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Nisus for You

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NTC Thermistor

NTC Thermistor Terminology

NTC Thermistor

A “thermistor” is a “thermally sensitive resistor” whose primary function is to exhibit a change in electrical resistance with a change in body temperature.

NTC thermistor is one in which the zero-power resistance decreases with an increase in temperature.

Factors for Thermistor Characteristics

1. Zero-Power Resistance : $R(\Omega)$

$$R = R_0 \exp B (1/T - 1/T_0)$$

where R : Resistance value at Kelvin temperature $T(K)$
 R_0 : Resistance value at Kelvin temperature $T_0(K)$
 B : B constant

2. B Constant : K

$$B(T_1/T_2) = (\ln R_1 - \ln R_2) / (1/T_1 - 1/T_2)$$

where R_1 : Resistance value at the Kelvin temperature $T_1(K)$
 R_2 : Resistance value at the Kelvin temperature $T_2(K)$
 T_1, T_2 : Kelvin temperature ($K = ^\circ C + 273.15$)

3. Dissipation Constant : δ

($mW/^\circ C$)

Dissipation constant(δ) is power in milliwatts required to raise thermistor temperature $1^\circ C$. Measured with thermistor suspended by its leads in a specified environment.

$$\delta = P / \Delta t \text{ (mW/}^\circ C)$$

where P : Power
 Δt : Raise temperature ($^\circ C$)

4. Thermal Time Constant : $\tau(\text{sec})$

Thermal time constant(τ) is the time required by a thermistor change 63.2% of the difference between its initial and final temperature. Measure with thermistor suspended by its leads in a specified environment.

5. Temperature Coefficient of Resistance : $\alpha(\%/^\circ C)$

Temperature coefficient of resistance(α) is expressed in the following equation :

$$\alpha = - (B / T^2) \times 100$$

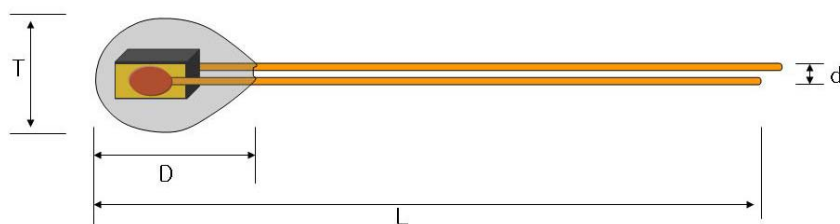
NTC Thermistor

Chip in Glass Thermistor



- High quality and high precision thermistor
- Chip type
- Stability, reproducibility and no aging characteristic
- High responsibility
- Mass productibility

Features



Designation		T	D	L	d
CB-1	Size(mm)	2.15	3.20	65.0	0.30
	Tol.(mm)	±0.35	±0.80	±5.00	±0.05
CB-3	Size(mm)	1.25	2.30	65.0	0.20
	Tol.(mm)	±0.25	±0.70	±5.00	±0.05
CB-5	Size(mm)	0.75	1.60	65.0	0.15
	Tol.(mm)	±0.15	±0.60	±5.00	±0.05
CB-7	Size(mm)	0.55	1.20	65.0	0.10
	Tol.(mm)	±0.10	±0.50	±5.00	±0.05

Physical Characteristics

Type	Dissipation Factor(mW/°C)		Time Constant(63.2%)(sec)	
	In still Air		In still Air	In stirred Oil
CB-1	1.2 ~ 1.3		10 ~ 11	0.9 ~ 1.1
CB-3	0.7 ~ 0.8		4.0 ~ 5.0	0.3 ~ 0.4
CB-5	0.4 ~ 0.5		2.0 ~ 3.0	0.18 ~ 0.20
CB-7	0.2 ~ 0.3		0.5 ~ 1.0	0.07 ~ 0.10



