

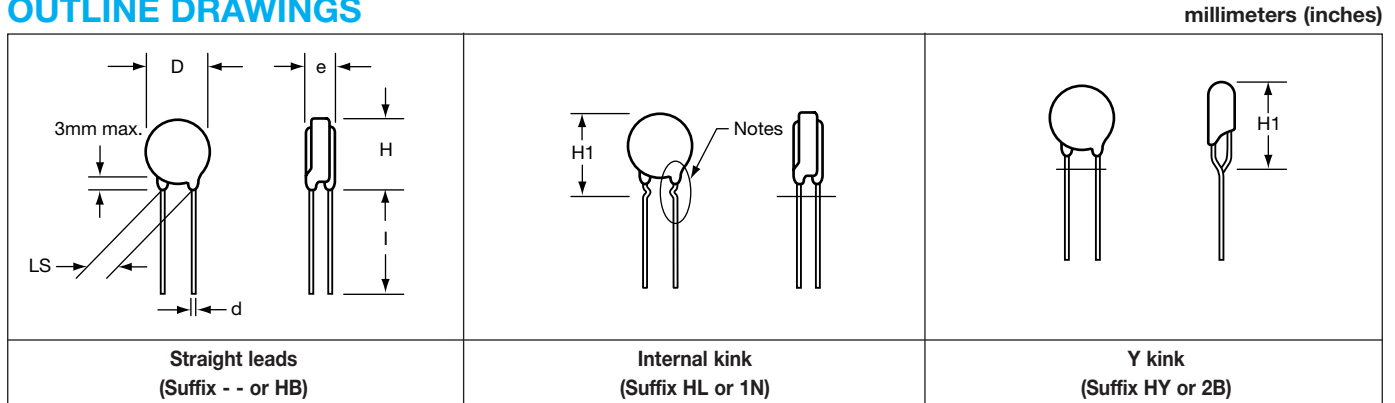
NTC Inrush Current Limiters Thermistors



NF 08 - 10 - 13 - 15 - 20

(For more details see also the catalog dedicated to this range)

OUTLINE DRAWINGS



Notes: In case of adding strength to the lead wire from the side, it may occur crack and fragment at a part of pant leg.
* 0.6 mm copper wire and 5.08 mm leads spacing for those two types.

DIMENSIONS millimeters (inches)

| Type | D max mm | e max mm | H max mm | H1 max mm | l min mm | d ±0.02 mm (±0.008) | LS ±0.8 mm (±0.030) |
|-------|-------------|------------|-------------|--------------|------------|---------------------|---------------------|
| NF08* | 9.5 (.374) | 5.0 (.197) | 13.0 (.512) | 16.0 (.630) | 30 (1.181) | 0.6 (.024) | 5.08 (.20) |
| NF08 | 9.5 (.374) | 5.0 (.197) | 13.0 (.512) | 16.0 (.630) | 30 (1.181) | 0.8 (.031) | 7.62 (.03) |
| NF10* | 11.5 (.453) | 5.0 (.197) | 15.0 (.591) | 18.0 (.709) | 30 (1.181) | 0.6 (.024) | 5.08 (.20) |
| NF10 | 11.5 (.453) | 5.0 (.197) | 15.0 (.591) | 18.0 (.709) | 30 (1.181) | 0.8 (.031) | 7.62 (.30) |
| NF13 | 15.0 (.591) | 6.0 (.236) | 18.0 (.709) | 22.0 (.866) | 30 (1.181) | 0.8 (.031) | 7.62 (.30) |
| NF15 | 17.0 (.669) | 6.0 (.236) | 20.0 (.787) | 24.0 (.945) | 30 (1.181) | 1.0 (.039) | 7.62 (.30) |
| NF20 | 22.0 (.866) | 6. (.236) | 25.0 (.984) | 29.0 (1.142) | 30 (1.181) | 1.0 (.039) | 7.62 (.30) |

