	3235.1	3416.6	43	45.920	47.210	48.517
-39	2869.0	3029.1	3196.9	44	44.112	45.369	46.644
-38	2689.3	2837.6	2992.8	45	42.384	43.609	44.852
-37	2522.1	2659.4	2803.1	46	40.731	41.925	43.137
-36	2366.4	2493.6	2626.6	47	39.150	40.314	41.496
-35	2221.4	2339.3	2462.5	48	37.638	38.772	39.924
-34	2086.2	2195.5	2309.7	49	36.191	37.295	38.418
-33	1960.1	2061.5	2167.4	50	34.806	35.882	36.977
-32	1842.5	1936.6	2034.8	51	33.479	34.527	35.594
-31	1732.6	1820.1	1911.1	52	32.208	33.229	34.269
-30	1630.1	1711.3	1795.8	53	30.991	31.986	32.999
-29	1534.3	1609.7	1688.2	54	29.825	30.794	31.782
-28	1444.7	1514.8	1587.7	55	28.708	29.652	30.615
-27	1360.9	1426.1	1493.8	56	27.638	28.557	29.496
-26	1282.6	1343.2	1406.1	57	26.612	27.508	28.422
-25	1209.2	1265.6	1324.1	58	25.628	26.501	27.392
-24	1140.5	1193.0	1247.4	59	24.685	25.535	26.404
-23	1076.1	1125.0	1175.6	60	23.781	24.609	25.455
-22	1015.8	1061.3	1108.4	61	22.913	23.720	24.545
-21	959.19	1001.6	1045.4	62	22.081	22.867	23.671
-20	906.11	945.61	986.44	63	21.283	22.048	22.831
-19	856.11	892.92	930.94	64	20.516	21.262	22.025
-18	809.19	843.50	878.91	65	19.781	20.507	21.251
-17	765.13	797.12	830.11	66	19.074	19.781	20.507
-16	723.74	753.58	784.33	67	18.396	19.085	19.792
-15	684.85	712.69	741.36	68	17.745	18.416	19.105
-14	648.29	674.27	701.01	69	17.119	17.773	18.444
-13	613.91	638.16	663.10	70	16.518	17.155	17.809
-12	581.56	604.20	627.47	71	15.940	16.561	17.199
-11	551.12	572.26	593.98	72	15.385	15.990	16.611
-10	522.45	542.20	562.48	73	14.852	15.441	16.047

Temp.(℃)	R_{min}(kΩ)	R_{nor}(kΩ)	R_{max}(kΩ)	Temp.(℃)	R_{min}(kΩ)	R_{nor}(kΩ)	R_{max}(kΩ)
-9	495.45	513.91	532.84	74	14.339	14.913	15.503
-8	470.01	487.26	504.94	75	13.846	14.405	14.980
-7	446.03	462.15	478.67	76	13.371	13.916	14.477
-6	423.41	438.49	453.92	77	12.915	13.446	13.993
-5	402.08	416.18	430.60	78	12.476	12.993	13.526
-4	381.95	395.13	408.61	79	12.054	12.558	13.078
-3	362.94	375.28	387.88	80	11.648	12.139	12.645
-2	345.00	356.54	368.32	81	11.261	11.740	12.234
-1	328.04	338.85	349.87	82	10.890	11.356	11.838
0	312.02	322.13	332.44	83	10.532	10.987	11.457
1	296.93	306.40	316.05	84	10.187	10.631	11.089
2	282.65	291.52	300.55	85	9.855	10.288	10.735
3	269.14	277.45	285.90	86	9.535	9.957	10.393
4	256.35	264.13	272.04	87	9.227	9.639	10.064
5	244.23	251.52	258.93	88	8.931	9.332	9.747
6	232.75	239.59	246.52	89	8.645	9.036	9.441
7	221.88	228.28	234.78	90	8.369	8.750	9.145
8	211.57	217.57	223.65	91	8.103	8.475	8.861
9	201.79	207.42	213.11	92	7.847	8.210	8.586
10	192.52	197.79	203.13	93	7.600	7.954	8.321
11	183.72	188.66	193.66	94	7.361	7.707	8.065
12	175.37	180.00	184.69	95	7.132	7.468	7.818
13	167.44	171.79	176.17	96	6.910	7.238	7.580
14	159.92	163.99	168.10	97	6.696	7.016	7.349
15	152.77	156.58	160.43	98	6.489	6.802	7.127
16	145.97	149.55	153.16	99	6.290	6.595	6.913
17	139.52	142.87	146.25	100	6.098	6.395	6.705
18	133.38	136.52	139.69	101	5.912	6.202	6.505
19	127.54	130.49	133.46	102	5.732	6.016	6.311
20	121.99	124.76	127.53	103	5.559	5.836	6.124
21	116.71	119.30	121.90	104	5.392	5.662	5.944
22	111.68	114.11	116.55	105	5.230	5.494	5.769
23	106.90	109.17	111.45	106	5.074	5.332	5.600
24	102.34	104.47	106.61	107	4.923	5.175	5.437

