NTC POWER THERMISTOR, SCK SERIES

Meritek

Meritek Part Numbers are designated as follows:

SCK 05 □□□ □ M □ □□

* Meritek series
* Element size (Diameter in m/m)
* Zero power resistance at 25°C (Ω)
  2~3 significant digits
* Max steady state current at 25°C (A)
* Tolerance: L:+15% M:+20%
* Lead Type
  Blank: straight Y: kinked Y type
* Package
  Blank: bulk TR : tape & reel

Thermal dissipation coefficient(δ)
The thermal dissipation coefficient is the ratio, normally expressed in milliwatts per degree C (mW/°C), at a specified ambient temperature, of a change in power dissipation in a thermistor to the resultant body temperature change.
(δ =VXI/ΔT)

Thermal time constant(t)
The thermal time constant is the time required for a thermistor to change 63.2 percent of total difference between its initial and final body temperature when subjected to a step function change in ambient temperature under zero-power condition and is normally expressed in seconds.

Material constant(B)
The material constant of a NTC thermistor is a measure of its resistance at one temperature compared to its resistance at a different temperature. Its value may be calculated by the formula shown below and is expressed in degrees kelvin (°K). The reference temperature used in this formula for determining material constant rating of Meritek' s thermistor is 298.15°K and 323.15 °K B=Ln(R_1/R_2)/($1/T_1$-$1/T_2$)

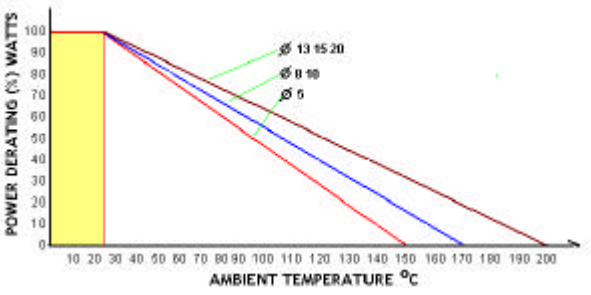
Temperature coefficient of resistance (a)
The temperature coefficient of resistance is the ratio at a specified temperature, T, of the rate of change of zero-power resistance with temperature to the zeropower resistance of the thermistor. The temperature coefficient is commonly expressed in percent per degree C(%/°C). α =I /R dR/dT

Surge energy
Surge energy is the maximum energy of pulses.
The thermistor is capable of tolerating surge energy more than 1000 times with the resistance changing rates within ± 10%. This energy varies with voltage and capacitance.

Storage temperature range:- 40 to +125 °C
Operating temperature range:- 30 to +125 °C

DERATING CURVE OF SURGE CURRENT LIMITING THERMISTOR

The maximum power of a thermistor will decrease with the change of ambient temperature.(See Fig.G)



