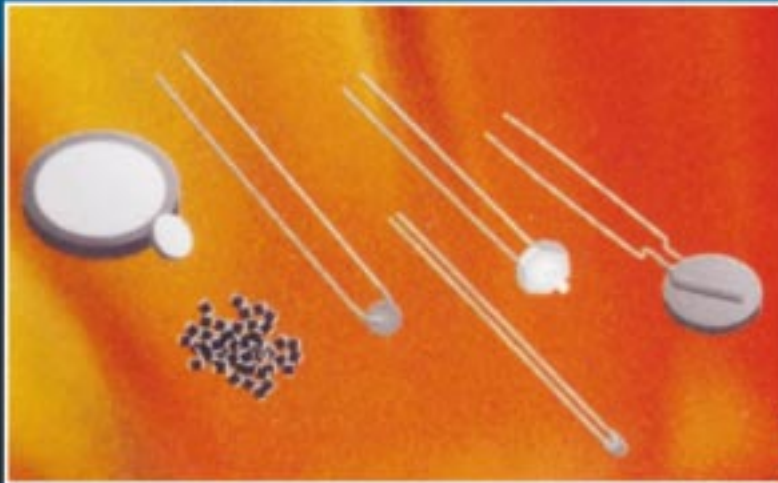




# TPC NTC Thermistors - Preliminary Catalog

# NTC SMD Thermistors



## With Nickel Barrier Termination NB 12 - NB 20 - NB 21

Chip thermistors are high quality and low cost devices especially developed for surface mounting applications. They are widely used for temperature compensation but can also achieve temperature control of printed circuits.

A nickel barrier metallization provides outstanding qualities of solderability and enables this chip to meet the requirements of the most severe soldering processes.

| Types                                      | NB 21<br>IEC SIZE : 06-03 | NB 12<br>IEC SIZE : 08-05 | NB 20<br>IEC SIZE : 12-06 |
|--------------------------------------------|---------------------------|---------------------------|---------------------------|
| <b>DIMENSIONS:</b><br>millimeters (inches) |                           |                           |                           |
| Terminations                               | Nickel Barrier            |                           |                           |
| Marking                                    | On packaging only         |                           |                           |
| Climatic category                          | 40/125/56                 |                           |                           |
| Operating temperature                      | -55°C to +150°C           |                           |                           |
| Tolerance on R <sub>n</sub> (25°C)         | ±5%, ±10%, ±20%           |                           |                           |
| Maximum dissipation at 25°C                | 0.7 W                     | 0.12 W                    | 0.24 W                    |
| Thermal dissipation factor                 | 1 mW/°C                   | 2 mW/°C                   | 4 mW/°C                   |
| Thermal time constant                      | 4 s                       | 5 s                       | 7s                        |

Resistance - Temperature characteristics: pages 32 to 35.

## APPLICATIONS

- LCD compensation
- Battery packs
- Mobile phones
- CD players
- Heating systems
- Air-conditioning systems
- Temperature control of Switch Mode Power Supplies
- Compensation of pressure sensors
- Protection of power transistors in various electronic circuits

## HOW TO ORDER

**NB 20**

Type

**K 0**

Material Code  
K  
(See tables page 13)

**0103**

Resistance  
10,000 Ω

**M**

Tolerance  
M (±20%)

**BA**

Suffix: Packaging  
— : Bulk  
BA: Super 8 plastic tape  
BE: Super 8 plastic tape (1/2 reel)