Temp.(℃)	R_{min}(kΩ)	R_{nor}(kΩ)	R_{max}(kΩ)	Temp.(℃)	R_{min}(kΩ)	R_{nor}(kΩ)	R_{max}(kΩ)
25	98.000	100.00	102.00	108	4.777	5.023	5.279
26	93.784	95.740	97.697	109	4.636	4.876	5.126
27	89.770	91.682	93.597	110	4.500	4.734	4.978
28	85.948	87.816	89.688	111	4.368	4.597	4.835
29	82.306	84.131	85.962	112	4.241	4.464	4.697
30	78.837	80.620	82.409	113	4.118	4.336	4.563
31	75.531	77.271	79.020	114	3.999	4.211	4.434
32	72.379	74.078	75.787	115	3.883	4.091	4.309
33	69.374	71.032	72.701	116	3.772	3.975	4.187
34	66.507	68.126	69.755	117	3.664	3.862	4.070
35	63.773	65.352	66.943	118	3.560	3.753	3.956
36	61.164	62.704	64.258	119	3.459	3.648	3.846
37	58.674	60.176	61.692	120	3.361	3.546	3.739
38	56.297	57.762	59.242	121	3.266	3.447	3.636
39	54.027	55.456	56.899	122	3.174	3.351	3.536
40	51.860	53.252	54.661	123	3.086	3.258	3.439
41	49.789	51.147	52.521	124	3.000	3.168	3.345
42	47.810	49.134	50.474	125	2.916	3.081	3.254

Note: B=3950K,R(25℃)=100KΩ.