NTC POWER THERMISTOR, SCK SERIES

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Part No	Zero Power Resistance at 25°C (Ù)	Max. Steady State Current at 25 °C (A)	Approx. Resistance at Max.Current at 25 °C (mÙ)	Thermal Dissipation Constant (mW/ °C)	Thermal Time Constant (Sec.)	Operating Temperature (°C)
SCK05-052	5	2	429	14	17	-40~+150
SCK05-101	10	1	1126	15	17	-40~+150
SCK05-20X3	20	0.3	5560	14	22	-40~+150
SCK08-042	4	2	441	17	31	-40~+170
SCK08-053	5	3	261	17	36	-40~+170
SCK08-063	6	3	283	17	38	-40~+170
SCK08-082	8	2	520	16	36	-40~+170
SCK08-102	10	2	542	17	38	-40~+170
SCK08-152	15	2	548	15	38	-40~+170
SCK08-201	20	1	1544	17	41	-40~+170
SCK08-30X	30	0.5	4094	16	33	-40~+170
SCK10-2R55A	2.5	5	120	18	46	-40~+170
SCK10-034	3	4	156	18	45	-40~+170
SCK10-035	3	5	119	18	45	-40~+170
SCK10-044	4	4	161	16	40	-40~+170
SCK10-054	5	4	180	17	33	-40~+170
SCK10-083	8	3	278	17	43	-40~+170
SCK10-103	10	3	297	17	46	-40~+170
SCK10-122	12	2	512	18	50	-40~+170
SCK10-123	12	3	301	18	50	-40~+170
SCK10-133	13	3	356	18	49	-40~+170
SCK10-152X	15	2.5	442	17	51	-40~+170
SCK10-162	16	2	604	18	55	-40~+170
SCK10-162X	16	2.5	442	16	45	-40~+170
SCK10-202	20	2	646	17	54	-40~+170
SCK10-252	25	2	674	17	52	-40~+170
SCK10-302	30	2	700	17	50	-40~+170
SCK10-472	47	2	720	18	49	-40~+170
SCK10-501X	50	1.5	1170	18	48	-40~+170
SCK10-502	50	2	813	18	48	-40~+170
SCK10-801	80	1	2236	17	53	-40~+170
SCK10-1001	100	1	2318	17	45	-40~+170
SCK10-1201	120	1	2406	19	54	-40~+170

NTC POWER THERMISTOR, SCK SERIES

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Part No	Zero Power Resistance at 25°C (Ù)	Max. Steady State Current at 25 °C (A)	Approx. Resistance at Max. Current at 25 °C (m Ù)	Thermal Dissipation Constant (mW/ °C)	Thermal Time Constant (Sec.)	Operating Temperature (°C)
SCK13-1R37	1.3	7	70	17	49	-40~+200
SCK13-2R55	2.5	5	117	17	61	-40~+200
SCK13-2R56	2.5	6	94	17	48	-40~+200
SCK13-055	5	5	166	18	75	-40~+200
SCK13-084	8	4	206	17	65	-40~+200
SCK13-104	10	4	217	17	66	-40~+200
SCK13-124	12	4	217	17	66	-40~+200
SCK13-153	15	3	343	18	66	-40~+200
SCK13-163	16	3	348	16	68	-40~+200
SCK13-203	20	3	410	20	76	-40~+200
SCK15-1R38	1.3	8	64	21	59	-40~+200
SCK15-1R58	1.5	8	62	21	66	-40~+200
SCK15-028	2	8	78	20	63	-40~+200
SCK15-2R58	2.5	8	75	20	63	-40~+200
SCK15-037	3	7	91	21	73	-40~+200
SCK15-046	4	6	117	20	62	-40~+200
SCK15-048	4	8	87	27	76	-40~+200
SCK15-056	5	6	121	20	66	-40~+200
SCK15-057	5	7	98	20	65	-40~+200
SCK15-065	6	5	159	20	74	-40~+200
SCK15-075	7	5	161	20	79	-40~+200
SCK15-078	7	8	108	28	57	-40~+200
SCK15-086	8	6	130	20	68	-40~+200
SCK15-105	10	5	178	20	79	-40~+200
SCK15-125	12	5	185	19	59	-40~+200
SCK15-152	15	2	704	21	77	-40~+200
SCK15-154	15	4	261	19	79	-40~+200
SCK15-164	16	4	261	19	79	-40~+200
SCK15-204	20	4	283	18	90	-40~+200
SCK15-253	25	3	425	21	76	-40~+200
SCK15-303	30	3	461	20	90	-40~+200
SCK15-403	40	3	511	22	83	-40~+200
SCK15-404	40	4	360	22	86	-40~+200
SCK15-473	47	3	501	20	77	-40~+200
SCK15-802X	80	2.5	693	19	71	-40~+200
SCK15-1202	120	2	1010	19	65	-40~+200