# NTC SMD Thermistors



With Nickel Barrier Termination NB 12 – NB 20 – NB 21

## TABLE OF VALUES

| NB 12<br>IEC SIZE : 08-05                                                                                                                                                                                                                                                                                                        |                                                                                                                                          |                  |                                                                     |                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------|----------------------------|
| Types                                                                                                                                                                                                                                                                                                                            | Rn at 25°C<br>( $\Omega$ )                                                                                                               | Material<br>Code | B (K)<br>$\left(\frac{\Delta B/B}{(1) \pm 5\%}, (2) \pm 3\%\right)$ | $\alpha$ at 25°C<br>(%/°C) |
| NB 12 KC 0 180<br>NB 12 KC 0 220<br>NB 12 KC 0 270<br>NB 12 KC 0 330<br>NB 12 KC 0 390<br>NB 12 KC 0 470<br>NB 12 KC 0 560<br>NB 12 KC 0 680<br>NB 12 KC 0 820<br>NB 12 KC 0 101                                                                                                                                                 | 18<br>22<br>27<br>33<br>39<br>47<br>56<br>68<br>82<br>100                                                                                | KC               | 3470 (1)                                                            | - 3.9                      |
| NB 12 MC 0 121<br>NB 12 MC 0 151<br>NB 12 MC 0 181<br>NB 12 MC 0 221<br>NB 12 MC 0 271<br>NB 12 MC 0 331<br>NB 12 MC 0 391<br>NB 12 MC 0 471<br>NB 12 MC 0 561<br>NB 12 MC 0 681<br>NB 12 MC 0 821<br>NB 12 MC 0 102<br>NB 12 MC 0 122<br>NB 12 MC 0 152<br>NB 12 MC 0 182<br>NB 12 MC 0 222<br>NB 12 MC 0 272<br>NB 12 MC 0 332 | 120<br>150<br>180<br>220<br>270<br>330<br>390<br>470<br>560<br>680<br>820<br>1,000<br>1,200<br>1,500<br>1,800<br>2,200<br>2,700<br>3,300 | MC               | 3910 (1)                                                            | - 4.4                      |
| NB 12 J 5 0 392<br>NB 12 J 5 0 472                                                                                                                                                                                                                                                                                               | 3,900<br>4,700                                                                                                                           | J5               | 3480 (1)                                                            | - 3.9                      |
| NB 12 K 0 0562<br>NB 12 K 0 0682<br>NB 12 K 0 0822<br>NB 12 K 0 0103                                                                                                                                                                                                                                                             | 5,600<br>6,800<br>8,200<br>10,000                                                                                                        | K                | 3630 (1)                                                            | - 4.0                      |
| NB 12 L 0 0123<br>NB 12 L 0 0153                                                                                                                                                                                                                                                                                                 | 12,000<br>15,000                                                                                                                         | L                | 3790 (2)                                                            | - 4.2                      |
| NB 12 M 0 0183<br>NB 12 M 0 0223<br>NB 12 M 0 0273<br>NB 12 M 0 0333                                                                                                                                                                                                                                                             | 18,000<br>22,000<br>27,000<br>33,000                                                                                                     | M                | 3950 (2)                                                            | - 4.4                      |
| NB 12 N 0 0393<br>NB 12 N 0 0473<br>NB 12 N 0 0563                                                                                                                                                                                                                                                                               | 39,000<br>47,000<br>56,000                                                                                                               | N                | 4080 (2)                                                            | - 4.6                      |
| NB 12 N 5 0683<br>NB 12 N 5 0823                                                                                                                                                                                                                                                                                                 | 68,000<br>82,000                                                                                                                         | N5               | 4160 (2)                                                            | - 4.7                      |
| NB 12 P 0 0104<br>NB 12 P 0 0124<br>NB 12 P 0 0154<br>NB 12 P 0 0184                                                                                                                                                                                                                                                             | 100,000<br>120,000<br>150,000<br>180,000                                                                                                 | P                | 4220 (2)                                                            | - 4.7                      |

| NB 20<br>IEC SIZE : 12-06                                                                                |                                                                |                  |                                                                     |                            |
|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|------------------|---------------------------------------------------------------------|----------------------------|
| Types                                                                                                    | Rn at 25°C<br>( $\Omega$ )                                     | Material<br>Code | B (K)<br>$\left(\frac{\Delta B/B}{(1) \pm 5\%}, (2) \pm 3\%\right)$ | $\alpha$ at 25°C<br>(%/°C) |
| NB 20 J 0 0472<br>NB 20 J 0 0562                                                                         | 4,700<br>5,600                                                 | J                | 3480 (1)                                                            | - 3.9                      |
| NB 20 J 5 0682<br>NB 20 J 5 0822                                                                         | 6,800<br>8,200                                                 | J5               | 3480 (2)                                                            | - 3.9                      |
| NB 20 K 0 0103<br>NB 20 K 0 0123                                                                         | 10,000<br>12,000                                               | K                | 3630 (1)                                                            | - 4.0                      |
| NB 20 L 0 0153<br>NB 20 L 0 0183                                                                         | 15,000<br>18,000                                               | L                | 3790 (2)                                                            | - 4.2                      |
| NB 20 M 0 0223<br>NB 20 M 0 0273<br>NB 20 M 0 0333<br>NB 20 M 0 0393                                     | 22,000<br>27,000<br>33,000<br>39,000                           | M                | 3950 (2)                                                            | - 4.4                      |
| NB 20 N 0 0473<br>NB 20 N 0 0563<br>NB 20 N 0 0683<br>NB 20 N 0 0823                                     | 47,000<br>56,000<br>68,000<br>82,000                           | N                | 4080 (2)                                                            | - 4.6                      |
| NB 20 N 5 0104                                                                                           | 100,000                                                        | N5               | 4160 (2)                                                            | - 4.7                      |
| NB 20 P 0 0124<br>NB 20 P 0 0154<br>NB 20 P 0 0184                                                       | 120,000<br>150,000<br>180,000                                  | P                | 4220 (2)                                                            | - 4.7                      |
| NB 20 Q 0 0224<br>NB 20 Q 0 0274<br>NB 20 Q 0 0334<br>NB 20 Q 0 0394<br>NB 20 Q 0 0474<br>NB 20 Q 0 0564 | 220,000<br>270,000<br>330,000<br>390,000<br>470,000<br>560,000 | Q                | 4300 (2)                                                            | - 4.7                      |
| NB 20 R 0 0684<br>NB 20 R 0 0824<br>NB 20 R 0 0105                                                       | 680,000<br>820,000<br>1,000,000                                | R                | 4400 (2)                                                            | - 4.8                      |

