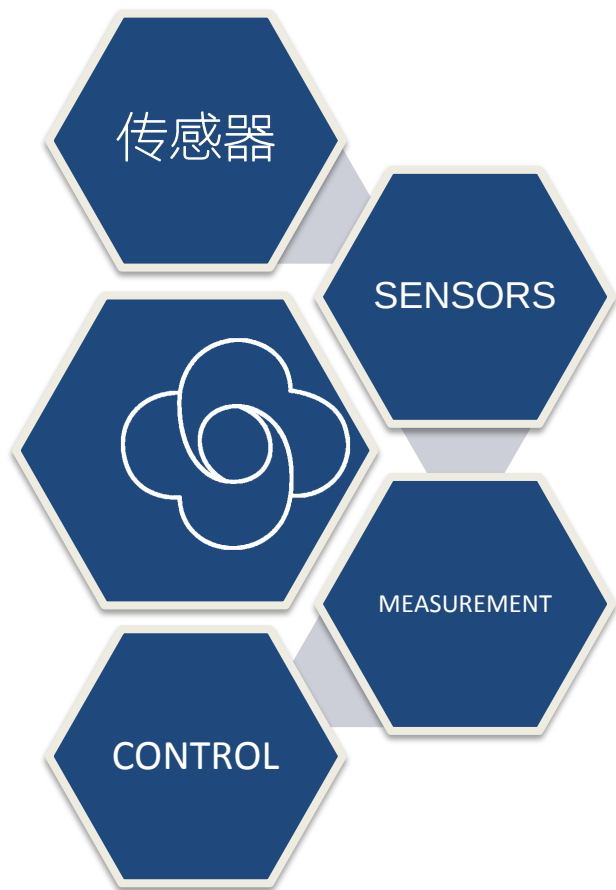




SENSOR MANUAL

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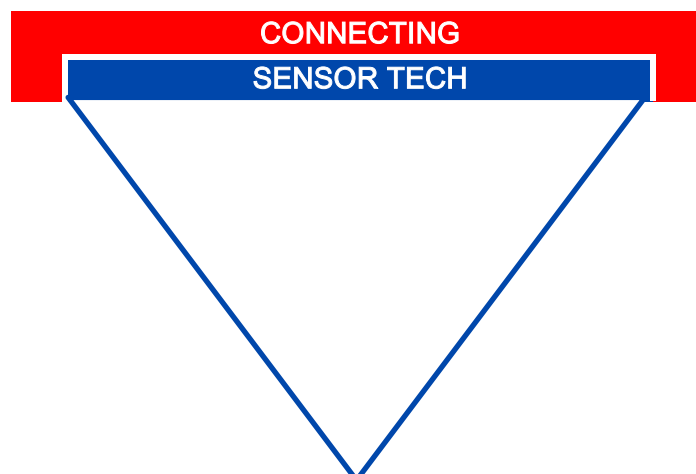
QUICK LINKS

[NTC SENSORS](#)

[DS18B20](#)

[NTC THERMISTOR](#)

[SENSOR PROBES](#)



NTC THERMISTOR

负温度系数热敏电阻

热敏电阻(Thermistor)是对热敏感的半导体电阻(Thermal Sensitive Resistor)，其阻值随温度变化而发生非常显著变化的半导体。一般而言分为两大类。一类是电阻值随温度升高而升高的 PTC (Postive Temperature Coefficient) 热敏电阻。另一类是电阻值随温度升高而降低的 NTC (Negative Temperature Coefficient) 热敏电阻。本目录说明仅限于NTC 热敏电阻。

A thermistor is "a thermally sensitive resistor" that is a semiconductor whose resistance varies significantly with temperature. In general, there are two types thermal sensitive resistor. One is PTC (Postive Temperature Coefficient); the resistance increases as temperature increases. The other is NTC (Negative Temperature Coefficient); the resistance decreases as temperature increases. The following description is applicable only to NTC thermistors.

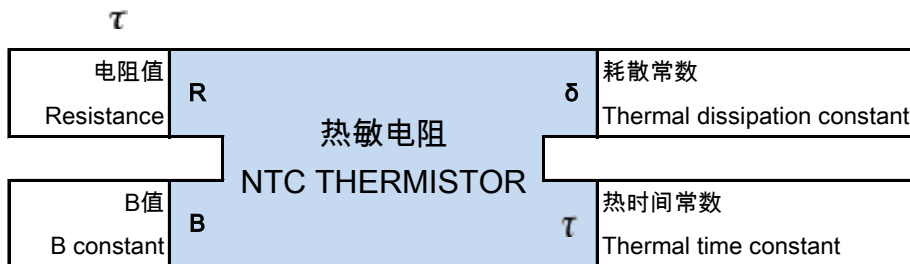
热敏电阻是应用于信息系统与控制系统的敏感元件，主要用于对温度的测量、控制、保护及用作加热器。热敏电阻是一种由锰、铜、硅、钴、镍、铁、锌等多种金属氧化物为原料烧结而成的陶瓷半导体感热晶体。使用温度在-50 ~ +1000℃之间，涵盖了日常温度控制所需的温度范围。热敏电阻体积小、稳定性好且响应性高，在国防、工控、通信、汽车、航天等领域以及日常家电中得到了广泛的应用。

NTC thermistor is an sensitive elements widely used in information system and control system, which is mainly used for temperature measurements, control, protection and heating. Thermistors are thermally sensitive elements of sintered fine ceramic semiconductor composed of several transition metal oxides, primarily Mn, Co and Ni. Their operating temperature range is from -50°C to +1000°C that covers the whole range necessary for ordinary temperature control. They are also small, stable and have great sensitivity. Thanks to these features, they are used in large quantities as temperature sensors and temperature compensation elements in consumer electronic appliances and industrial equipment.

4个重要的参数

热敏电阻的性能主要以电阻值、B值、热耗散常数 δ 、热时间常数 τ 这4个参数来表示。有时也用电阻温度系数 α 作为辅助常数。

Basically, characteristics of a thermistors is represented by four constants: resistance R, B constant B, thermal dissipation constant δ and thermal time constant τ



电阻值 R (k Ω)

热敏电阻的电阻值R和绝对温度T之间，有以下近似关系。

Between resistance R and absolute temperature T, there is the following approximate relationship.

$$R_1 = R_2 \exp B \left(\frac{1}{T_1} - \frac{1}{T_2} \right) \dots \dots \dots (1)$$

根据公式、可以求证任意温度T时的热敏电阻R。

Thermistor resistance R at any temperature T can be calculated from equation (1)

R1: Resistance (Ω) at absolute temperature T1 (K)

绝对温度T1 (K) 时的电阻值

R2: Resistance (Ω) at absolute temperature T2 (K)

绝对温度T2 (K) 时的电阻值

B : B constant

B值

B constant B (K)

B值是电阻在2个温度之间的电阻值变化量的常数，由以下计算公式得出。

B is a constant that expresses a change rate in resistance between two temperatures, which is derived from the equation (1).

$$B = \frac{\ln R_1 - \ln R_2}{\frac{1}{T_1} - \frac{1}{T_2}} = \frac{2.3026(\log R_1 - \log R_2)}{\frac{1}{T_1} - \frac{1}{T_2}} \dots\dots\dots (2)$$

B值一般是B25°C/50°C=2000 ~ 6000K，B值越大每1°C的电阻变化率也变大。

In general, B constant value ranges B25°C/50°C = 2,000 - 6,000K. The higher the B value is, the greater the change rate in resistance per 1°C becomes.

R1: Resistance (Ω) at absolute temperature T1 (K)

绝对温度T1 (K) 时的电阻值

R2: Resistance (Ω) at absolute temperature T2 (K)

绝对温度T2 (K) 时的电阻值

B : B constant

B值

耗散常数δ (mW/°C)

耗散常数δ是指给热敏电阻通电加热时，热敏电阻晶体表面和引线产生自热的热量大小程度。

耗散常数δ可以用公式(3)计算出附加在热敏电阻上的消耗与相应的温度上升值。

Thermal dissipation constant δ is a constant that expresses a degree of radiation from surface and lead wires of a thermistor element, when electric current is applied to heat it up.