NTC POWER THERMISTOR, SCK SERIES

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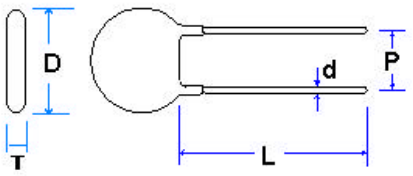
Part No	Zero Power Resistance at 25°C (Ù)	Max. Steady State Current at 25 °C (A)	Approx. Resistance at Max. Current at 25 °C (m Ù)	Thermal Dissipation Constant (mW/ °C)	Thermal Time Constant (Sec.)	Operating Temperature (°C)
SCK 20-0R78	0.7	8	59	28	96	-40~+200
SCK20-0R715	0.7	15	35	29	122	-40~+200
SCK20-0120	1	20	20	25	73	-40~+200
SCK20-2R512	2.5	12	60	29	104	-40~+200
SCK20-2R515	2.5	15	46	29	103	-40~+200
SCK20-058	5	8	93	28	101	-40~+200
SCK20-0510	5	10	82	29	123	-40~+200
SCK20-0512	5	12	66	29	124	-40~+200
SCK20-106	10	6	173	32	100	-40~+200
SCK20-108	10	8	122	29	119	-40~+200
SCK20-128	12	8	106	24	130	-40~+200
SCK20-138	13	8	106	24	130	-40~+200
SCK20-206	20	6	190	28	107	-40~+200



Dimensions: Unit: mm

Disc Ø	D max	L min	d	P	Tmax
05	6.5	31	0.8 ± 0.02	4 ± 0.6	5
08	9.5	31	0.8 ± 0.02	5 ± 0.8	5
10	11.5	31	0.8 ± 0.02	5 ± 0.8	5
13	14.5	30	0.8 ± 0.02	7.5 ± 1.1	6
15	16.5	29	1.0 ± 0.02	8 ± 1.2	6
20	21.5	26	1.0 ± 0.02	8 ± 1.2	6

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NTC POWER THERMISTOR, SCK SERIES

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- **R-T CHARACTERISTIC**

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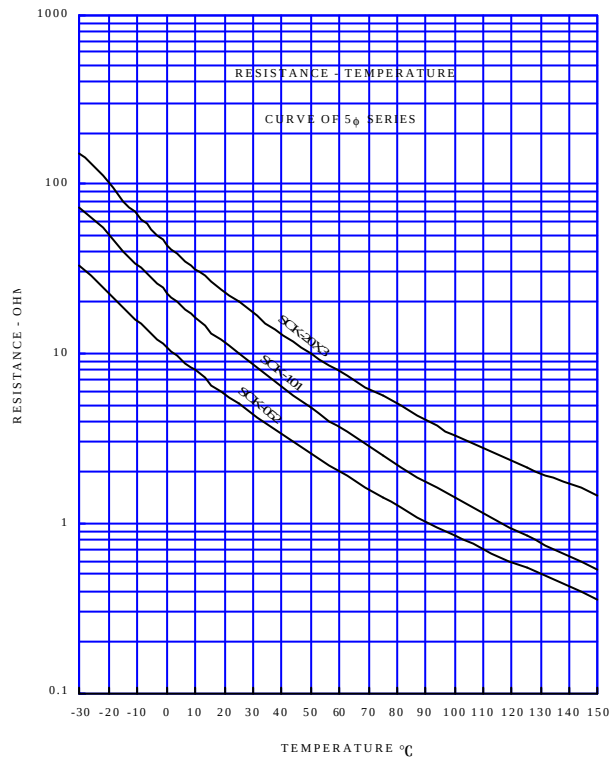