GENERAL CHARACTERISTICS

| Type | Standard tolerance** % | Maximum operating T°C | Max power 25°C Watts | Thermal dissipation δ _{th} (mW/K) | Thermal time constant τ _C (s) | Heat capacity H (mJ/K) | Packing bulk | Packing tape |
|-------|------------------------|-----------------------|----------------------|--|--|------------------------|--------------|--------------|
| NF08* | 20 | -40 / +200 | 1.6 | 8 | 60 | 480 | ✓ | ✓ |
| NF08 | 20 | -40 / +200 | 2.2 | 11 | 60 | 660 | ✓ | ✓ |
| NF10* | 20 | -40 / +200 | 2.0 | 10 | 75 | 750 | ✓ | - |
| NF10 | 20 | -40 / +200 | 2.6 | 13 | 75 | 975 | ✓ | ✓ |
| NF13 | 20 | -40 / +200 | 3.2 | 16 | 100 | 1600 | ✓ | ✓ |
| NF15 | 20 | -40 / +200 | 4.1 | 20 | 115 | 2300 | ✓ | - |
| NF20 | 20 | -40 / +200 | 5.0 | 25 | 160 | 4000 | ✓ | - |

* 0.6 mm copper wire and 5.08 mm leads spacing for those two types.

** Other tolerances available: L: ±15, X: ±25%

SUFFIXES FOR BULK PACKING (Suffixes for taping: see page 35)

- - straight leads 0.8 or 1 mm wire diameter and 7.62 lead spacing
- HB straight leads 0.6 mm wire diameter and 5.08 lead spacing
- HL internal kink 0.8 mm or 1 mm wire diameter and 7.62 lead spacing
- 1N internal kink 0.6 mm wire diameter and 5.08 lead spacing
- HY Y kink 0.8 or 1 mm wire diameter and 7.62 lead spacing
- 2B Y kink 0.6 mm wire diameter and 5.08 lead spacing

HOW TO ORDER

NF13

Type

AA

Inrush Current Limiters

0509

Resistance
5 kΩ

M

Tolerance
M (±20%)

--

Suffix
Bulk, Straight Leads
(See illustration above)