| NB 21<br>IEC SIZE : 06-03 |                            |                  |                                                                     |                            |
|---------------------------|----------------------------|------------------|---------------------------------------------------------------------|----------------------------|
| Types                     | Rn at 25°C<br>( $\Omega$ ) | Material<br>Code | B (K)<br>$\left(\frac{\Delta B/B}{(1) \pm 5\%}, (2) \pm 3\%\right)$ | $\alpha$ at 25°C<br>(%/°C) |
| NB 21 PC 0472             | 4,700                      | PC               | 4200 (1)                                                            | - 4.7                      |
| NB 21 J 5 0103            | 10,000                     | J5               | 3480 (1)                                                            | - 3.9                      |
| NB 21 K 0 0153            | 15,000                     | K                | 3630 (2)                                                            | - 4.0                      |
| NB 21 L 0 0223            | 22,000                     | L                | 3790 (2)                                                            | - 4.2                      |
| NB 21 M 0 0473            | 47,000                     | M                | 3950 (2)                                                            | - 4.4                      |
| NB 21 N 5 0104            | 100,000                    | N5               | 4160 (2)                                                            | - 4.7                      |
| NB 21 P 0 0154            | 150,000                    | P                | 4220 (2)                                                            | - 4.7                      |

# NTC SMD Thermistors



## NC 12 – NC 20

Chip thermistors are a high quality and low cost device especially developed for surface mounting applications. They are widely used for temperature compensation but can also achieve temperature control of printed circuits. Its silver -

palladium - platinum metallization provides a high degree of resistance to dewetting of the terminations during soldering (typically 260°C / 30 s).

| Types                                   | NC 12<br>IEC SIZE : 08-05                                                                                                 | NC 20<br>IEC SIZE : 12-06                                                                                                   |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>DIMENSIONS: millimeters (inches)</b> | <p>2 (.079) ± 0.3 (.012)<br/>1.25 (.049) ± 0.2 (.008)<br/>0.5 (.020) ... 1.3 (.051)<br/>0.2 (.008) min 0.2 (.008) min</p> | <p>3.2 (.126) ± 0.4 (.016)<br/>1.6 (.063) ± 0.25 (.010)<br/>0.5 (.020) ... 1.5 (.059)<br/>0.2 (.008) min 0.2 (.008) min</p> |
| Terminations                            | Silver – palladium – platinum metallization                                                                               |                                                                                                                             |
| Marking                                 | On packaging only                                                                                                         |                                                                                                                             |
| Climatic category                       | 40/125/56                                                                                                                 |                                                                                                                             |
| Operating temperature                   | -55°C to +150°C                                                                                                           |                                                                                                                             |
| Tolerance on R <sub>n</sub> (25°C)      | ±5%, ±10%, ±20%                                                                                                           |                                                                                                                             |
| Maximum dissipation at 25°C             | 0.12 W                                                                                                                    | 0.24 W                                                                                                                      |
| Thermal dissipation factor              | 2 mW/°C                                                                                                                   | 4 mW/°C                                                                                                                     |
| Thermal time constant                   | 5 s                                                                                                                       | 7 s                                                                                                                         |

Resistance - Temperature characteristics: pages 32 to 35.