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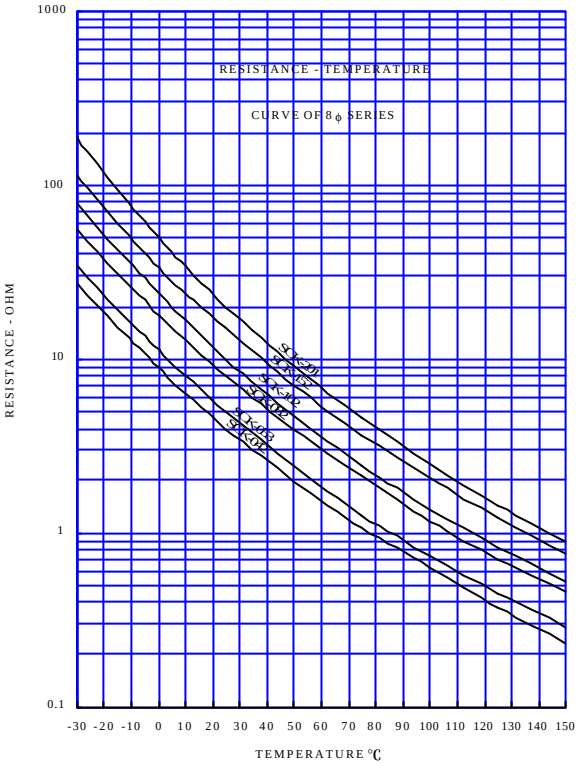

- **V-I CHARACTERISTIC CURVE**

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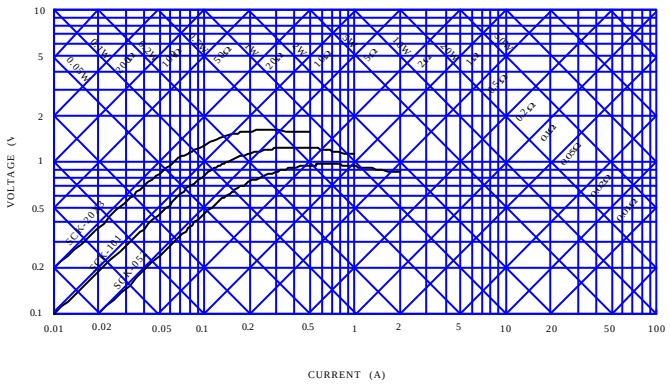

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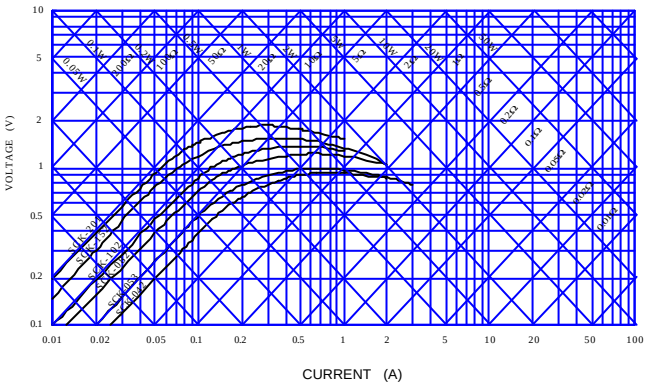

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Meritek

- **R-T CHARACTERISTIC**

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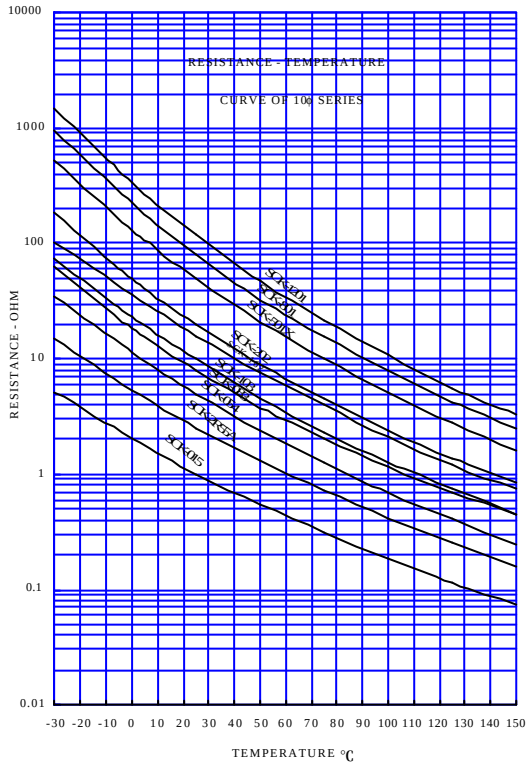