NTC Thermistor

Temperature-Resistance Characteristics

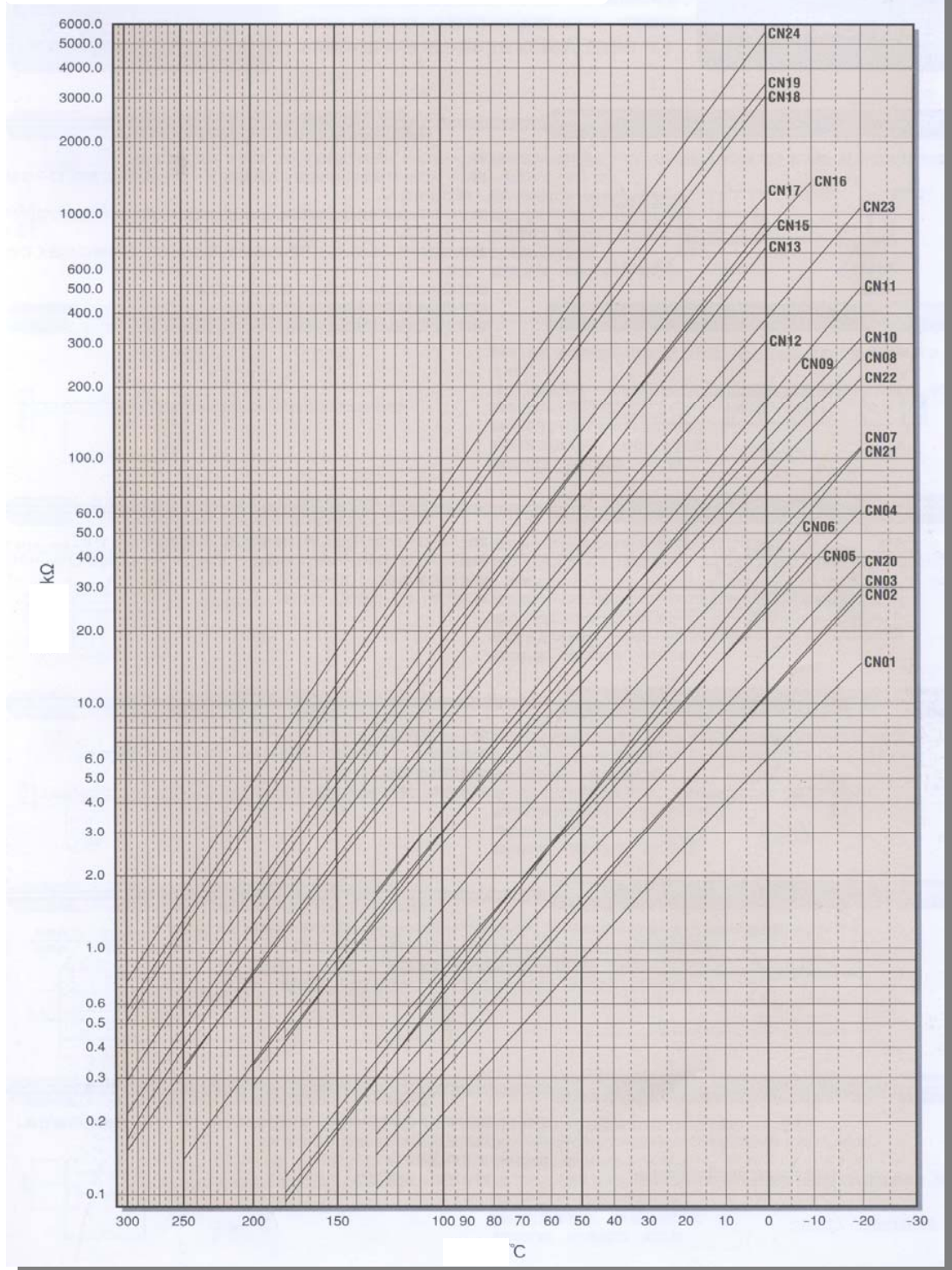
Class	Std. Resistance	R25 (kΩ)	B(K)	B25/85	Operating Temp
1	6.00kΩ/0°C	2.1757	3390/0~10°C	3416.5	-20~20°C
2	11.0kΩ/0°C	3.9165	3450/0~10°C	3475.9	-20~20°C
3	11.0kΩ/0°C	3.7402	3600/0~10°C	3627.3	-20~20°C
4	24.0kΩ/0°C	8.5428	3450/0~10°C	3475.6	-20~20°C
5	25.0kΩ/0°C	8.1518	3735/0~10°C	3762.3	-20~20°C
6	30.0kΩ/0°C	9.7821	3735/0~10°C	3762.2	-20~20°C
7	45.0kΩ/0°C	16.150	3480/0~10°C	3495.8	-20~20°C
8	100.0kΩ/0°C	34.643	3550/0~10°C	3576.4	-20~20°C
9	3.00kΩ/10°C	43.678	3920/0~10°C	3954.0	-20~20°C
10	3.60kΩ/10°C	41.151	3570/0~10°C	3596.3	-20~20°C
11	7.80kΩ/10°C	101.94	3750/100~20°C	3790.4	-20~25°C
12	1.00kΩ/20°C	215.57	4500/100~20°C	4165.8	-20~30°C
13	1.25kΩ/20°C	271.49	4500/100~20°C	4175.8	-20~30°C
14	18.0kΩ/10°C	266.63	4300/100~20°C	3975.4	-20~30°C
15	1.70kΩ/20°C	369.11	4400/100~20°C	4074.6	-20~30°C
16	3.20kΩ/20°C	874.05	4700/100~20°C	4343.0	-20~30°C
17	3.60kΩ/20°C	984.66	4700/100~20°C	4345.3	-20~30°C
18	15.0kΩ/0°C	5.3407	3450/0~10°C	3475.9	-20~20°C
19	37.0kΩ/0°C	10.899	4080/0~10°C	4114.8	-20~20°C
20	2.70kΩ/10°C	29.351	3500/0~10°C	3522.9	-20~20°C
21	0.81kΩ/20°C	122.48	4200/100~20°C	3891.3	-20~25°C
22	4.80kΩ/20°C	1534.9	4850/100~20°C	4448.5	-20~30°C
23	4.80kΩ/20°C	1534.9	4850/100~20°C	4448.5	-20~30°C
24	10.0kΩ/25°C	10.000	3435/25~8°C	3435.0	-20~30°C
25	10.0kΩ/25°C	10.000	3450/0~10°C	3480.0	-20~20°C
26	30.0kΩ/0°C	10.740	3434/25~5°C	3470.0	-20~20°C
27	3.48kΩ/50°C	8.5080	3450/0~10°C	3480.0	-20~20°C
28	5.00kΩ/25°C	5.0000	3930/25~5°C	3970.0	-20~20°C
29	10.0kΩ/25°C	10.000	3930/25~5°C	3970.0	-20~20°C
30	49.1kΩ/25°C	49.120	3900/25~5°C	3950.0	-20~20°C
31	100.0kΩ/25°C	100.00	3950/25~5°C	4000.0	-20~30°C
32	500.0kΩ/25°C	500.00	4145/0~10°C	4200.0	-20~30°C
33	15.4kΩ/75°C	100.00	3918/25~10°C	3890.0	-20~30°C

* Suggest us other Spec. customer wanted



NTC Thermistor

Temperature-Resistance Curve





Stability and Reliability of Thermistor

The issue of long term stability of components is a critical one in most temperature sensing applications. Systems designers are usually concerned with developing circuitry and thermistor sensor specifications which assure accurate, long-term measurement capability. It is extremely important therefore that the resistance versus temperature characteristics of the thermistors used in such critical applications do not change or drift over time