Thermal dissipation constant δ can be determined by the equation (3) as a ratio between a power consumption applied to a thermistor and a degree of temperature increased by the power.

$$\delta = \frac{W}{T - T_a} = \frac{I^2 R}{T - T_a} \dots\dots\dots (3)$$

Thermal dissipation constant (mW/°C)

耗散常数 (mW/°C)

W: Power consumption in thermistor (mW)

热敏电阻的消耗功率(mW)

T : Temperature at heat equilibrium after rising (°C)

升温达到热平衡时的温度值(°C)

Ta : External ambient temperature (°C)

周围温度(°C)

I : Current flowing in a thermistor at temperature T (mA)

温度T时，通过热敏电阻的电流值(mA)

R : Resistance of a thermistor at temperature T (kΩ)

温度T时，热敏电阻的电阻值(kΩ)

进行精密温度测量或者控制时，要观察热敏电阻的耗散常数δ的值，控制电流，避免通过热敏电阻的电流过大电阻本身加热而引起的温度误差。此产品介绍中所述耗散常数是指在静止空气中的单个热敏电阻晶体的值。请注意在组装加工成温度传感器之后其δ的值会有变化。

In order to measure temperature accurately and to control precicely, it is important to look closely at the value of of a thermistor and minimize electric current so that measurement error caused by heating is eliminated. Thermal dissipation constant in this catalog shows a value when a discrete element is placed in still air. Please note that values for assembled thermal sensors will be different.

热时间常数 T (sec.)

热时间常数T是在热敏电阻的周围温度或通过热敏电阻的电流在发生激烈变化的情况下，其电阻值发生急变的时间程度的常数。

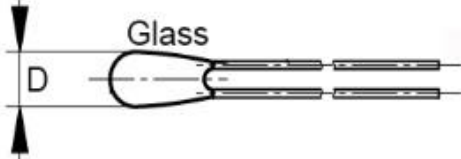
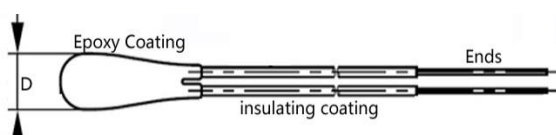
热时间常数是热敏电阻晶体的温度从初始值到最终值的温度差(1-1/e)，即到达63.2%时所需要的时间。

Thermal time constant T is a constant which indicates how fast resistance of a thermistor follows to a change in surrounding temperature or electric current injected. The constant is expressed by a time to reach to (1-1/e) or 63.2% of a difference between initial and final achieving temperatures of a thermistor element.

型号与分类

Part No.

热敏电阻主要型号和特性

型号/ Part #		D (mm)	Temperature Range	示意图/Sturcture Image
MGB	MG-B05	Ø0.50 ± 0.1	-50℃ ~ +300℃	
	MG-B08	Ø0.80 ± 0.1		
	MG-B12	Ø1.20 ± 0.2	-50℃ ~ +350℃	
	MG-B18	Ø1.80 ± 0.2		
	MG-B23	Ø2.30 ± 0.2		
MGD	MG-D18	⊙1.80 ± 1.0	-50℃ ~ +250℃	
	MG-D13	⊙1.30 ± 1.0		
MEB	ME-B08	Ø0.80 ± 0.1	-30℃ ~ +110℃	
	ME-B12	Ø1.20 ± 0.1		
	ME-B14	Ø1.40 ± 0.1		
	ME-B16	Ø1.60 ± 0.1		

Part No. Description

M	G	B	08	103	F	3950U	F
---	---	---	----	-----	---	-------	---

M	G/E	B/D	08 / 12	R @ 25°C	R ± %	B (25/50°C)	B ± %
热敏电阻	G: Glass	B: Bead	08: 0.8mm	503=50*10 ³ Ω	F ± 1%	3000K	F ± 1%
Thermistor	玻璃封装	单端式样	12: 1.2mm	104=10*10 ⁴ Ω	G ± 2%	~	G ± 2%
	E: Epoxy	D: Diode	18: 1.8mm	502=50*10 ² Ω	H ± 3%	5000K	H ± 3%
	环氧封装	二极管式	20: 2.0mm	103=10*10 ³ Ω	J ± 5%		J ± 5%

MGB18-103F3950UF

M	NTC Thermistor / 负温度系数热敏电阻
G	Glass sealed thermistor/ 玻璃封装热敏电阻
E	Epoxy resin coated thermistor/ 环氧树脂封装热敏电阻
B	Bead structure thermistor/ 单端珠状热敏电阻
D	Diode structure thermistor/ 二极管式热敏电阻
18	Outer diameter of the thermistor head/ 热敏电阻头部直径 1.8mm
103	Resistance @ 25°C / 25°C 电阻值 103=10KΩ=10*10 ³ Ω 503=50KΩ=50*10 ³ Ω 153=15KΩ=15*10 ³ Ω 以此类推
F	Resistance tolerance @ 25°C ± 1% / 25°C时电阻值精度为 ± 1%. 以此类推
3950U	Beta value at (25/50°C) / B值(25/50°C)
F	Tolerance of Beta value/ B值精度 ± 1%