## APPLICATIONS

- LCD compensation
- Battery packs
- Mobile phones
- CD players
- Heating systems
- Air-conditioning systems
- Temperature control of Switch Mode Power Supplies
- Compensation of pressure sensors
- Protection of power transistors in various electronic circuits

## HOW TO ORDER

**NC 20**

Type

**K 0**

Material Code  
K

(See tables pages 11, 32-35)

**0103**

Resistance  
10,000 Ω

**M**

Tolerance  
M (±20%)

**BA**

Suffix: Packaging  
--: Bulk  
BA: Super 8 plastic tape  
BE: Super 8 plastic tape (1/2 reel)

# NTC SMD Thermistors



## NC 12 – NC 20

### TABLE OF VALUES

| NC 12<br>IEC SIZE : 08-05                                                                                                                                                                                                                                                                                                        |                                                                                                                                          |                  |                                                                     |                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------|----------------------------|
| Types                                                                                                                                                                                                                                                                                                                            | Rn at 25°C<br>( $\Omega$ )                                                                                                               | Material<br>Code | B (K)<br>$\left(\frac{\Delta B/B}{(1) \pm 5\%}, (2) \pm 3\%\right)$ | $\alpha$ at 25°C<br>(%/°C) |
| NC 12 KC 0 180<br>NC 12 KC 0 220<br>NC 12 KC 0 270<br>NC 12 KC 0 330<br>NC 12 KC 0 390<br>NC 12 KC 0 470<br>NC 12 KC 0 560<br>NC 12 KC 0 680<br>NC 12 KC 0 820<br>NC 12 KC 0 101                                                                                                                                                 | 18<br>22<br>27<br>33<br>39<br>47<br>56<br>68<br>82<br>100                                                                                | KC               | 3470 (1)                                                            | - 3.9                      |
| NC 12 MC 0 121<br>NC 12 MC 0 151<br>NC 12 MC 0 181<br>NC 12 MC 0 221<br>NC 12 MC 0 271<br>NC 12 MC 0 331<br>NC 12 MC 0 391<br>NC 12 MC 0 471<br>NC 12 MC 0 561<br>NC 12 MC 0 681<br>NC 12 MC 0 821<br>NC 12 MC 0 102<br>NC 12 MC 0 122<br>NC 12 MC 0 152<br>NC 12 MC 0 182<br>NC 12 MC 0 222<br>NC 12 MC 0 272<br>NC 12 MC 0 332 | 120<br>150<br>180<br>220<br>270<br>330<br>390<br>470<br>560<br>680<br>820<br>1,000<br>1,200<br>1,500<br>1,800<br>2,200<br>2,700<br>3,300 | MC               | 3910 (1)                                                            | - 4.4                      |
| NC 12 J 5 0 392<br>NC 12 J 5 0 472<br>NC 12 J 5 0 562                                                                                                                                                                                                                                                                            | 3,900<br>4,700<br>5,600                                                                                                                  | J5               | 3480 (1)                                                            | - 3.9                      |
| NC 12 K 0 0682<br>NC 12 K 0 0822<br>NC 12 K 0 0103<br>NC 12 K 0 0123                                                                                                                                                                                                                                                             | 6,800<br>8,200<br>10,000<br>12,000                                                                                                       | K                | 3630 (1)                                                            | - 4.0                      |
| NC 12 L 0 0153<br>NC 12 L 0 0183                                                                                                                                                                                                                                                                                                 | 15,000<br>18,000                                                                                                                         | L                | 3790 (2)                                                            | - 4.2                      |
| NC 12 M 0 0223<br>NC 12 M 0 0273<br>NC 12 M 0 0333<br>NC 12 M 0 0393                                                                                                                                                                                                                                                             | 22,000<br>27,000<br>33,000<br>39,000                                                                                                     | M                | 3950 (2)                                                            | - 4.4                      |
| NC 12 N 0 0473<br>NC 12 N 0 0563<br>NC 12 N 0 0683<br>NC 12 N 0 0823                                                                                                                                                                                                                                                             | 47,000<br>56,000<br>68,000<br>82,000                                                                                                     | N                | 4080 (2)                                                            | - 4.6                      |
| NC 12 P 0 0104<br>NC 12 P 0 0124<br>NC 12 P 0 0154<br>NC 12 P 0 0184                                                                                                                                                                                                                                                             | 100,000<br>120,000<br>150,000<br>180,000                                                                                                 | P                | 4220 (2)                                                            | - 4.7                      |
| NC 12 Q 0 0224                                                                                                                                                                                                                                                                                                                   | 220,000                                                                                                                                  | Q                | 4300 (2)                                                            | -4.7                       |