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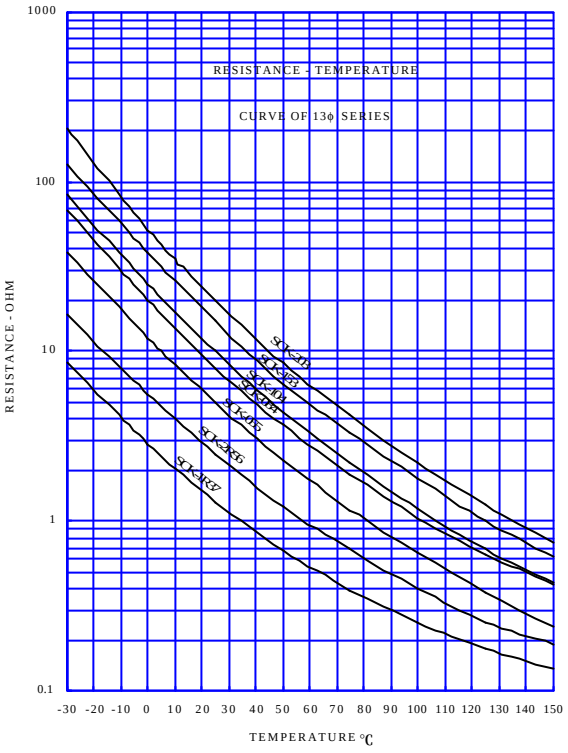

- **V-I CHARACTERISTIC CURVE**

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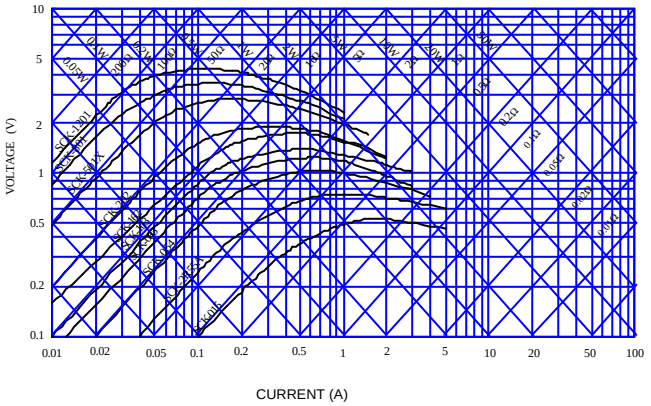

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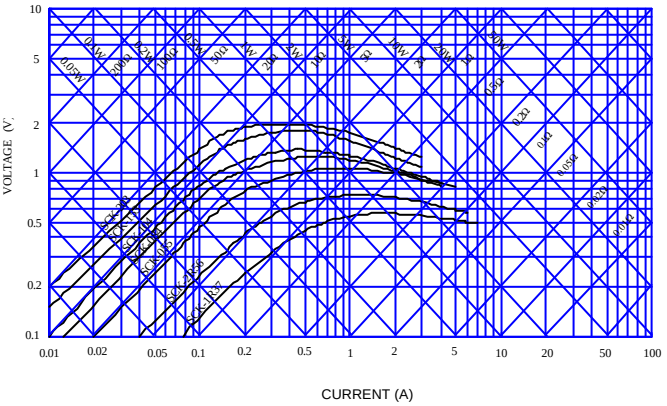