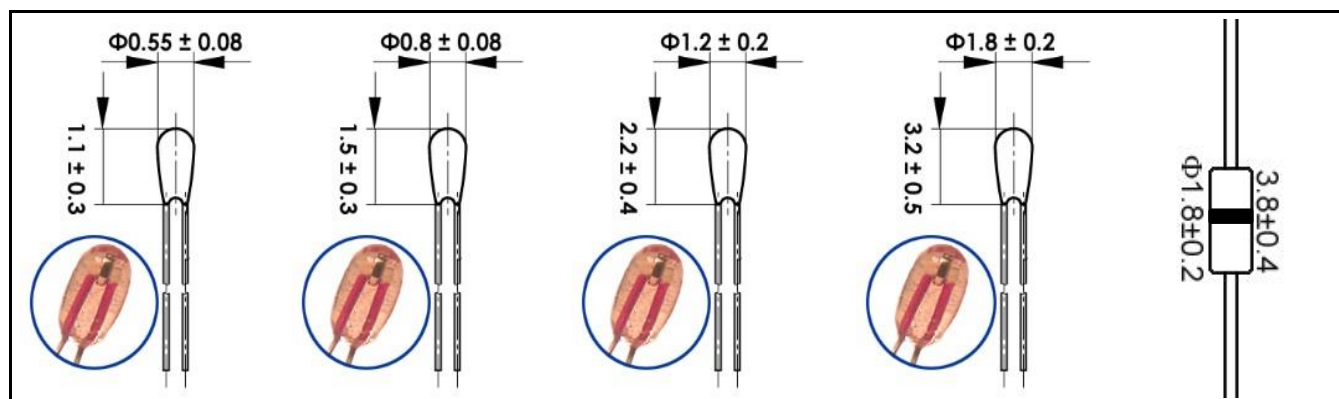
选型参考表

测温型负温度系数热敏电阻

SELECTION MANUAL

NTC Thermistor

	MGB05	MGB08	MGB12	MGB18	MGD18	MEB08	MEB12	MEB14
使用温度 OP Temp.	-50℃ ~ +300℃		-50℃ ~ +350℃		-50℃ ~ +250℃	-30℃ ~ +110℃		
25℃ 阻值 R @ 25℃	2.0KΩ ~ 200KΩ		2.0KΩ ~ 500KΩ		2.0KΩ ~ 1000KΩ	2.0KΩ ~ 200KΩ		
B(25/50℃)	3000K ~ 4500K		3000K ~ 4500K		3000K ~ 4500K	3000K ~ 4500K		
耗散常数 δ In Still Air	0.25mW/℃ 0.2 - 0.3mW/℃	0.4mW/℃ 0.35 - 0.55mW/℃	0.75mW/℃ 0.7 - 0.9mW/℃	1.1mW/℃ 1.0 - 1.2mW/℃	2.3mW/℃ 1.9 - 3.0mW/℃	0.4mW/℃ 0.35 - 0.55mW/℃	0.75mW/℃ 0.7 - 0.9mW/℃	
热时间常数 τ In Still Air	1 s 0.6 - 1.5 s	2 s 1.7 - 2.9 s	5 s 3.5 - 6.5 s	10 s 8 - 13 s	12 s 10 - 16 s	2 s 1.7 - 2.9 s	3 s 2 - 5 s	
绝缘电阻 Insulation R	DC50V 10MΩ			DC500V 50MΩ	DC500V 100MΩ	DC100V 100MΩ		
电阻精度 @25 Tolerance @25	± 1 % ± 2 % ± 3 % ± 5 %					±0.16% ± 1 % ± 2 % ± 3 %		
头部尺寸 mm Head Dia	∅ 0.55 ± 0.08 x 1.1 ± 0.3	∅ 0.8 ± 0.08 x 1.5 ± 0.3	∅ 1.2 ± 0.2 x 2.2 ± 0.4	∅ 1.8 ± 0.2 x 3.2 ± 0.5	∅ 1.8 ± 0.2 x 3.8 ± 0.4	∅ 0.8 ± 0.1 x 1.6 ± 0.1	∅ 1.2 ± 0.1 x 2.2 ± 0.1	∅ 1.4 ± 0.1 x 3.0 ± 0.1
引线长度 mm Leads	32mm 70mm Customized 订制				28 * 2	20 ~ 120mm Customized 订制		



Temperature measurement

测温型负温度系数热敏电阻

Glass-encapsulated sensors

MG

PART #	R @ 25°C		B(25/50°C)	
MGB08-104F3950	100KΩ	F/G/H/J	3950	F

PART #	R @ 25°C		B(25/50°C)	
MGB12-502F3920	5KΩ	F/G/H/J	3920	F
MGB12-103F3380	10KΩ	F/G/H/J	3380	F
MGB12-103F3470	10KΩ	F/G/H/J	3470	F
MGB12-103F3950	10KΩ	F/G/H/J	3950	F
MGB12-503F3950	50KΩ	F/G/H/J	3950	F
MGB12-503F4000	50KΩ	F/G/H/J	4000	F
MGB12-104F3950	100KΩ	F/G/H/J	3950	F
MGB12-104F4000	100KΩ	F/G/H/J	4000	F

PART #	R @ 25°C		B(25/50°C)	
MGB18-502F3950	5KΩ	F/G/H/J	3950	F
MGB18-103F3350	10KΩ	F/G/H/J	3350	F
MGB18-103F3380	10KΩ	F/G/H/J	3380	F
MGB18-103F3950	10KΩ	F/G/H/J	3950	F
MGB18-503F3950	50KΩ	F/G/H/J	3950	F
MGB18-503F4000	50KΩ	F/G/H/J	4000	F
MGB18-104F3950	100KΩ	F/G/H/J	3950	F
MGB18-104F4000	100KΩ	F/G/H/J	4000	F
MGB18-104F4200	100KΩ	F/G/H/J	4200	F
MGB18-104F4230	100KΩ	F/G/H/J	4230	F
MGB18-104F4250	100KΩ	F/G/H/J	4250	F
MGB18-104F4350	100KΩ	F/G/H/J	4350	F
MGB18-204F3890	100KΩ	F/G/H/J	3890	F
MGB18-234F4130	100KΩ	F/G/H/J	4130	F

PART #	R @ 25°C		B(25/50°C)	
MGD18-302F3950	3KΩ	F/G/H/J	3950	F
MGD18-472F3470	4.7KΩ	F/G/H/J	3470	F
MGD18-502F3280	5KΩ	F/G/H/J	3280	F
MGD18-502F3470	5KΩ	F/G/H/J	3470	F
MGD18-103F3380	10KΩ	F/G/H/J	3380	F
MGD18-103F3470	10KΩ	F/G/H/J	3470	F
MGD18-103F3600	10KΩ	F/G/H/J	3600	F
MGD18-103F3950	10KΩ	F/G/H/J	3950	F
MGD18-103F4000	10KΩ	F/G/H/J	4000	F
MGD18-103F4100	10KΩ	F/G/H/J	4100	F
MGD18-153F3470	15KΩ	F/G/H/J	3470	F
MGD18-203F3470	20KΩ	F/G/H/J	3470	F
MGD18-203F3950	20KΩ	F/G/H/J	3950	F
MGD18-203F4200	20KΩ	F/G/H/J	4200	F
MGD18-203F4230	20KΩ	F/G/H/J	4230	F
MGD18-303F3950	30KΩ	F/G/H/J	3950	F
MGD18-473F4000	47KΩ	F/G/H/J	4000	F
MGD18-503F3920	50KΩ	F/G/H/J	3920	F
MGD18-503F3950	50KΩ	F/G/H/J	3950	F
MGD18-503F4000	50KΩ	F/G/H/J	4000	F
MGD18-104F3950	100KΩ	F/G/H/J	3950	F
MGD18-104F4000	100KΩ	F/G/H/J	4000	F
MGD18-104F4200	100KΩ	F/G/H/J	4200	F
MGD18-104F4330	100KΩ	F/G/H/J	4330	F
MGD18-204F3890	200KΩ	F/G/H/J	3890	F
MGD18-204F4000	200KΩ	F/G/H/J	4000	F
MGD18-234F4130	230KΩ	F/G/H/J	4130	F
MGD18-504F4050	500KΩ	F/G/H/J	4050	F

RESISTANCE-TEMP. TABLE

R-T TABLE

Glass-encapsulated sensors

MG

KΩ

Rt Temp. °C \ Item	202F3890	103F3380	103F3470	103F3600	103F3950	103F4000	203F3950	502F3470
-30°C	37.4800	120.3000	127.1000	132.3250	173.7550	189.3000	347.5100	50.9770
-25°C	27.5100	92.0000	96.5000	100.4055	129.4075	139.1000	258.8000	39.6400
-20°C	20.2200	71.2655	74.2480	76.7756	97.4205	103.0000	194.8300	31.2810
-15°C	15.1200	55.6000	57.5100	59.2630	73.2141	76.8900	146.4200	24.7400
-10°C	11.3600	43.7215	45.0720	46.2458	55.8015	57.9300	111.5970	19.8795
-5°C	8.6800	34.7000	35.6000	36.4217	42.7122	44.1500	85.4200	16.0200
-0°C	6.6680	27.7745	28.3430	28.8773	32.9977	33.7600	65.9920	13.0520
5°C	5.1370	22.2900	22.6600	23.0310	25.5513	26.1200	51.1000	10.6400
10°C	4.0130	18.1265	18.3240	18.5643	20.0690	20.2600	40.1360	8.7950
15°C	3.1560	14.7100	14.8500	14.9806	15.7608	15.9200	31.5200	7.2610
20°C	2.5110	12.1085	12.1630	12.2085	12.5131	12.5900	25.0250	6.2680
25°C	2.0000	10.0000	10.0000	10.0000	10.0000	10.0000	20.0000	5.0000
30°C	1.6150	8.3318	8.2970	8.2725	8.0703	7.9916	16.1400	4.1500
35°C	1.3140	6.9667	6.8990	6.8537	6.5443	6.4732	13.0880	3.4560
40°C	1.0740	5.8455	5.7721	5.6768	5.3202	5.2578	10.6400	2.8800
45°C	0.8810	4.9324	4.8330	4.7200	4.3522	4.2954	8.7040	2.4170
50°C	0.7290	4.1786	4.0589	3.9293	3.5835	3.5419	7.1669	2.0300
55°C	0.6090	3.5694	3.4280	3.3011	2.9891	2.9287	5.9780	1.7270
60°C	0.5100	3.0548	2.8022	2.7741	2.4901	2.4394	4.9800	1.4630
65°C	0.4300	2.6291	2.4530	2.3490	2.0891	2.0431	4.1780	1.2510
70°C	0.3650	2.2695	2.0861	1.9750	1.7491	1.7157	3.4980	1.0060
75°C	0.3090	1.9609	1.7710	1.6910	1.4810	1.4504	2.9620	0.9160
80°C	0.2640	1.7033	1.5180	1.4430	1.2580	1.2331	2.5160	0.7900
85°C	0.2270	1.4877	1.3080	1.2399	1.0720	1.0538	2.1440	0.6830
90°C	0.1960	1.2850	1.1210	1.0540	0.9180	0.8900	1.8360	0.5930
95°C	0.1700	1.1280	0.9690	0.9120	0.7910	0.7640	1.5820	0.5160
100°C	0.1470	0.9910	0.8430	0.7890	0.6830	0.6590	1.3660	0.4510
105°C	0.1300	0.8840	0.7400	0.6950	0.6000	0.5780	1.2000	0.4000
110°C	0.1150	0.7770	0.6460	0.6050	0.5210	0.5040	1.0420	0.3510
115°C	0.1010	0.6860	0.5660	0.5300	0.4580	0.4390	0.9160	0.3100
120°C	0.0890	0.6070	0.4970	0.4650	0.4000	0.3840	0.8000	0.2740
125°C	0.0790	0.5340	0.4360	0.4070	0.3490	0.3370	0.6980	0.2420
130°C	0.0700	0.4760	0.3850	0.3610	0.3090	0.2960	0.6180	0.2160
135°C	0.0630	0.4210	0.3420	0.3190	0.2730	0.2620	0.5460	0.1920
140°C	0.0560	0.3740	0.3020	0.2810	0.2410	0.2320	0.4820	0.1711
145°C	0.0500	0.3330	0.2680	0.2500	0.2140	0.2060	0.4280	0.1530
B _{25/50}	3890	3380	3470	3600	3950	4000	3950	3470
B _{25/85}	3872	3390	3620	3736	3975	4031	3975	3544
B _{0/50}	3907	3343	3430	3521	3920	3980	3919	3285