3.3 Filter Transmission Curve

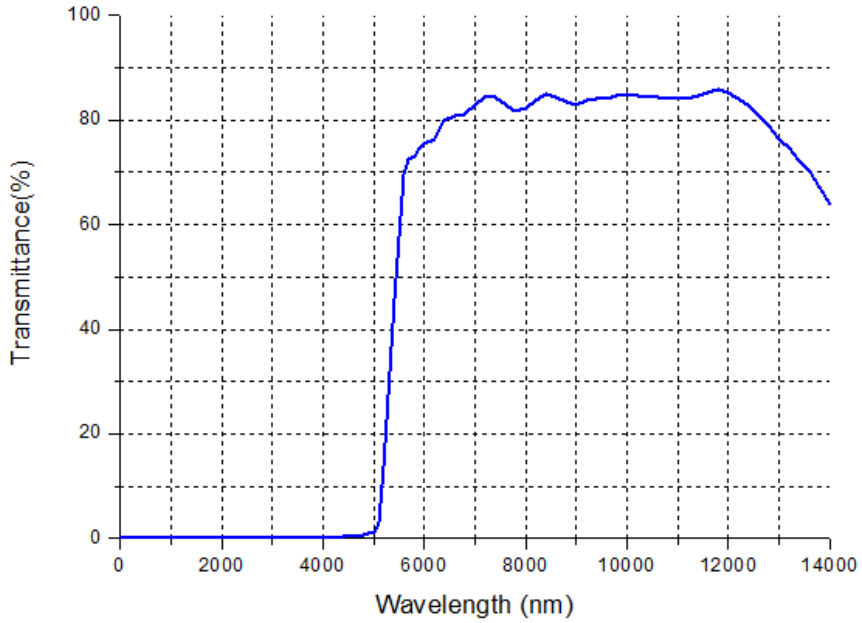
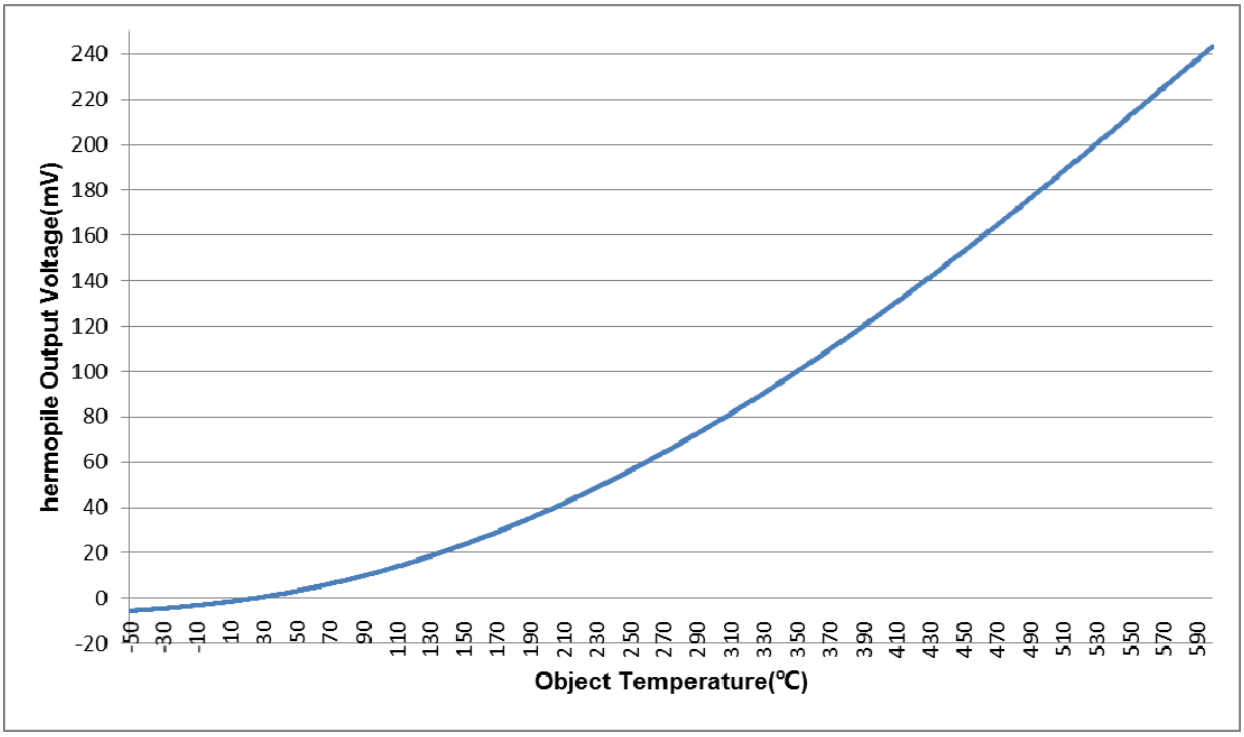