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- **R-T CHARACTERISTIC**

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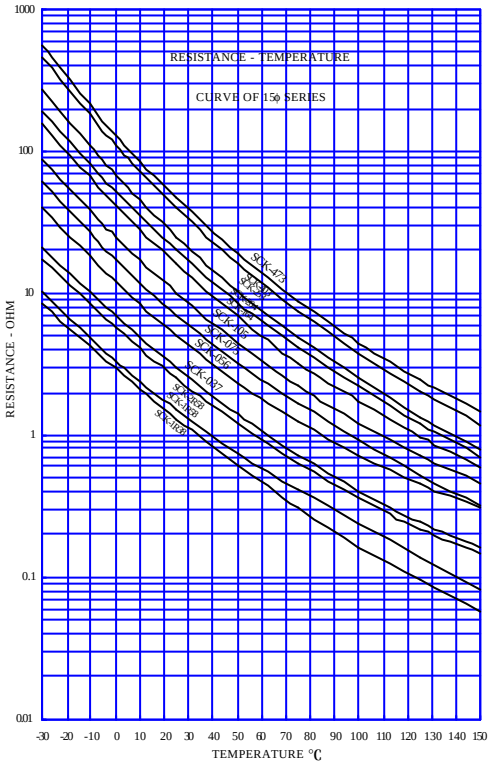

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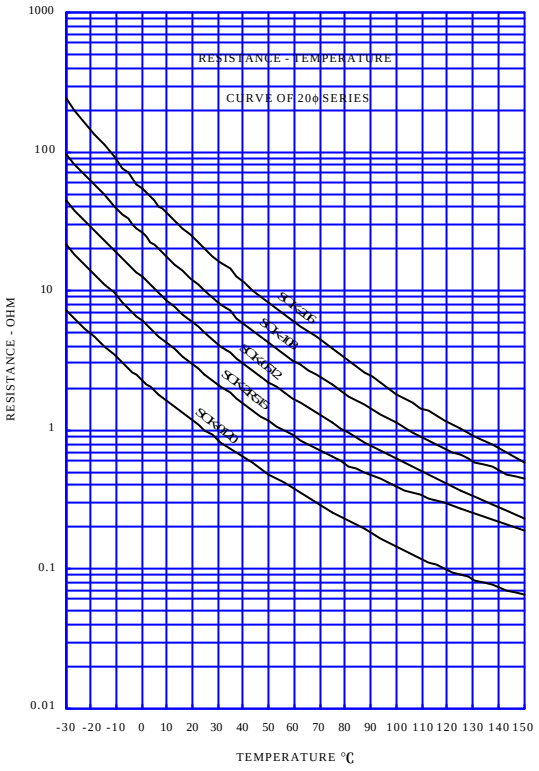

- **V-I CHARACTERISTIC CURVE**

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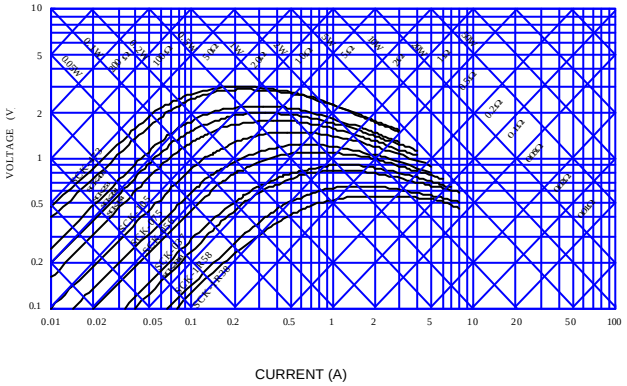

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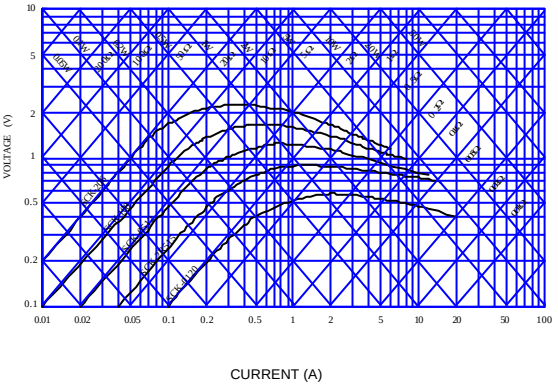