R-T TABLE

MG

 $K\Omega$

RT Temp. °C	Item							
	202F3890	103F3380	103F3470	103F3600	103F3950	103F4000	203F3950	502F3470
150°C	0.0450	0.2980	0.2400	0.2230	0.1910	0.1830	0.3820	0.1375
155°C	0.0410	0.2710	0.2170	0.2020	0.1730	0.1660	0.3460	0.1250
160°C	0.0380	0.2430	0.1954	0.1810	0.1550	0.1490	0.3100	0.1130
165°C	0.0350	0.2210	0.1770	0.1640	0.1410	0.1350	0.2820	0.1030
170°C	0.0320	0.1979	0.1592	0.1468	0.1258	0.1208	0.2516	0.0929
175°C	0.0280	0.1780	0.1420	0.1320	0.1130	0.1089	0.2260	0.0840
180°C	0.0260	0.1617	0.1287	0.1197	0.1027	0.0984	0.2054	0.0767
185°C	0.0230	0.1460	0.1160	0.1080	0.0930	0.0893	0.1860	0.0700
190°C	0.0220	0.1327	0.1093	0.0982	0.0845	0.0807	0.1690	0.0638
195°C	0.0200	0.1200	0.0957	0.0890	0.0700	0.0735	0.1540	0.0580
200°C	0.0180	0.1098	0.0876	0.0812	0.0698	0.0671	0.1396	0.0532
205°C	0.0170	0.1020	0.0810	0.0750	0.0650	0.0624	0.1300	0.0490
210°C	0.0160	0.0930	0.0740	0.0690	0.0600	0.0571	0.1200	0.0460
215°C	0.0150	0.0850	0.0680	0.0630	0.0540	0.0526	0.1080	0.0420
220°C	0.0140	0.0780	0.0620	0.0580	0.0500	0.0484	0.1000	0.0390
225°C	0.0130	0.0720	0.0570	0.0530	0.0460	0.0445	0.0920	0.0360
230°C	0.0120	0.0660	0.0520	0.0490	0.0420	0.0409	0.0840	0.0330
R ₂₅	2KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	20KΩ	5KΩ
B _{25/50}	3890	3380	3470	3600	3950	4000	3950	3470
B _{25/85}	3872	3390	3620	3736	3975	4031	3975	3544
B _{0/50}	3907	3343	3430	3521	3920	3980	3919	3285

RESISTANCE-TEMP. TABLE

R-T TABLE

Glass-encapsulated sensors

MG

KΩ

Rt Temp. °C \ Item	503F3950	503F4000	104F3950	104F4000	104F4230	204F3900	234F4130	504F4040
-30°C	855.2500	864.4574	1733.2000	1797.7500	2059.0500	3217.9500	4550.0000	8837.0000
-25°C	634.8000	634.8936	1283.0000	1324.0000	1494.0000	2401.1390	3317.0000	6507.0000
-20°C	474.8550	477.5319	959.0500	987.0001	1102.7000	1817.4000	2438.0000	4878.5000
-15°C	358.0000	359.8936	724.8000	740.8000	819.0000	1380.0750	1817.0000	3710.0000
-10°C	272.7950	273.9362	551.4100	563.2500	614.6400	1059.4050	1365.0000	2798.9000
-5°C	209.8000	210.7447	423.7000	430.8000	465.2000	820.7415	1038.0000	2149.0000
-0°C	162.3150	162.7979	327.2400	332.1300	354.2250	639.2616	793.1000	1655.9000
5°C	126.5000	126.9149	254.8000	257.0000	270.9000	498.9244	611.0000	1286.0000
10°C	99.4750	99.6170	199.9900	201.5650	209.5450	394.5483	475.8300	1005.5000
15°C	78.3100	78.5106	157.6000	157.8000	162.3000	311.0146	369.1800	790.8000
20°C	62.4035	62.6074	125.2450	125.3850	126.9700	249.1109	292.7500	628.3300
25°C	50.0000	50.0000	100.0000	100.0000	100.0000	200.0000	230.0000	500.0000
30°C	40.4000	40.3383	81.0000	80.6000	79.5238	162.1068	183.9100	402.3800
35°C	32.8000	32.5319	65.6500	65.0200	63.4875	131.4055	147.7000	323.9000
40°C	26.7000	26.4691	53.5000	52.9000	50.9713	107.5043	119.1600	263.0100
45°C	21.8400	21.5957	43.7800	43.1600	41.1150	88.2035	96.5000	213.9000
50°C	17.9380	17.6981	35.8999	35.4450	33.3672	72.6629	78.7369	175.3556
55°C	14.8900	14.6277	29.9900	29.4000	27.3036	60.5722	64.8000	144.8000
60°C	12.3700	11.6936	25.0000	24.4000	22.2271	50.5018	53.2610	115.4900
65°C	10.3000	10.0957	20.9000	20.3700	18.5207	42.2515	44.4000	99.6000
70°C	8.6000	8.4505	17.5500	17.0500	15.3243	35.5012	36.8940	83.2100
75°C	7.2140	7.0638	14.7600	14.3000	12.7579	29.8510	30.6900	69.3600
80°C	6.1000	5.9681	12.5400	12.1300	10.7214	25.3008	25.8080	58.5000
85°C	5.1600	5.0319	10.6600	10.2800	8.4850	21.6007	21.7100	49.3000
90°C	4.3900	4.2872	9.1000	8.7500	7.5302	18.4206	18.4280	41.9000
95°C	3.7390	3.6574	7.7840	7.4680	6.3692	15.7505	15.6400	35.6300
100°C	3.2100	3.1277	6.7100	6.4200	5.4202	13.5904	13.3130	30.4000
105°C	2.7800	2.7234	5.8500	5.5900	4.6801	11.8803	11.5900	26.4000
110°C	2.4100	2.3511	5.0700	4.8400	4.0201	10.2803	9.9450	22.7000
115°C	2.0700	2.0319	4.4100	4.1900	3.4401	8.9103	8.5800	19.6000
120°C	1.8070	1.7649	3.8500	3.6500	2.9801	7.8002	7.4190	17.0300
125°C	1.5670	1.5319	3.3400	3.1500	2.5601	6.7602	6.4200	14.7700
130°C	1.3740	1.3383	2.9400	2.7600	2.2401	5.9701	5.5642	12.8800
135°C	1.2030	1.1766	2.5800	2.4000	1.9421	5.2201	4.8700	11.2400
140°C	1.0520	1.0309	2.2710	2.1100	1.6950	4.6001	4.2310	9.8300
145°C	0.9240	0.9053	2.0000	1.8420	1.4770	4.0401	3.6900	8.6100
B _{25/50}	3950	4000	3950	4000	4230	3900	4130	4040
B _{25/85}	4043	4086	3985	4050	4294	3962	4202	4123
B _{100/200}	4365	4275	4137	4421	4540	4244	4560	4431