Figure 1 Filter Transmission Curve

3.4 Sensitivity Output Curve



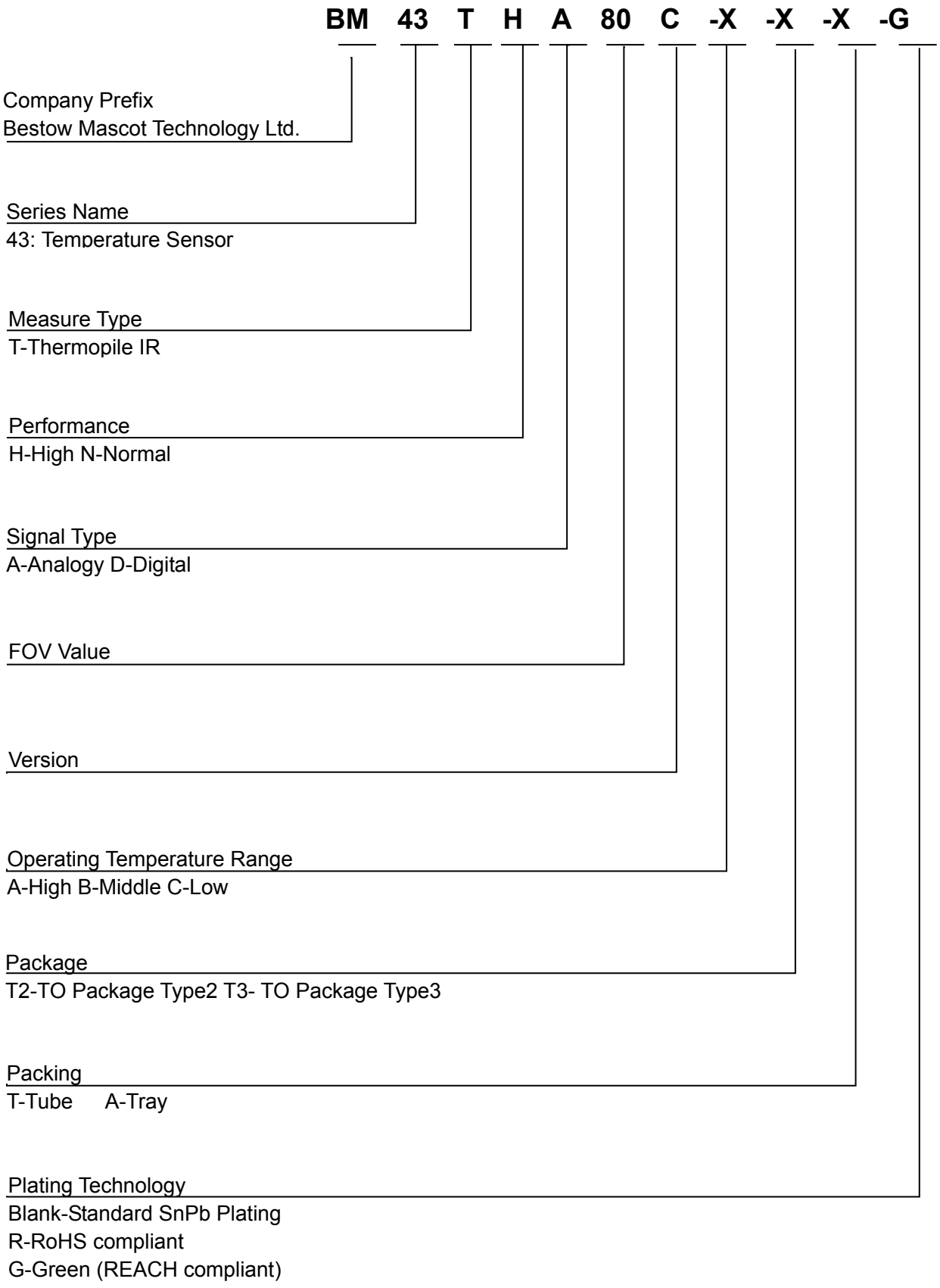
3.5 Typical Reliability Test Items

No.	Tested Item	Condition	Result (N/F[1])
1	High Humidity Test	+85±2℃, 85±2%RH 120h	20/0
2	Low Temperature	-40±3℃ 200h	20/0
3	High Temperature	+105±3℃ 200h	20/0
4	Thermal Shock	(-40℃→+85℃)×20Cycle 2h	20/0
5	Vibration	Frequency sweep: 10~55Hz/min → 2h Direction : X, Y, X (1.5mm distance for each direction)	20/0

Note1: N for amount of sample, F for amount of failure after test

4. Ordering Information

4.1 Naming Scheme

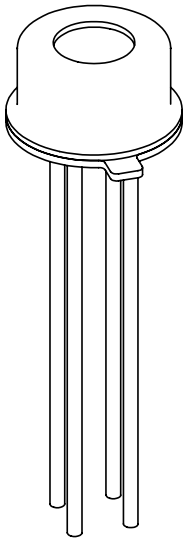


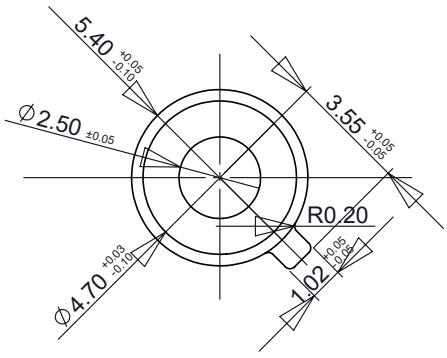
4.2 Order Information

Temperature Range	Package	Packaging	HSF	Order Code
Middle	T2	Tube	Green	BM43THA80C-B-T2-T-G
		Tray	Green	BM43THA80C-B-T2-A-G
	T3	Tube	Green	BM43THA80C-B-T3-T-G
		Tray	Green	BM43THA80C-B-T3-A-G
Low	T2	Tube	Green	BM43THA80C-C-T2-T-G
		Tray	Green	BM43THA80C-C-T2-A-G
	T3	Tube	Green	BM43THA80C-C-T3-T-G
		Tray	Green	BM43THA80C-C-T3-A-G