Table of Values



NF 08 - 10 - 13 - 15 - 20

| cUL | Ceramic Disc ø (mm) | Part number reference T _{ype} | Zero power resistance R _{25°C} (Ω) | Max steady state current I _{SS} max 25°C (A) | Resistance at max current R _{ISS} max (Ω) |
|-----|------------------------|--|---|---|--|
| * | 08 | NF08AA0509MHB | 5.0 | 2.9 | 0.20 |
| * | | NF08AA0809MHB | 8.0 | 2.3 | 0.30 |
| * | | NF08AA0100MHB | 10.0 | 2.1 | 0.37 |
| * | | NF08AA0150MHB | 15.0 | 1.8 | 0.50 |
| * | | NF08AA0330MHB | 33.0 | 1.3 | 0.97 |
| * | 08 | NF08AA0509M -- | 5.0 | 3.4 | 0.20 |
| * | | NF08AA0809M -- | 8.0 | 2.7 | 0.30 |
| * | | NF08AA0100M -- | 10.0 | 2.5 | 0.37 |
| * | | NF08AA0150M -- | 15.0 | 2.1 | 0.50 |
| * | | NF08AA0330M -- | 33.0 | 1.5 | 0.97 |
| * | 10 | NF10AA0259MHB | 2.5 | 4.5 | 0.10 |
| * | | NF10AA0409MHB | 4.0 | 3.6 | 0.16 |
| * | | NF10AA0509MHB | 5.0 | 3.3 | 0.19 |
| * | | NF10AA0809MHB | 8.0 | 2.6 | 0.30 |
| * | | NF10AA0100MHB | 10.0 | 2.5 | 0.34 |
| * | | NF10AA0160MHB | 16.0 | 2.0 | 0.50 |
| * | | NF10AA0200MHB | 20.0 | 1.9 | 0.59 |
| * | | NF10AA0250MHB | 25.0 | 1.7 | 0.69 |
| * | | NF10AA0500MHB | 50.0 | 1.4 | 1.07 |
| * | | NF10AA0800MHB | 80.0 | 1.1 | 1.60 |
| * | | NF10AA0121MHB | 120.0 | 1.0 | 1.90 |
| * | | 10 | NF10AA0259M -- | 2.5 | 5.2 |
| * | NF10AA0409M -- | | 4.0 | 4.1 | 0.16 |
| * | NF10AA0509M -- | | 5.0 | 3.8 | 0.19 |
| * | NF10AA0809M -- | | 8.0 | 3.0 | 0.30 |
| * | NF10AA0100M -- | | 10.0 | 2.8 | 0.34 |
| * | NF10AA0160M -- | | 16.0 | 2.3 | 0.50 |
| * | NF10AA0200M -- | | 20.0 | 2.1 | 0.59 |
| * | NF10AA0250M -- | | 25.0 | 2.0 | 0.69 |
| * | NF10AA0500M -- | | 50.0 | 1.6 | 1.07 |
| * | NF10AA0800M -- | | 80.0 | 1.3 | 1.60 |
| * | NF10AA0121M -- | | 120.0 | 1.2 | 1.90 |
| * | 13 | | NF13AA0259M -- | 2.5 | 5.7 |
| * | | NF13AA0509M -- | 5.0 | 4.2 | 0.19 |
| * | | NF13AA0709M -- | 7.0 | 3.7 | 0.24 |
| * | | NF13AA0809M -- | 8.0 | 3.6 | 0.25 |
| * | | NF13AA0100M -- | 10.0 | 3.3 | 0.30 |
| * | | NF13AA0150M -- | 15.0 | 2.8 | 0.41 |
| * | | NF13AA0220M -- | 22.0 | 2.3 | 0.61 |
| * | | NF13AA0330M -- | 33.0 | 2.2 | 0.70 |
| * | | NF13AA0400M -- | 40.0 | 2.0 | 0.80 |
| * | | NF13AA0600M -- | 60.0 | 1.9 | 0.95 |
| * | 15 | NF15AA0139M -- | 1.3 | 8.9 | 0.05 |
| * | | NF15AA0159M -- | 1.5 | 8.3 | 0.06 |
| * | | NF15AA0259M -- | 2.5 | 6.6 | 0.09 |
| * | | NF15AA0309M -- | 3.0 | 6.1 | 0.11 |
| * | | NF15AA0409M -- | 4.0 | 5.5 | 0.13 |
| * | | NF15AA0509M -- | 5.0 | 4.9 | 0.17 |
| * | | NF15AA0609M -- | 6.0 | 4.7 | 0.19 |
| * | | NF15AA0709M -- | 7.0 | 4.3 | 0.22 |
| * | | NF15AA0809M -- | 8.0 | 4.2 | 0.24 |
| * | | NF15AA0100M -- | 10.0 | 3.7 | 0.30 |
| * | | NF15AA0120M -- | 12.0 | 3.5 | 0.33 |
| * | | NF15AA0160M -- | 16.0 | 3.0 | 0.44 |
| * | | NF15AA0200M -- | 20.0 | 3.1 | 0.43 |
| * | | NF15AA0250M -- | 25.0 | 2.8 | 0.53 |
| * | | NF15AA0330M -- | 33.0 | 2.5 | 0.66 |
| * | | NF15AA0400M -- | 40.0 | 2.3 | 0.80 |
| * | NF15AA0470M -- | 47.0 | 2.3 | 0.74 | |
| * | 20 | NF20AA0259M -- | 2.5 | 7.8 | 0.08 |
| * | | NF20AA0409M -- | 4.0 | 6.4 | 0.13 |
| * | | NF20AA0509M -- | 5.0 | 5.9 | 0.15 |
| * | | NF20AA0100M -- | 10.0 | 4.3 | 0.28 |
| * | | NF20AA0150M -- | 15.0 | 4.0 | 0.32 |
| * | | NF20AA0330M -- | 33.0 | 3.1 | 0.52 |

* c/L/L approval (File E167822)