R-T TABLE

MG

 $K\Omega$

Rt Temp. °C	Item							
	503F3950	503F4000	104F3950	104F4000	104F4230	204F3900	234F4130	504F4040
150°C	0.8170	0.8021	1.7700	1.6280	1.2950	3.5901	3.2475	7.6000
155°C	0.7330	0.7202	1.5890	1.4590	1.1630	3.2301	2.9000	6.8200
160°C	0.6510	0.6426	1.4140	1.2930	1.0290	2.8801	2.5564	6.0400
165°C	0.5810	0.5691	1.2590	1.1490	0.9130	2.5701	2.2600	5.3500
170°C	0.5180	0.5117	1.1220	1.0230	0.8120	2.3100	1.9997	4.7800
175°C	0.4600	0.4532	0.9970	0.9050	0.7170	2.0500	1.7700	4.2300
180°C	0.4150	0.4085	0.8960	0.8140	0.6430	1.8580	1.5793	3.8000
185°C	0.3700	0.3649	0.7970	0.7230	0.5720	1.6620	1.4110	3.3900
190°C	0.3340	0.3447	0.7190	0.6510	0.5130	1.5030	1.2555	3.0600
195°C	0.2990	0.2957	0.6430	0.5810	0.4580	1.3510	1.1240	2.7200
200°C	0.2710	0.2777	0.5820	0.5250	0.4140	1.2290	1.0065	2.4700
205°C	0.2490	0.2457	0.5330	0.4810	0.3780	1.1300	0.9270	2.2500
210°C	0.2260	0.2234	0.4830	0.4360	0.3430	1.0290	0.8354	2.0400
215°C	0.2050	0.2032	0.4370	0.3940	0.3100	0.9370	0.7540	1.8490
220°C	0.1860	0.1840	0.3960	0.3560	0.2800	0.8520	0.6800	1.6760
225°C	0.1690	0.1681	0.3600	0.3230	0.2540	0.7790	0.6160	1.5230
230°C	0.1550	0.1543	0.3280	0.2940	0.2320	0.7130	0.5590	1.3870
235°C	0.1420		0.2993	0.2680			0.5282	
240°C	0.1310		0.2737	0.2450			0.4812	
245°C	0.1210		0.2507	0.2240			0.4396	
250°C	0.1110		0.2300	0.2050			0.4051	
255°C			0.2114	0.1890			0.3699	
260°C			0.1946	0.1740			0.3394	
265°C			0.1794	0.1602			0.3122	
270°C			0.1656	0.1480			0.2891	
275°C			0.1531	0.1370			0.2652	
280°C			0.1417	0.1260			0.2442	
285°C			0.1314	0.1170			0.2253	
290°C			0.1220	0.1090			0.2081	
295°C			0.1134	0.1010			0.1931	
300°C			0.1056	0.0939			0.1794	
R ₂₅	50KΩ	50KΩ	100KΩ	100KΩ	100KΩ	200KΩ	230KΩ	500KΩ
B _{25/50}	3950	4000	3950	4000	4230	3900	4130	4040
B _{25/85}	4043	4086	3985	4050	4294	3962	4202	4123
B _{100/200}	4365	4275	4137	4421	4540	4244	4560	4431

Temperature measurement

测温型负温度系数热敏电阻

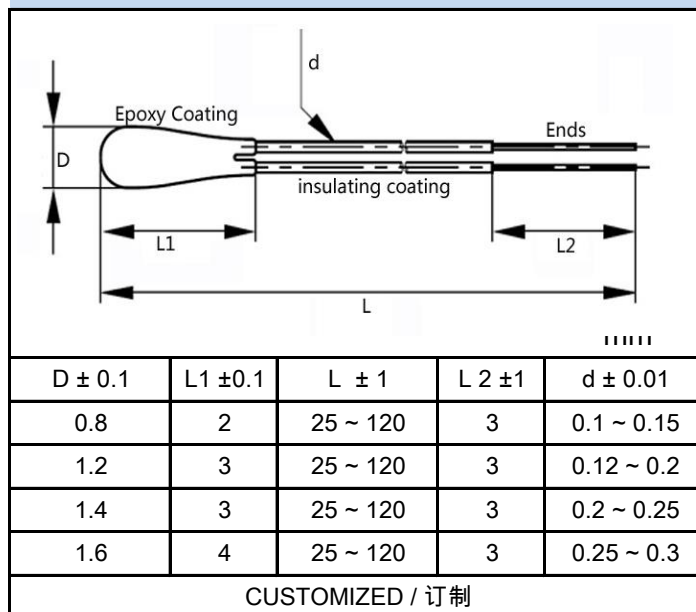
Epoxy resin coated miniature sensors

ME

PART #	R @ 25°C		B(25/50°C)	
MEB14-202F3950	2KΩ	F/G/H	3950	F
MEB14-222F3950	2.252KΩ	F/G/H	3950	F
MEB14-302F3950	3KΩ	F/G/H	3950	F
MEB14-502F3275	5KΩ	F/G/H	3275	F
MEB14-502F3470	5KΩ	F/G/H	3470	F
MEB14-502F3950	5KΩ	F/G/H	3950	F
MEB14-103F3380	10KΩ	F/G/H	3380	F
MEB14-103F3470	10KΩ	F/G/H	3470	F
MEB14-103F3600	10KΩ	F/G/H	3600	F
MEB14-103F3950	10KΩ	F/G/H	3950	F
MEB14-103F4100	10KΩ	F/G/H	4100	F
MEB14-303F3950	30KΩ	F/G/H	3950	F
MEB14-473F3950	47KΩ	F/G/H	3950	F
MEB14-473F4000	47KΩ	F/G/H	4000	F
MEB14-503F3950	50KΩ	F/G/H	3950	F
MEB14-503F4000	50KΩ	F/G/H	4000	F
MEB14-503F4060	50KΩ	F/G/H	4060	F
MEB14-104F3920	100KΩ	F/G/H	3920	F
MEB14-104F3950	100KΩ	F/G/H	3950	F
MEB14-104F4000	100KΩ	F/G/H	4000	F
MEB14-204F4000	200KΩ	F/G/H	4000	F
MEB13-503F3950L87	50KΩ	±0.16%	3950	F