4.3 TO Package Type2 Outline Information (in mm)

TOP





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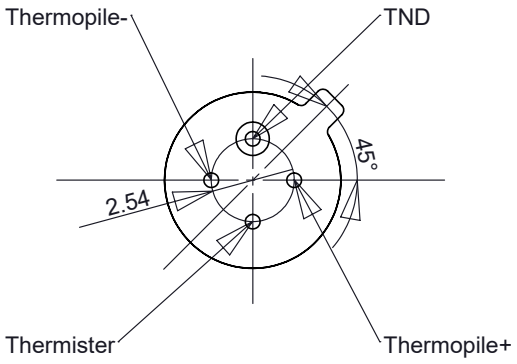
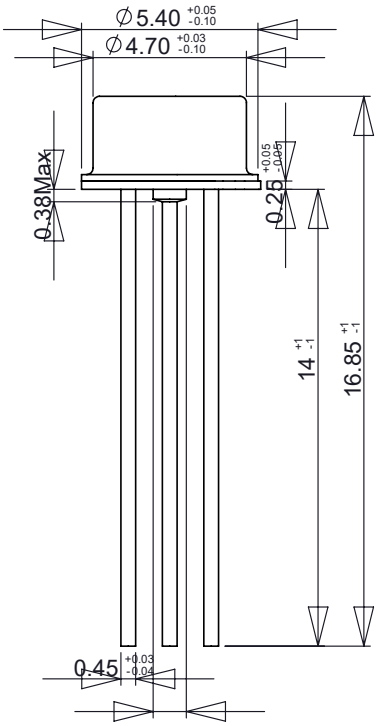
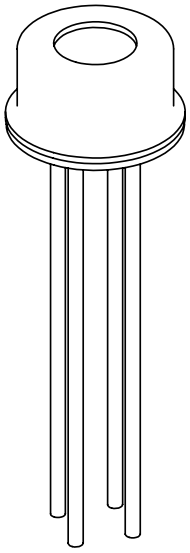


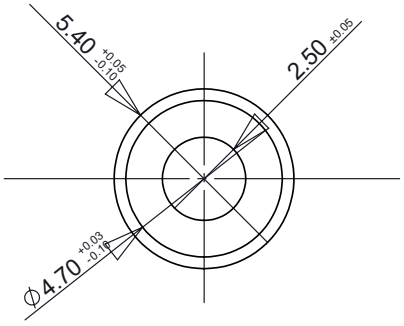
Front



4.4 TO Package Type3 Outline Information (in mm)

TOP





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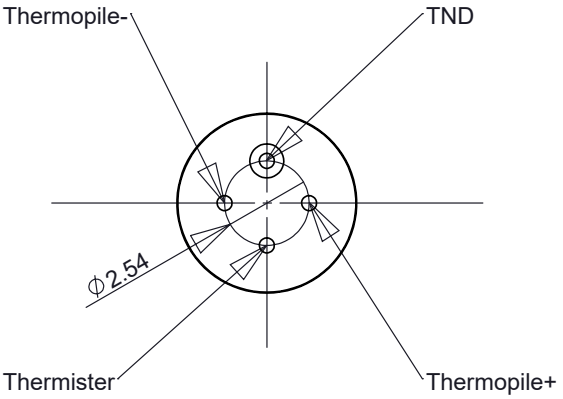
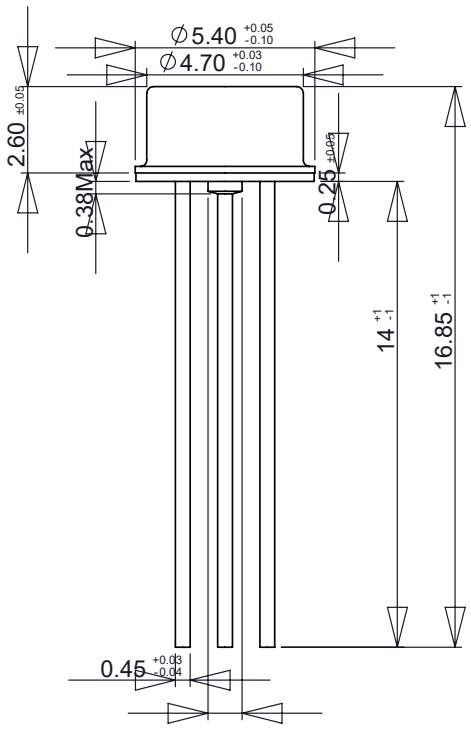
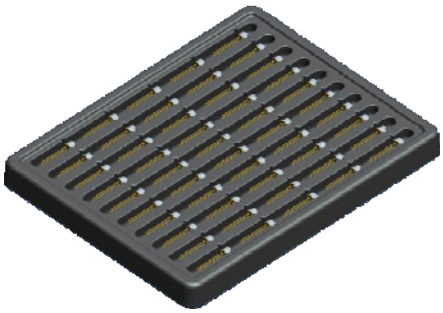