NTC POWER THERMISTOR, SCK SERIES

Meritek

NTC THERMISTOR-INRUSH CURRENT LIMITING DEVICES

Meritek NTC Power Thermistor (SCK) devices are made of a specially formulated metal oxide ceramic material which is capable of suppressing high inrush current surges.
SCK devices, being of relatively high resistance, shall limit the inrush current for I - 2 seconds during which time the device decreases in resistance substantially to a point where its voltage drop is negligible. The devices are especially useful in power supplies (see Fig A) because of the extremely low impedance of the capacitor being charged, of which the bridge is usually subjected to an exceedingly high current surge at turn on point.

FEATURES

* High inrush current restriction effect.
* Small power loss in stationary state.
  (Normally IW or less than 50W power.)
* High thermal and electrical stability.
* Wide selection of electrical characteristics.
* Special coating material: gray silicone.

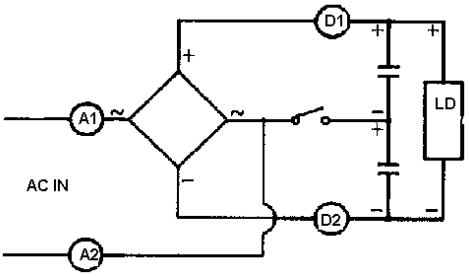


Fig A

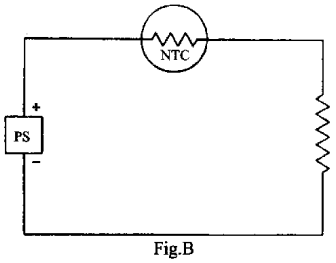


Fig.B

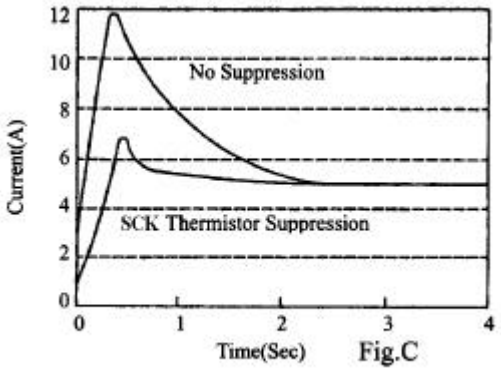


Fig.C

NTC THERMISTOR CHARACTERISTICS

To choose for application or take as referable parameters, the NTC thermistors are usually decided by the following three fundamental characteristics:
* Temperature-Resistance Characteristic:
The resistance value of NTC thermistor is decreased while the ambient temperature or itself temperature is increased. (see Fig.D)