①

STRUCTURE IMAGE/ 结构示意图



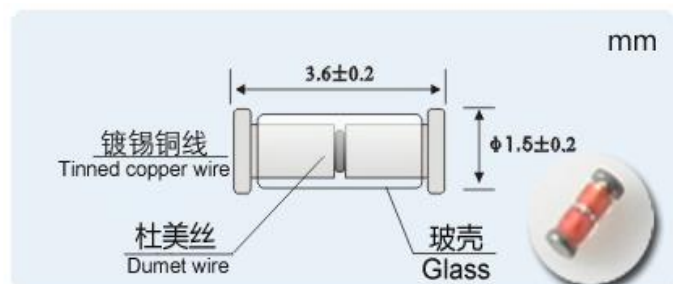
① SPECIAL FOR ELECTRONIC THERMOMETER

电子体温计专用热敏电阻 精度 ± 0.05°C

OTHER THERMISTOR / 其他热敏电阻

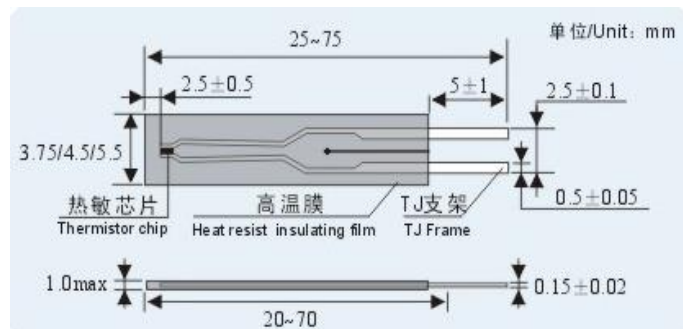
MGD-S : Glass-sealed SMD type NTC

MGD-S : 玻封贴片型



MEF : Thin Film Thermistor

MEF : 薄膜热敏电阻



RESISTANCE-TEMP. TABLE

R-T TABLE

Epoxy resin coated miniature sensors

ME

KΩ

R _T / Item Temp. °C	202F3950	222F3950	302F3950	502F3950	103F3950	503F3950	104F3950	203F3950
-30°C	---	---	---	---	175.2876	---	---	---
-25°C	---	---	---	---	130.2341	---	---	---
-20°C	19.5207	21.9608	29.2811	48.8019	97.6037	482.9097	965.8195	195.2074
-15°C	14.6560	16.4880	21.9839	36.6399	73.2798	363.0629	726.1259	146.5596
-10°C	11.1069	12.4953	16.6604	27.7673	55.5345	275.5318	551.0637	111.0690
-5°C	8.4924	9.5540	12.7386	21.2310	42.4620	210.9676	421.9353	84.9240
-0°C	6.5484	7.3670	9.8226	16.3711	32.7421	162.8960	325.7920	65.4842
5°C	5.0903	5.7265	7.6354	12.7257	25.4513	126.7846	253.5692	50.9026
10°C	3.9873	4.4857	5.9809	9.9682	19.9364	99.4280	198.8560	39.8728
15°C	3.1463	3.5395	4.7194	7.8657	15.7313	78.5368	157.0735	31.4626
20°C	2.5001	2.8126	3.7502	6.2503	12.5005	62.4608	124.9216	25.0010
25°C	2.0000	2.2520	3.0000	5.0000	10.0000	50.0000	100.0000	20.0000
30°C	1.6102	1.8115	2.4154	4.0256	8.0512	40.2743	80.5486	16.1024
35°C	1.3045	1.4675	1.9567	3.2612	6.5223	32.6330	65.2660	13.0446
40°C	1.0630	1.1959	1.5945	2.6575	5.3150	26.5914	53.1827	10.6300
45°C	0.8712	0.9801	1.3067	2.1779	4.3558	21.7857	43.5713	8.7116
50°C	0.7179	0.8076	1.0768	1.7947	3.5893	17.9409	35.8818	7.1786
55°C	0.5947	0.6690	0.8920	1.4867	2.9733	14.8480	29.6959	5.9466
60°C	0.4951	0.5570	0.7427	1.2378	2.4755	12.3466	24.6931	4.9510
65°C	0.4142	0.4660	0.6214	1.0356	2.0712	10.3133	20.6267	4.1424
70°C	0.3482	0.3917	0.5223	0.8706	1.7411	8.6526	17.3052	3.4822
75°C	0.2941	0.3308	0.4411	0.7352	1.4703	7.2897	14.5794	2.9406
80°C	0.2494	0.2806	0.3741	0.6236	1.2471	6.1662	12.3325	2.4942
85°C	0.2125	0.2392	0.3187	0.5312	1.0623	5.2361	10.4723	2.1246
90°C	0.1817	0.2044	0.2726	0.4543	0.9086	4.4629	8.9258	1.8172
95°C	0.1561	0.1756	0.2341	0.3902	0.7803	3.8175	7.6350	1.5606
100°C	0.1345	0.1514	0.2018	0.3364	0.6727	3.2768	6.5535	1.3454
105°C	0.1164	0.1310	0.1746	0.2911	0.5821	2.8220	5.6440	1.1642
110°C	0.1011	0.1138	0.1517	0.2528	0.5056	2.4381	4.8763	1.0112
115°C	0.0881	0.0992	0.1322	0.2204	0.4407	2.1131	4.2261	0.8814
120°C	0.0771	0.0867	0.1157	0.1928	0.3855	1.8368	3.6736	0.7710
125°C	0.0677	0.0761	0.1015	0.1692	0.3383	1.6013	3.2026	0.6766
130°C	0.0596	0.0670	0.0894	0.1490	0.2979	1.3999	2.7998	0.5958
135°C	0.0526	0.0592	0.0789	0.1316	0.2631	1.2272	2.4543	0.5262
140°C	0.0466	0.0524	0.0699	0.1166	0.2331	1.0786	2.1571	0.4662
145°C	0.0414	0.0466	0.0622	0.1036	0.2072	0.9504	1.9007	0.4144
B _{25/50}	3950	3950	3950	3950	3950	3950	3950	3950
B _{25/85}	3990	3990	3990	3990	3990	4015	4015	3990
B _{0/50}	3902	3902	3902	3902	3902	3894	3894	3902

RESISTANCE-TEMP. TABLE

R-T TABLE

Epoxy resin coated miniature sensors

ME

 $K\Omega$

RT Item Temp. °C	202F3950	222F3950	302F3950	502F3950	103F3950	503F3950	104F3950	203F3950
150°C	0.0369	0.0416	0.0554	0.0924	0.1847	0.8395	1.6789	0.3694
155°C	0.0330	0.0371	0.0495	0.0826	0.1651	0.7433	1.4866	0.3302
160°C	0.0296	0.0333	0.0444	0.0740	0.1480	0.6597	1.3193	0.2960
165°C	0.0266	0.0299	0.0399	0.0666	0.1331	0.5868	1.1735	0.2662
170°C	0.0240	0.0270	0.0360	0.0600	0.1200	0.5231	1.0461	0.2400
175°C	0.0217	0.0244	0.0325	0.0542	0.1084	0.4673	0.9345	0.2168
180°C	0.0197	0.0221	0.0295	0.0492	0.0983	0.4183	0.8365	0.1966
185°C	0.0179	0.0201	0.0268	0.0447	0.0893	0.3752	0.7503	0.1786
190°C	0.0163	0.0183	0.0244	0.0407	0.0813	0.3372	0.6744	0.1626
195°C	0.0148	0.0167	0.0223	0.0371	0.0742	0.3036	0.6072	0.1484
200°C	0.0136	0.0153	0.0204	0.0340	0.0680	0.2739	0.5478	0.1360
205°C	0.0125	0.0140	0.0187	0.0312	0.0623		0.4950	0.1246
210°C	0.0115	0.0129	0.0172	0.0287	0.0573		0.4482	0.1146
215°C	0.0106	0.0119	0.0158	0.0264	0.0528		0.4064	0.1056

[illegible]

B _{25/85}	3990	3990	3990	3990	3990	4015	4015	3990
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[illegible]