- Electrical performances for suffixes HL and HY are identical to the suffix --.
- Electrical performances for suffixes 1N and 2B are identical to the suffix HB



NTC Inrush Current Limiters Thermistors

Application Guide

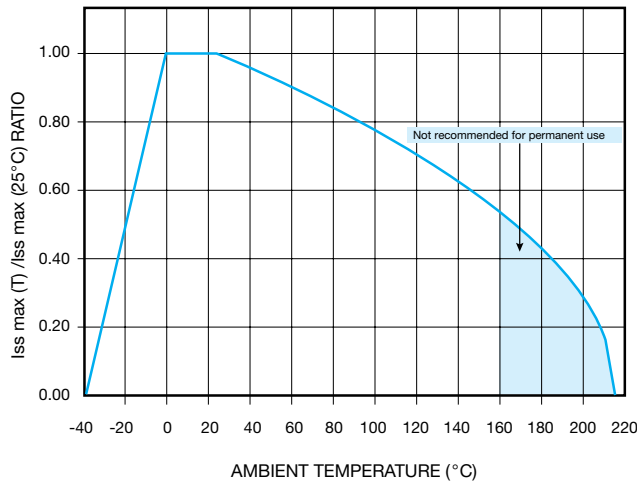
1 – HOW TO DETERMINE THE MAXIMUM STEADY STATE CURRENT OF NF THERMISTORS?

- If the ambient temperature is 25°C: the current is given in table page 30.
- If the ambient temperature is different from 25°C: the current at 25°C must be derated as specified in the graph below.

Example: maximum steady state current of NF13AA0100M at 60°C ambient:

$$I_{SS_{max25}} \times 0.9 = 3.0 \text{ A.}$$

Derating of maximum steady state current with ambient temperature



2 – HOW TO CALCULATE THE WORKING TEMPERATURE OF NF THERMISTOR?

Example: NF08AA0330M

$$I_{SS} = 0.2 \text{ A, } T_{\text{ambient}} = 25^\circ\text{C}$$

- From the graph V (I) page 32, we find V_{SS} = 2.2 V therefore, R_{SS} = 11 Ω
- From the graph R(T), page 32, at R = 11 Ω, we find T ± 65°C

3 – HOW TO CALCULATE THE WORKING POINT OF NF THERMISTOR AT A DIFFERENT AMBIENT TEMPERATURE THAN 25°C?

Example: NF13AA0100M

$$I_{SS} = 3 \text{ A, } T_{\text{ambient}} = T_A = 60^\circ\text{C}$$

$$R_T I_{SS}^2 = \delta (T - T_A) \text{ and thus}$$

$$T = \frac{R_T I_{SS}^2}{\delta} + T_A$$

- As R_T depends on T, this equation is quite complex to be solved by an algebraic way. The quickest manner to solve it is to operate by iterations:

for NF13, δ = 16 mW/K (see page 29)

therefore, the equation becomes:

$$T = 562.5 R_T + 60$$

from the R_T curve page 33 we find R_T starting from T:

| T (°C) | R _T (Ω) | ⇒ | 562.5 R _T + 60 (°C) |
|--------|--------------------|---|--------------------------------|
| 185 | 0.28 | | 217 |
| 190 | 0.26 | | 206 |
| 195 | 0.24 | | 195 |
| 200 | 0.22 | | 184 |

The working temperature of this NF thermistor is about 195°C when operating under I_{SS} = 3 A and T_A = 60°C (this temperature is the one for which we have T = 562.5 R_T + 60).