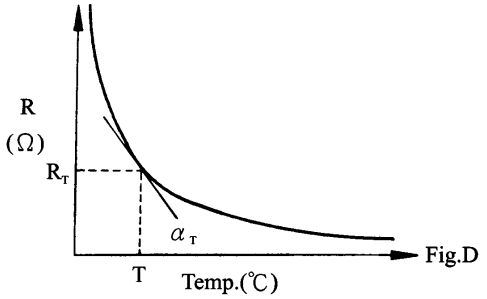


Fig.D

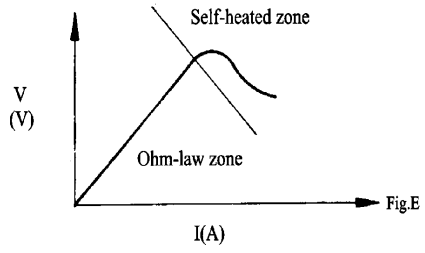
APPLICATION

As shown in Fig. B, the current surge can be eliminated by placing a NTC thermistor in series with a filament string.
Yet, if the resistance of one NTC thermistor does not provide sufficient inrush current limiting functions for your application, two or more may be used in series or in separate legs of the supply circuit(Fig. A). Notic that , the thermistor cannot be used in parallel since one unit will tend to conduct nearly all the current available. Thus, SCK thermistor may be used in the AC(point AI or A2) or the DC(point DI or D2) locations in the circuit.(See Fig. A)
The resistance of NTC thermistors is designed higher than the total resistance of filaments when the circuit is turned on.
As current begins flowing, the thermistor shall immediately "self-heat". Then, in I - 2 seconds, its resistance will be reduced to a minimum and become insignificant to the total resistance of a circuit. With the same concept, current surges in electric motors can be held to a minimum. Fig. C shows a typical DC motor's turn on surge before and after the application of a SCK thermistor to the circuit.

- Nominal resistance at 25°C (Ω) R_{25}
- Zero-power resistance (Ω) R_T
- Tolerance on the resistance nominal
  $\Delta R_{25}/R_{25}$=15%(L),20%(M)
- Material constant(Sensibility index)(°K) B
- Temperature coefficient of resistance(%°C) α_T

Voltage-Current Characteristic:

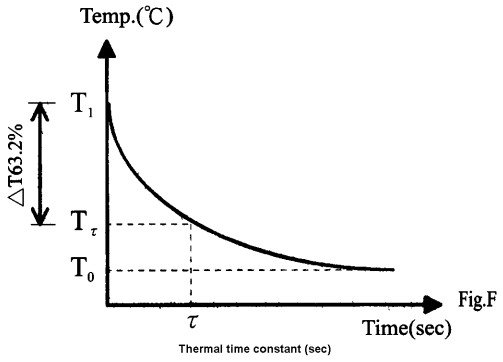
When operating in small current (see Fig.E), the low power will Not allow the NTC thermistor self-hot, thus its resistance value is thus maintained constant and displayed with a linear curve (in conformity with Ohm-law V/R=I). If the current is increased, the NTC thermistor will follow Joule-efficiency(P=V x I) and make itself self-heated, resulting in a decreasing resistance value current and voltage are then inversely related.



- Thermal dissipation coefficient(mW/^{o}C) δ
- Maximum steadystate current(A) Imax
- Resistance at maximum current(Ω) RImax

Temperature-Time Characteristic:

As shown in Fig. F which explains the time needed to reach the thermal equilibrium of NTC components with the environment. This characteristic depends on two important parameters as outlined below.
If a step change in temperature is applied to a component e.g. from high(T_1) to low(T_0) temperature, the energy lost by the component(-HdT) is equal to the energy dissipated by it (δ (T-T_0) dt).
-HdT= (δ (T-T_0) dt
This equation yields:T-T_1=(T_0T_1) X $e^{1/4}$, t =H/δ



PARAMETERS DEFINITION

Thermistor
A thermistor is a thermally sensitive resistor whose primary function is to exhibit a change in resistance accompanying a change in temperature.

Negative Temperature Coefficient (NTC) Thermistor
NTC thermistor is a thermistor whose the zero-power resistance decreases while itself temperature is increased.

Inrush current
Inrush current is the initial surge of current that results when power is first applied to a load having a low starting impedance, such as a discharged capacitor, a cold lamp filament, or a stopped motor, etc.

Inrush current limiter
Specially designed and constructed NTC thermistor may be used as an inrush current limiters. Meritek' s inrush current limiter(SCK) is available in a wide range of current handling and zero-power resistance value combinations.

Zero-power resistance(R_t)
The zero-power resistance is the direct current resistance value of a thermistor measured at a specified temperature "T" with a power dissipation by the thermistor low enough that any further decrease in power will result in less than 0. I percent change in resistance.

Maximum steady-state current (Imax.)
The maximum steady-state current is the rating of the maximum current, normally expressed in amperes (A), allowable to be conducted by an inrush limiting NTC thermistor for an extended period of time.

Resistance at maximum current (RImax.)
The resistance at maximum current is the approximate resistance of an inrush current limiting thermistor, expressed in ohms(Ω), when it is conducting its rated maximum steady state current.