| NC 20<br>IEC SIZE : 12-06                                                                                                                                                                                                                                |                                                                                                      |                  |                                                                     |                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------|----------------------------|
| Types                                                                                                                                                                                                                                                    | Rn at 25°C<br>( $\Omega$ )                                                                           | Material<br>Code | B (K)<br>$\left(\frac{\Delta B/B}{(1) \pm 5\%}, (2) \pm 3\%\right)$ | $\alpha$ at 25°C<br>(%/°C) |
| NC 20 KC 0 100<br>NC 20 KC 0 120<br>NC 20 KC 0 150<br>NC 20 KC 0 180<br>NC 20 KC 0 220<br>NC 20 KC 0 270<br>NC 20 KC 0 330<br>NC 20 KC 0 390<br>NC 20 KC 0 470<br>NC 20 KC 0 560<br>NC 20 KC 0 680<br>NC 20 KC 0 820<br>NC 20 KC 0 101                   | 10<br>12<br>15<br>18<br>22<br>27<br>33<br>39<br>47<br>56<br>68<br>82<br>100                          | KC               | 3470 (1)                                                            | - 3.9                      |
| NC 20 MC 0 121<br>NC 20 MC 0 151<br>NC 20 MC 0 181<br>NC 20 MC 0 221<br>NC 20 MC 0 271<br>NC 20 MC 0 331<br>NC 20 MC 0 391<br>NC 20 MC 0 471<br>NC 20 MC 0 561<br>NC 20 MC 0 681<br>NC 20 MC 0 821<br>NC 20 MC 0 102<br>NC 20 MC 0 122<br>NC 20 MC 0 152 | 120<br>150<br>180<br>220<br>270<br>330<br>390<br>470<br>560<br>680<br>820<br>1,000<br>1,200<br>1,500 | MC               | 3910 (1)                                                            | - 4.4                      |
| NC 20 I 0 0 182<br>NC 20 I 0 0 222<br>NC 20 I 0 0 272<br>NC 20 I 0 0 332                                                                                                                                                                                 | 1,800<br>2,200<br>2,700<br>3,300                                                                     | I                | 3250 (1)                                                            | - 3.7                      |
| NC 20 J 0 0 392<br>NC 20 J 0 0 472<br>NC 20 J 0 0 562<br>NC 20 J 0 0 682                                                                                                                                                                                 | 3,900<br>4,700<br>5,600<br>6,800                                                                     | J                | 3480 (1)                                                            | - 3.9                      |
| NC 20 K 0 0 822<br>NC 20 K 0 0 103<br>NC 20 K 0 0 123<br>NC 20 K 0 0 153                                                                                                                                                                                 | 8,200<br>10,000<br>12,000<br>15,000                                                                  | K                | 3630 (1)                                                            | - 4.0                      |
| NC 20 L 0 0 183<br>NC 20 L 0 0 223                                                                                                                                                                                                                       | 18,000<br>22,000                                                                                     | L                | 3790 (2)                                                            | - 4.2                      |
| NC 20 M 0 0 273<br>NC 20 M 0 0 333<br>NC 20 M 0 0 393<br>NC 20 M 0 0 473                                                                                                                                                                                 | 27,000<br>33,000<br>39,000<br>47,000                                                                 | M                | 3950 (2)                                                            | - 4.4                      |
| NC 20 N 0 0 563<br>NC 20 N 0 0 683<br>NC 20 N 0 0 823<br>NC 20 N 0 0 104                                                                                                                                                                                 | 56,000<br>68,000<br>82,000<br>100,000                                                                | N                | 4080 (2)                                                            | - 4.6                      |
| NC 20 P 0 0 124<br>NC 20 P 0 0 154<br>NC 20 P 0 0 184<br>NC 20 P 0 0 224                                                                                                                                                                                 | 120,000<br>150,000<br>180,000<br>220,000                                                             | P                | 4220 (2)                                                            | - 4.7                      |
| NC 20 Q 0 0 274<br>NC 20 Q 0 0 334<br>NC 20 Q 0 0 394<br>NC 20 Q 0 0 474                                                                                                                                                                                 | 270,000<br>330,000<br>390,000<br>470,000                                                             | Q                | 4300 (2)                                                            | - 4.7                      |
| NC 20 R 0 0 564<br>NC 20 R 0 0 684<br>NC 20 R 0 0 824<br>NC 20 R 0 0 105                                                                                                                                                                                 | 560,000<br>680,000<br>820,000<br>1,000,000                                                           | R                | 4400 (2)                                                            | - 4.8                      |

## APPLICATIONS

- Commodity Product: 2 ranges  
ND : general purpose  
NV : professional
- Alarm and temperature measurement application
- Temperature regulation application
- Level detection application
- Compensation application