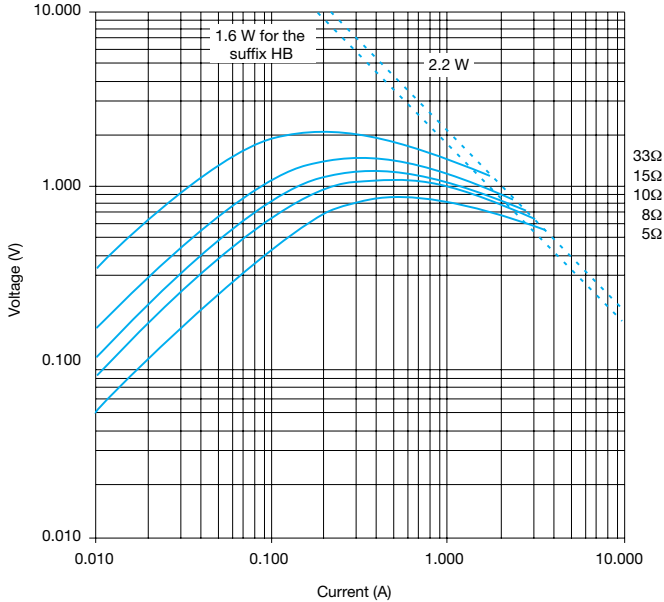
Important: A discrepancy may exist between practice and theory due to the tolerance of the thermistor (±20% usually).