RESISTANCE-TEMP. TABLE

R-T TABLE

Epoxy resin coated miniature sensors for thermometer

MEB-503E3950

KΩ

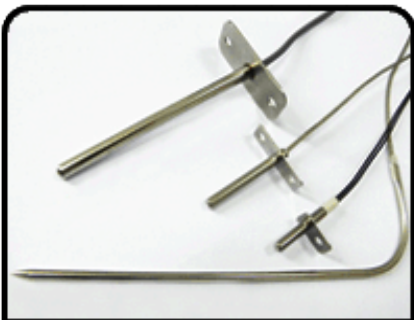
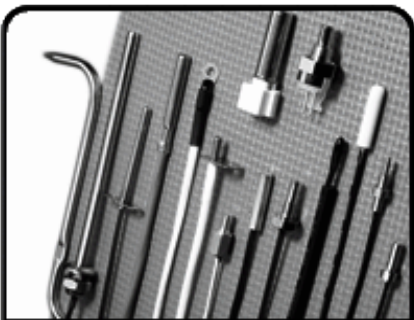
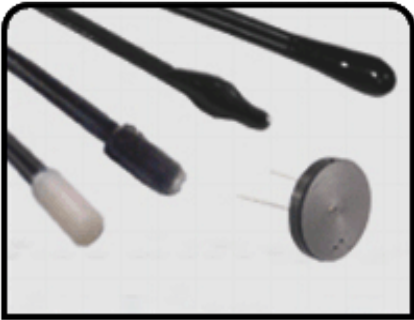
T(°C)	Rnor (KΩ)	T(°C)	Rnor (KΩ)	T(°C)	Rnor (KΩ)	T(°C)	Rnor (KΩ)	T(°C)	Rnor (KΩ)
30.0	40.240	33.1	35.280	36.2	31.020	39.3	27.340	42.4	24.120
30.1	40.070	33.2	35.130	36.3	30.890	39.4	27.230	42.5	24.030
30.2	39.890	33.3	34.990	36.4	30.760	39.5	27.120	42.6	23.930
30.3	39.720	33.4	34.840	36.5	30.640	39.6	27.010	42.7	23.840
30.4	39.550	33.5	34.690	36.6	30.510	39.7	26.900	42.8	23.740
30.5	39.390	33.6	34.550	36.7	30.380	39.8	26.790	42.9	23.650
30.6	39.220	33.7	34.400	36.8	30.260	39.9	26.680	43.0	23.550
30.7	39.050	33.8	34.260	36.9	30.140	40.0	26.580	43.1	23.460
30.8	38.890	33.9	34.120	37.0	30.010	40.1	26.470	43.2	23.370
30.9	38.720	34.0	33.980	37.1	29.890	40.2	26.360	43.3	23.270
31.0	38.560	34.1	33.830	37.2	29.770	40.3	26.250	43.4	23.180
31.1	38.397	34.2	33.690	37.3	29.650	40.4	26.150	43.5	23.090
31.2	38.233	34.3	33.550	37.4	29.530	40.5	26.040	43.6	23.000
31.3	38.070	34.4	33.410	37.5	29.410	40.6	25.940	43.7	22.910
31.4	37.910	34.5	33.280	37.6	29.290	40.7	25.830	43.8	22.820
31.5	37.740	34.6	33.140	37.7	29.170	40.8	25.730	43.9	22.730
31.6	37.580	34.7	33.000	37.8	29.050	40.9	25.620	44.0	22.640
31.7	37.430	34.8	32.860	37.9	28.930	41.0	25.520	44.1	22.550
31.8	37.270	34.9	32.730	38.0	28.810	41.1	25.420	44.2	22.460
31.9	37.110	35.0	32.590	38.1	28.700	41.2	25.320	44.3	22.370
32.0	36.950	35.1	32.460	38.2	28.580	41.3	25.210	44.4	22.280
32.1	36.800	35.2	32.320	38.3	28.460	41.4	25.110	44.5	22.190
32.2	36.640	35.3	32.190	38.4	28.350	41.5	25.010	44.6	22.110
32.3	36.490	35.4	32.060	38.5	28.230	41.6	24.910	44.7	22.020
32.4	36.330	35.5	31.920	38.6	28.120	41.7	24.810	44.8	21.930
32.5	36.180	35.6	31.790	38.7	28.010	41.8	24.710	44.9	21.850
32.6	36.030	35.7	31.660	38.8	27.890	41.9	24.610	45.0	21.760
32.7	35.880	35.8	31.530	38.9	27.780	42.0	24.510		
32.8	35.730	35.9	31.400	39.0	27.670	42.1	24.420		
32.9	35.580	36.0	31.270	39.1	27.560	42.2	24.320		
33.0	35.430	36.1	31.140	39.2	27.450	42.3	24.220		

R37°C (1-32) ±0.16%

Group	Rmax(KΩ)	Group	Rmax(KΩ)	Group	Rmax(KΩ)	Group	Rmax(KΩ)	Group	Rmax(KΩ)
1	29.275	8	29.625	15	29.975	22	30.325	29	30.675
2	29.325	9	29.675	16	30.025	23	30.375	30	30.725
3	29.375	10	29.725	17	30.075	24	30.425	31	30.775
4	29.425	11	29.775	18	30.125	25	30.475	32	30.825
5	29.475	12	29.825	19	30.175	26	30.525		
6	29.525	13	29.875	20	30.225	27	30.575		
7	29.575	14	29.925	21	30.275	28	30.625		

SENSORS PROBES

负温度系数温度传感器探头
MST



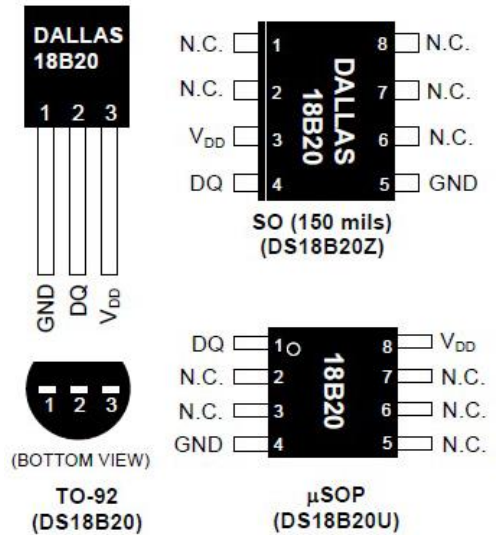
CUSTOMIZED CENTER	
Chip :	
Probe :	
Cable :	
Terminal :	
Operation Temperature :	
Application :	
Remarks :	

DS18B20

DS18B20 One-Wire Digital Thermometer

FEATURES

- ⊙ 1-wire interface requires only one port pin for communication.
- ⊙ Each has an unique 64-bit serial code stored in an on-Board ROM.
- ⊙ No External part required.
- ⊙ Powered from Data Line: from 3.0V to 5.5V
- ⊙ Temperature range from -55°C to +125°C (-67°F to +257°F)
- ⊙ ±0.5°C Accuracy from -10°C to +85°C
- ⊙ Selectable thermometer resolution from 9 to 12 Bits.
- ⊙ Conversion time within 750ms (Max) from Temperature to 12-Bit Digital word.
- ⊙ User-Definable Nonvolatile (NV) Alarm Settings
- ⊙ 3 types [8-Pin SO (150 mils), 8-Pin μ SOP, and 3-Pin TO-92]
- ⊙ Software Compatible with the DS18B22
- ⊙ Wide application



PINS DESCRIPTION

PINS			NAME	FUNCTIONS
SO	μ SOP	TO-92		
1. 2. 6. 7. 8	2. 3. 5. 6. 7	/	N.C.	No Connection
5	4	1	GND	Ground
3	8	3	VDD	VDD must be grounded in parasite power mode.
4	1	2	DQ	Data Input/Output. 1-Wire interface pin. Power supply in parasite power mode