Front



4.5 Packing Information

Container	Tray
Quantity	1000 pcs
Direction of feed	Direction of products is fixed in a container tray



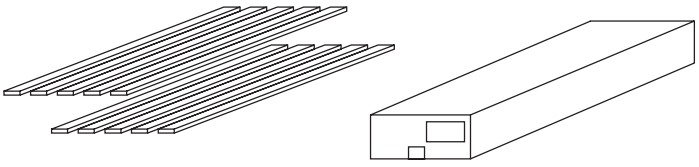
100pcs per tray

10 tray per box

MOQ=1000pcs

Container	Tube
Quantity	2000 pcs
Direction of feed	Direction of products is fixed in a container tray

50pcs per tube



40 tube per box

MOQ=2000pcs

5. Notice

●General Precaution

1) Before you use our Products, you are requested to carefully read this document and fully understand its contents. BM shall not be in any way responsible or liable for failure, malfunction or accident arising from the use of any BM's Products against warning, caution or note contained in this document.

2) All information contained in this document is current as of the issuing date and subject to change without any prior notice. Before purchasing or using BM's Products, please confirm the latest information with a BM sales representative.

●Precaution on using BM Products

1) Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment, transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the BM sales representative in advance. Unless otherwise agreed in writing by BM in advance, BM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any BM's Products for Specific Applications.

2) BM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:

[a] Installation of protection circuits or other protective devices to improve system safety

[b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

3) Our Products are designed and manufactured for use under standard conditions and not under any special or extraordinary environments or conditions, as exemplified below. Accordingly, BM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any BM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc, prior to use, must be necessary:

[a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents

[b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust

[c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2

[d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves

[e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items

[f] Sealing or coating our Products with resin or other coating materials

[g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering

[h] Use of the Products in places subject to dew condensation

4) The Products are not subject to radiation-proof design.

5) Please verify and confirm characteristics of the final or mounted products in using the Products.

6) In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse) is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7) De-rate Power Dissipation (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient temperature.

8) Confirm that operation temperature is within the specified range described in the product specification.

9) BM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

●Precaution for Mounting / Circuit board design

1) When a highly active halogen us (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2) In principle, the reflow soldering method must be used; if flow soldering method is preferred, please consult with the BM representative in advance. For details, please refer to BM Mounting specification

●Precautions Regarding Application Examples and External Circuits

1) If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components,

including transient characteristics, as well as static characteristics.

2) You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. BM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

●Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

●Precaution for Storage / Transportation

1) Product performance and soldered connections may deteriorate if the Products are stored in the places where:

[a] the Products are exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2

[b] the temperature or humidity exceeds those recommended by BM

[c] the Products are exposed to direct sunshine or condensation

[d] the Products are exposed to high Electrostatic

2) Even under BM recommended storage condition, solder ability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solder ability before using Products of which storage time is exceeding the recommended storage time period.

3) Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4) Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

●Precaution for Product Label

QR code printed on BM Products label is for BM's internal use only.

●Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

●Precaution for Foreign Exchange and Foreign Trade act

Since our Products might fall under controlled goods prescribed by the applicable foreign exchange and foreign trade act, please consult with BM representative in case of export.

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6. Revision History

Version	Publication date	Pages	Revise Description
1.0	Oct.2019	18	Initial Document Release