NTC Inrush Current Limiters Thermistors

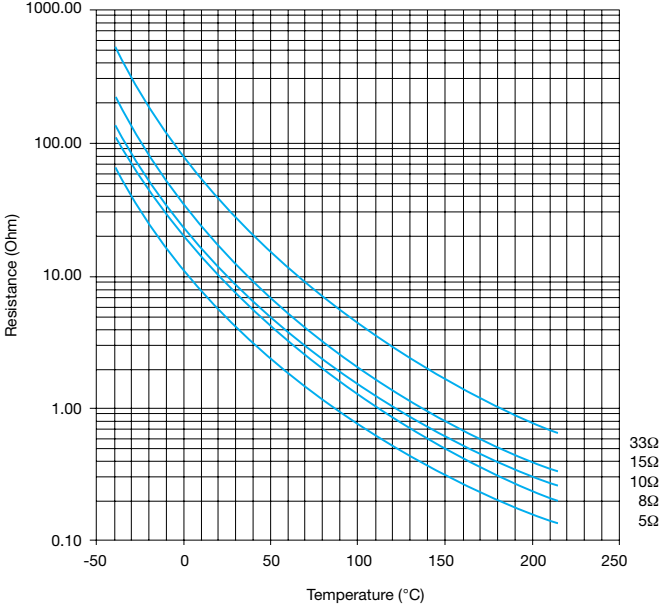


Voltage-Current and Resistance-Temperature Characteristics

TYPICAL VOLTAGE/CURRENT CHARACTERISTICS FOR TYPE NF08



TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTICS FOR TYPE NF08

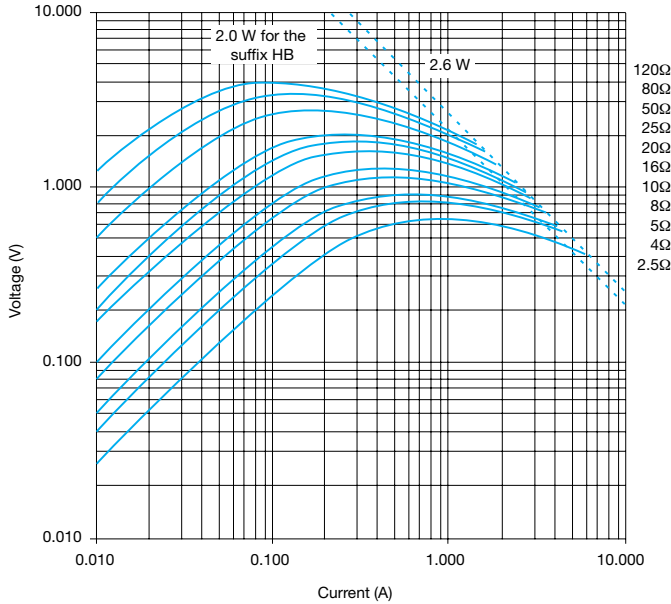


NTC Inrush Current Limiters Thermistors

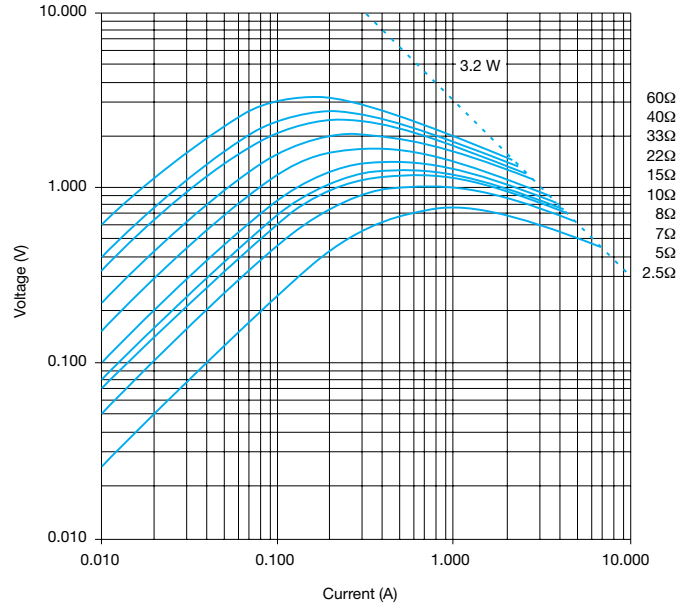


Voltage-Current and Resistance-Temperature Characteristics

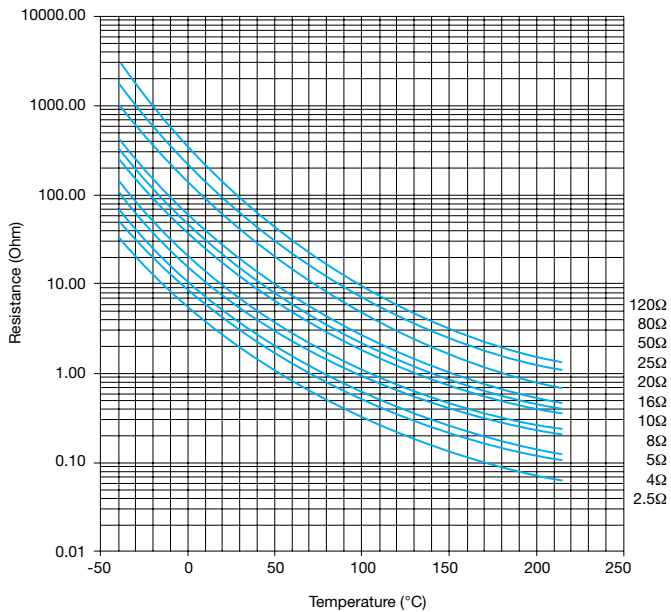
TYPICAL VOLTAGE/CURRENT CHARACTERISTICS FOR TYPE NF10



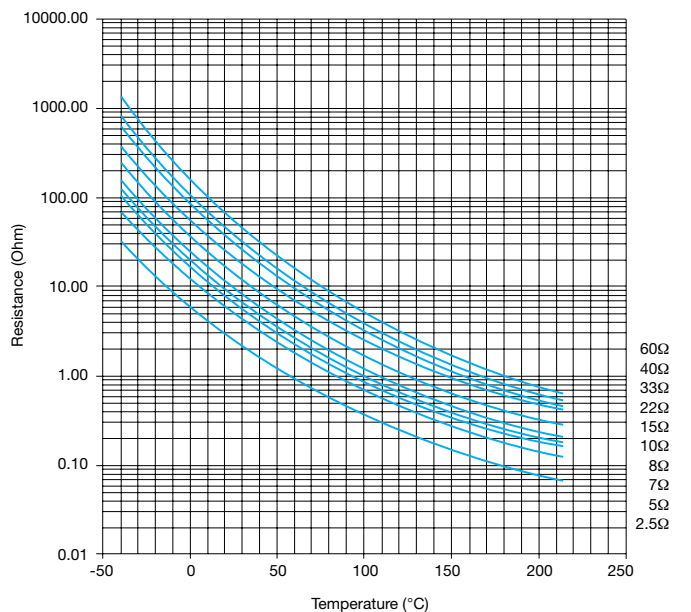
TYPICAL VOLTAGE/CURRENT CHARACTERISTICS FOR TYPE NF13



TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTICS FOR TYPE NF10



TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTICS FOR TYPE NF13

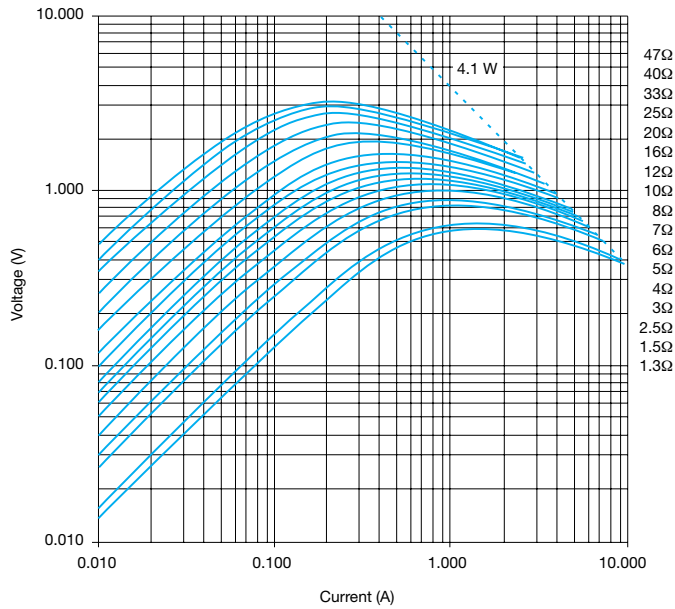


NTC Inrush Current Limiters Thermistors

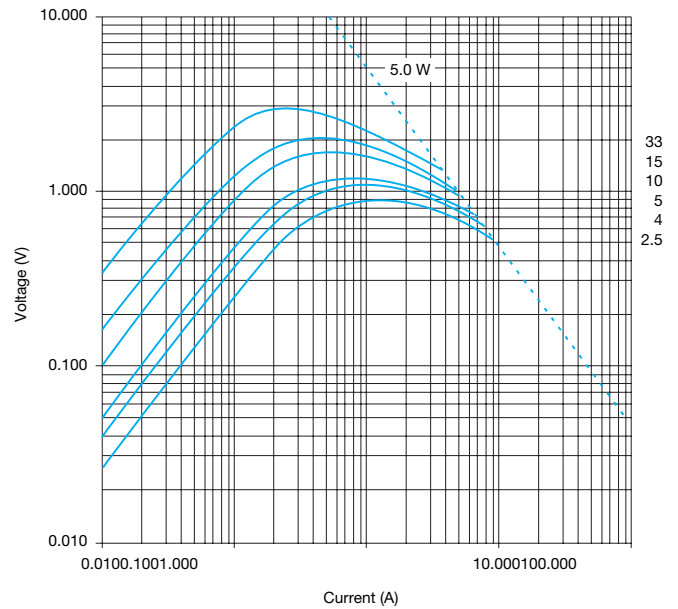


Voltage-Current and Resistance-Temperature Characteristics

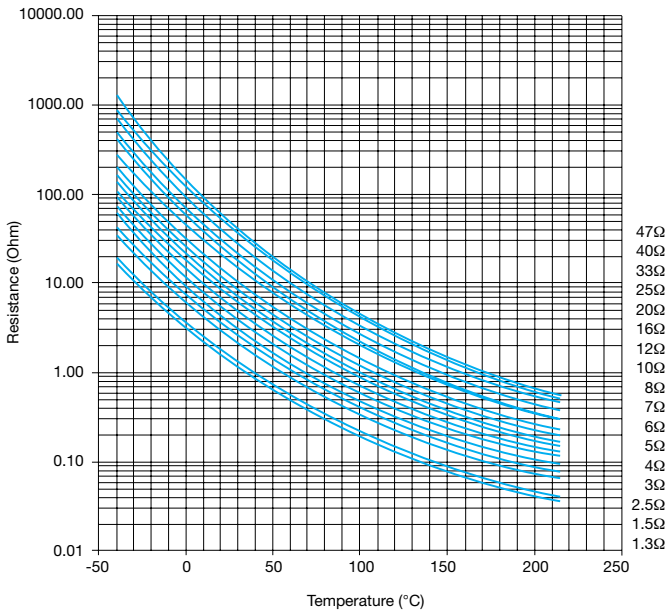
TYPICAL VOLTAGE/CURRENT CHARACTERISTICS FOR TYPE NF15