## TECHNOLOGY

- Coated disc phenolic resin
- Leads: Radial copper wire tinned
- Marking: on package only for ND03  
ND06/09: Nominal resistance and tolerance for  $\pm 5\%$ ,  $\pm 10\%$   
NV06/09: Nominal resistance and tolerance
- Delivery Mode: Bulk, reeled or ammpacked



### Leaded Discs

N.03

N.06

N.09



## PERFORMANCE CHARACTERISTICS

| Types                       | General purpose                                                |                               |                               | Professional                 |                              |
|-----------------------------|----------------------------------------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------------|
|                             | ND03                                                           | ND06                          | ND09                          | NV06                         | NV09                         |
| Climatic category           |                                                                |                               |                               | 55/125/56-434                | 55/125/56-434                |
| Operating Temperature       | -55 to +150°C                                                  | -55 to +150°C                 | -55 to +150°C                 | -55 to +150°C                | -55 to +150°C                |
| Tolerance on Rn (25°C)      | 220Ω to 1MΩ : $\pm 5, 10, 20\%$<br>1500Ω to 150 kΩ : $\pm 3\%$ | $\pm 5\%, \pm 10\%, \pm 20\%$ | $\pm 5\%, \pm 10\%, \pm 20\%$ | $\pm 2\%, \pm 5\%, \pm 10\%$ | $\pm 2\%, \pm 5\%, \pm 10\%$ |
| Maximum dissipation at 25°C | 0.25 W                                                         | 0.71 W                        | 0.9 W                         | 0.69 W                       | 0.85 W                       |
| Thermal dissipation factor  | 5 mW/°C                                                        | 7.1 mW/°C                     | 9 mW/°C                       | 6.9 mW/°C                    | 8.5 mW/°C                    |
| Thermal time constant       | 10 s                                                           | 22 s                          | 30 s                          | 18 s                         | 30 s                         |
| Response time               | < 3s                                                           |                               |                               |                              |                              |

## STANDARDIZATION

NV range : approved by NFC 93271  
Type: TN115 A for NV06  
TN116 for NV09  
List: GAM-T1  
List: LN2

## OPTIONS

Consult factory for availability of options:

- other nominal resistance values
- other tolerances
- epoxy coating
- alternative lead materials or lengths
- controlled dimensions

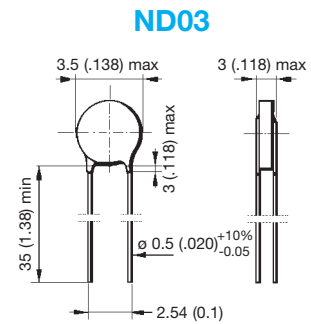
# NTC Disc Thermistors

ND 03/06/09 • NV 06/09



## TABLE OF VALUES

### ND03



| Part Number              | R <sub>n</sub> at 25°C (Ω) | Material Code | B (K)<br>( $\Delta B/B$ (1) $\pm 5\%$<br>(2) $\pm 3\%$ ) | $\alpha$ at 25°C (%/°C) |
|--------------------------|----------------------------|---------------|----------------------------------------------------------|-------------------------|
| ND03I00331<br>ND03I00471 | 330<br>470                 | I             | 3250 (1)                                                 | - 3.7                   |
| ND03J00681<br>ND03J00102 | 680<br>1,000               | J             | 3480 (1)                                                 | - 3.9                   |
| ND03K00152<br>ND03K00222 | 1,500<br>2,200             | K             | 3630 (2)                                                 | - 4.0                   |
| ND03L00332               | 3,300                      | L             | 3790 (2)                                                 | - 4.2                   |
| ND03M00472<br>ND03M00682 | 4,700<br>6,800             | M             | 3950 (2)                                                 | - 4.4                   |
| ND03N00103<br>ND03N00153 | 10,000<br>15,000           | N             | 4080 (2)                                                 | - 4.6                   |
| ND03P00223<br>ND03P00333 | 22,000<br>33,000           | P             | 4220 (2)                                                 | - 4.7                   |
| ND03Q00473<br>ND03Q00683 | 47,000<br>68,000           | Q             | 4300 (2)                                                 | - 4.7                   |
| ND03R00104<br>ND03R00154 | 100,000<br>150,000         | R             | 4400 (2)                                                 | - 4.8                   |
| ND03S00224               | 220,000                    | S             | 4520 (2)                                                 | - 5.0                   |
| ND03T00334<br>ND03T00474 | 330,000<br>470,000         | T             | 4630 (2)                                                 | - 5.1                   |
| ND03U00105               | 1,000,000                  | U             | 4840 (2)                                                 | - 5.3                   |