DS18B20 Sensor probes

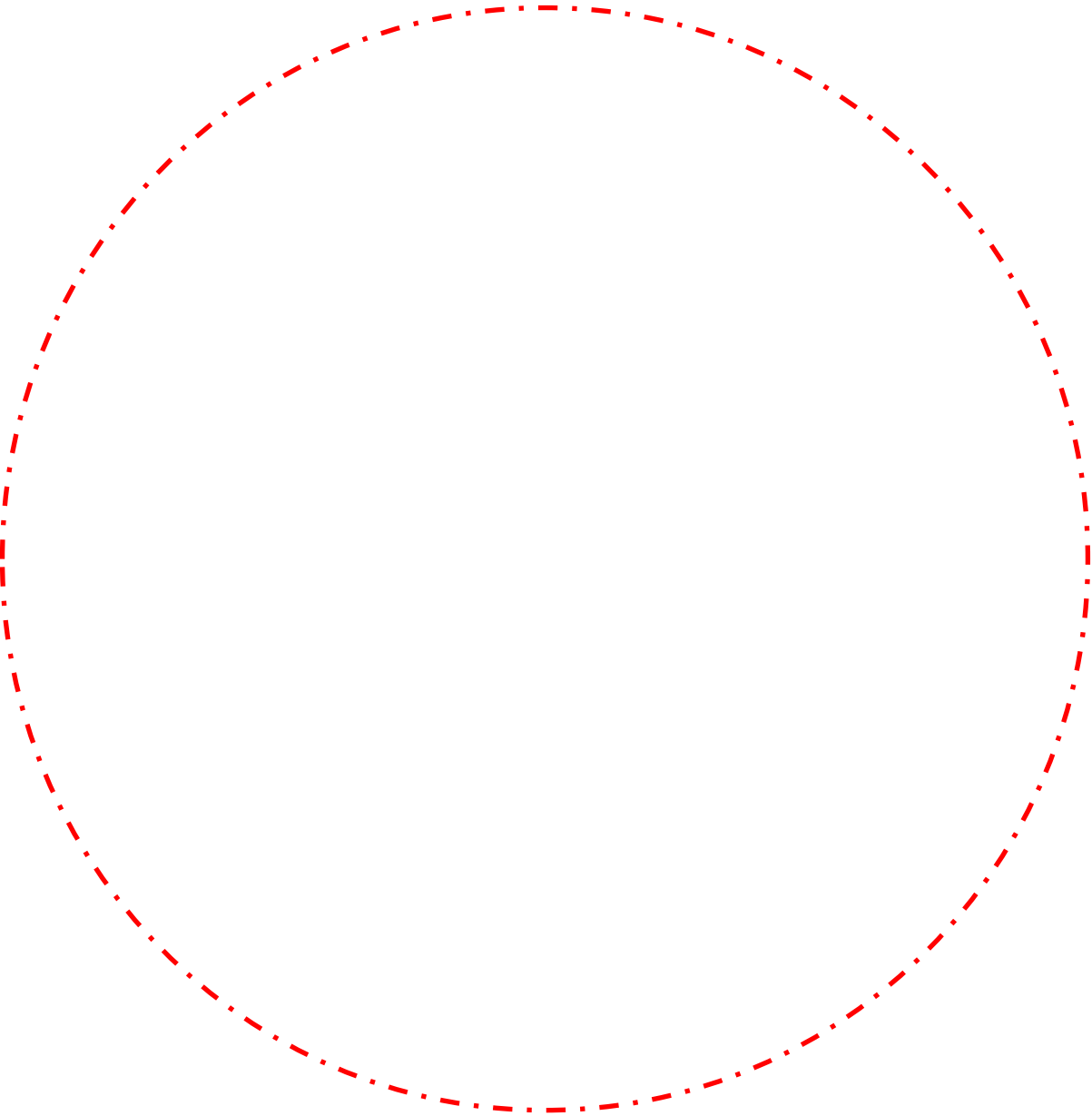
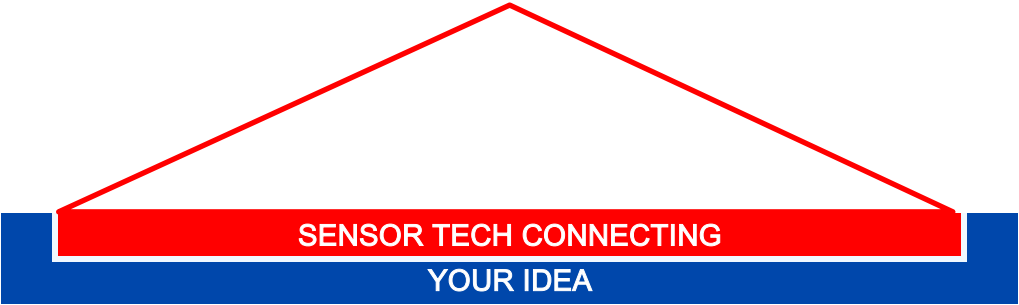


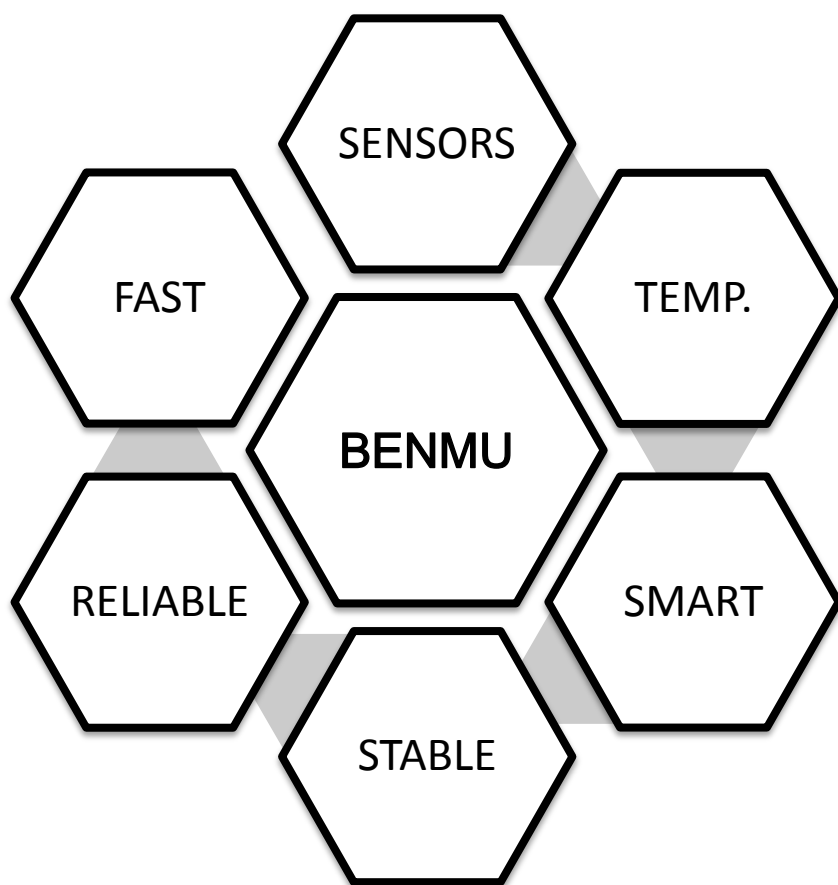
Applications

(TEMPERATURE) SENSOR (温度)传感器	民用 Civilian Applications	家电 Electric Appliances	烹调器 Cooker	电炉、烤箱、电饭锅、电磁炉、面包机、咖啡机、煤气炉 Stove, Toaster, Cooker, Heating iron, Oven, Pan, Coffee maker
			空调冷暖器 HVAC	空调、取暖器、暖床、电热地毯、电热毯 Air conditioning, Heaters, Electric carpets, Electric blankets
			家用电器 E-Appliances	热水器、锅炉、冰箱、干燥机、浴缸、太阳能系统、垃圾处理系统 Boilers, Refrigerator, Washing machine, Room dryer, Solar systems
			其他电器 Others	电子体温计、电熨斗、电吹风、染发器、熨衣板 Thermometers, Iron, Hair dryer, Hair coloring device, Ironing board
			OA	复印机、传真机、打印机、钟表、照相机 Copier, Fax machine, Printer, watches, Camera
		汽车 Auto		进气\排气温度、冷却水温度、发动机温度、变速箱温度、汽车空调 Intake/Exhaust, Cooling water, Engine, Transmission, air conditioning
	产业 INDUSTRY	农业 Agri.		温室、催芽机、制茶、牲畜饲养、烘培设备、土壤温度、粮仓温度 Greenhouse, germination, Dryer, baking, granary, Soil, fertilizer
		工业 Indu.		计量器、油温等液体测定、保温器、保温器、恒温器、自动化 Instruments, Thermostat, oil, warmer, Oil bath, Automatic
		渔业 Fish.		海水温度测定、声纳、养殖 Temperature control, water temperature, sonar, seaweed farming
		商业 Com.		冷冻冷藏陈列柜、售货机、融雪设备、冷藏车、净水器 Refrigerated display racks/ Trucks, water purifier
	研究 R&D	医疗 Med.		皮肤温度、直肠温度、保育器、输液加热器、保温设备 Skin temperature, rectal, incubators, infusion heater
		理化 ph-ch		海流温度、气象观测、人造卫星、地热温度、实验室设备 Temperature measuring, atmosphere observation
	NEW TECH			NEW TECH FOR CONNECTING AND READING

CUSTOMIZED CENTER

Chip :	
Probe :	
Cable :	
Terminal :	
Operation Temperature :	
Application :	
Remarks :	





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