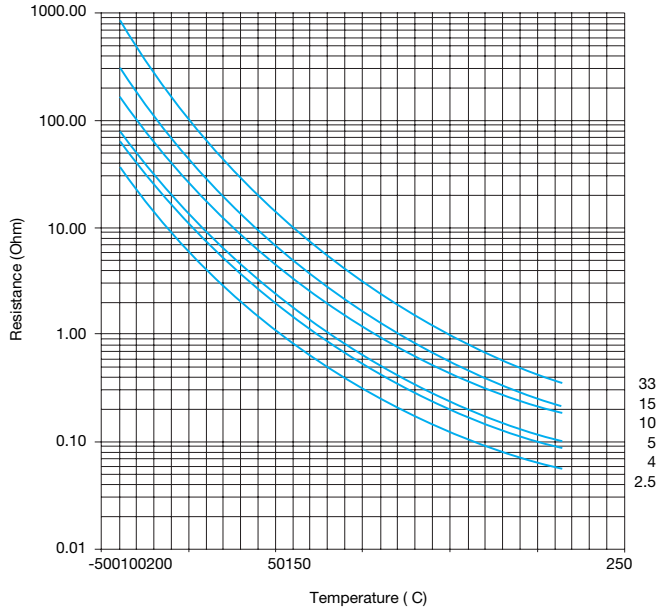
TYPICAL VOLTAGE/CURRENT CHARACTERISTICS FOR TYPE NF20



TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTICS FOR TYPE NF15



TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTICS FOR TYPE NF20



Packaging for Automatic Insertion



NTC Disc Thermistors / NF Series

PACKAGING AND KINK SUFFIXES

The following types can be ordered on tape either in AMMOPACK (fan folder) or on REEL in accordance with IEC 286-2.

| Types | Straight | | NF08 Internal Kink | | "Y" Kink | |
|--|----------|------|-----------------------|------|----------|------|
| Leads | Straight | | Internal Kink | | "Y" Kink | |
| DIMENSIONS: millimeters (inches) | | | | | | |
| Packaging | AMMOPACK | REEL | AMMOPACK | REEL | AMMOPACK | REEL |
| Ho = 16 | DA | DB | DQ | DR | D7 | D5 |
| Ho = 19.5 | DC | DD | DS | DT | D8 | D6 |

| Types | Straight | | NF08 / 10 / 13 Internal Kink | | "Y" Kink | |
|--|----------|------|---------------------------------|------|----------|------|
| Leads | Straight | | Internal Kink | | "Y" Kink | |
| DIMENSIONS: millimeters (inches) | | | | | | |
| Packaging | AMMOPACK | REEL | AMMOPACK | REEL | AMMOPACK | REEL |
| Ho = 16 | EA | EN | EC | EF | EQ | ER |
| Ho = 19.5 | EB | ED | | | | |

PACKAGING QUANTITIES

| Type | AMMOPACK | REEL | BULK |
|--------------|----------|------|------|
| NF08* (5.08) | 1000 | 1000 | 450 |
| NF08 (7.62) | 750 | 750 | |
| NF10* (5.08) | | | 450 |
| NF10 (7.62) | 750 | 750 | |
| NF13 (7.62) | 750 | 750 | 400 |
| NF15 (7.62) | – | – | 250 |
| NF20 (7.62) | – | – | 150 |