# NTC Disc Thermistors

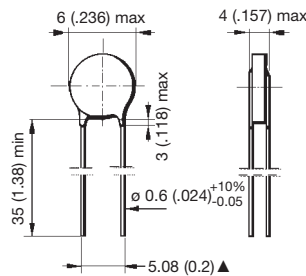
ND 03/06/09 • NV 06/09



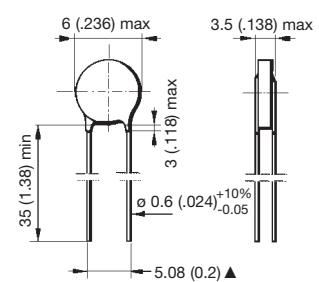
## TABLE OF VALUES

### ND06/NV06

#### ND06



#### NV06



| Part Number                            | R <sub>n</sub> at 25°C (Ω)    | Material Code | B (K)<br>( $\Delta B/B$ (1) $\pm 5\%$<br>(2) $\pm 3\%$ ) | $\alpha$ at 25°C (%/°C) |
|----------------------------------------|-------------------------------|---------------|----------------------------------------------------------|-------------------------|
| ND06I00101<br>ND06I00121               | 100<br>120                    | I             | 3250 (1)                                                 | - 3.7                   |
| ND06J00151<br>ND06J00221               | 150<br>220                    | J             | 3480 (1)                                                 | - 3.9                   |
| ND06K00331<br>ND06K00471               | 330<br>470                    | K             | 3630 (2)                                                 | - 4.0                   |
| ND06L00681<br>ND06L00102               | 680<br>1,000                  | L             | 3790 (2)                                                 | - 4.2                   |
| ND06M00152                             | 1,500                         | M             | 3950 (2)                                                 | - 4.4                   |
| ND06N00222<br>ND06N00332               | 2,200<br>3,300                | N             | 4080 (2)                                                 | - 4.6                   |
| ND06P00472<br>ND06P00682<br>ND06P00103 | 4,700<br>6,800<br>10,000      | P             | 4220 (2)                                                 | - 4.7                   |
| ND06Q00153<br>ND06Q00223               | 15,000<br>22,000              | Q             | 4300 (2)                                                 | - 4.7                   |
| ND06R00333                             | 33,000                        | R             | 4400 (2)                                                 | - 4.8                   |
| ND06S00473<br>ND06S00683               | 47,000<br>68,000              | S             | 4520 (2)                                                 | - 5.0                   |
| ND06T00104                             | 100,000                       | T             | 4630 (2)                                                 | - 5.1                   |
| ND06U00154<br>ND06U00224<br>ND06U00334 | 150,000<br>220,000<br>330,000 | U             | 4840 (2)                                                 | - 5.3                   |
| NV06I00101                             | 100                           | I             | 3250 (1)                                                 | - 3.7                   |
| NV06J00151<br>NV06J00221               | 150<br>220                    | J             | 3480 (1)                                                 | - 3.9                   |
| NV06K00331<br>NV06K00471               | 330<br>470                    | K             | 3630 (2)                                                 | - 4.0                   |
| NV06L00681<br>NV06L00102               | 680<br>1,000                  | L             | 3790 (2)                                                 | - 4.2                   |
| NV06M00152                             | 1,500                         | M             | 3950 (2)                                                 | - 4.4                   |
| NV06N00222<br>NV06N00332               | 2,200<br>3,300                | N             | 4080 (2)                                                 | - 4.6                   |
| NV06P00472<br>NV06P00682<br>NV06P00103 | 4,700<br>6,800<br>10,000      | P             | 4220 (2)                                                 | - 4.7                   |
| NV06Q00153<br>NV06Q00223               | 15,000<br>22,000              | Q             | 4300 (2)                                                 | - 4.7                   |
| NV06R00333                             | 33,000                        | R             | 4400 (2)                                                 | - 4.8                   |
| NV06S00473<br>NV06S00683               | 47,000<br>68,000              | S             | 4520 (2)                                                 | - 5.0                   |
| NV06T00104                             | 100,000                       | T             | 4630 (2)                                                 | - 5.1                   |
| NV06U00154<br>NV06U00224<br>NV06U00334 | 150,000<br>220,000<br>330,000 | U             | 4840 (2)                                                 | - 5.3                   |

# NTC Disc Thermistors

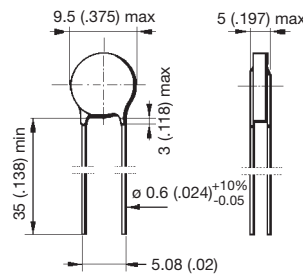
ND 03/06/09 • NV 06/09



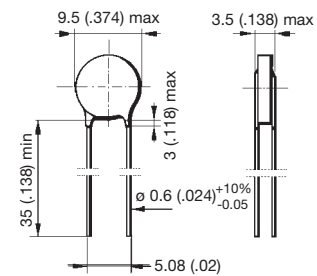
## TABLE OF VALUES

### ND09/NV09

#### ND09



#### NV09



| Part Number                            | R <sub>n</sub> at 25°C ( )   | Material Code | B (K)<br>( $\Delta B/B$ (1) $\pm 5\%$<br>(2) $\pm 3\%$ ) | $\alpha$ at 25°C (%/°C) |
|----------------------------------------|------------------------------|---------------|----------------------------------------------------------|-------------------------|
| ND09J00680<br>ND09J00101               | 68<br>100                    | J             | 3480 (1)                                                 | - 3.9                   |
| ND09K00151<br>ND09K00221               | 150<br>220                   | K             | 3630 (2)                                                 | - 4.0                   |
| ND09L00331                             | 330                          | L             | 3790 (2)                                                 | - 4.2                   |
| ND09M00471<br>ND09M00681               | 470<br>680                   | M             | 3950 (2)                                                 | - 4.4                   |
| ND09N00102<br>ND09N00152               | 1,000<br>1,500               | N             | 4080 (2)                                                 | - 4.6                   |
| ND09P00222<br>ND09P00332               | 2,200<br>3,300               | P             | 4220 (2)                                                 | - 4.7                   |
| ND09Q00472<br>ND09Q00682               | 4,700<br>6,800               | Q             | 4300 (2)                                                 | - 4.7                   |
| ND09R00103<br>ND09R00153               | 10,000<br>15,000             | R             | 4400 (2)                                                 | - 4.8                   |
| ND09S00223                             | 22,000                       | S             | 4520 (2)                                                 | - 5.0                   |
| ND09T00333<br>ND09T00473               | 33,000<br>47,000             | T             | 4630 (2)                                                 | - 5.1                   |
| ND09U00683<br>ND09U00104<br>ND09U00154 | 68,000<br>100,000<br>150,000 | U             | 4840 (2)                                                 | - 5.3                   |
| NV09J00680<br>NV09J00101               | 68<br>100                    | J             | 3480 (1)                                                 | - 3.9                   |
| NV09K00151<br>NV09K00221               | 150<br>220                   | K             | 3630 (2)                                                 | - 4.0                   |
| NV09L00331                             | 330                          | L             | 3790 (2)                                                 | - 4.2                   |
| NV09M00471<br>NV09M00681               | 470<br>680                   | M             | 3950 (2)                                                 | - 4.4                   |
| NV09N00102<br>NV09N00152               | 1,000<br>1,500               | N             | 4080 (2)                                                 | - 4.6                   |
| NV09P00222<br>NV09P00332               | 2,200<br>3,300               | P             | 4220 (2)                                                 | - 4.7                   |
| NV09Q00472<br>NV09Q00682               | 4,700<br>6,800               | Q             | 4300 (2)                                                 | - 4.7                   |
| NV09R00103<br>NV09R00153               | 10,000<br>15,000             | R             | 4400 (2)                                                 | - 4.8                   |
| NV09S00223                             | 22,000                       | S             | 4520 (2)                                                 | - 5.0                   |
| NV09T00333<br>NV09T00473               | 33,000<br>47,000             | T             | 4630 (2)                                                 | - 5.1                   |
| NV09U00683<br>NV09U00104<br>NV09U00154 | 68,000<br>100,000<br>150,000 | U             | 4840 (2)                                                 | - 5.3                   |

## TABLE OF RESISTANCE: TEMPERATURE CHARACTERISTICS

| T<br>(°C) | Material code B (K) |        |          |             |        |          |             |        |          | T<br>(°C) |
|-----------|---------------------|--------|----------|-------------|--------|----------|-------------|--------|----------|-----------|
|           | I 3250              |        |          | J 3480      |        |          | K 3630      |        |          |           |
|           | R (T) / R25         | TF (%) | α (°/°C) | R (T) / R25 | TF (%) | α (°/°C) | R (T) / R25 | TF (%) | α (°/°C) |           |
| -55       | 42.35               | 21.9   | 5.98     | 51.74       | 34.1   | 6.43     | 56.26       | 35.6   | 6.46     | -55       |
| -50       | 31.48               | 20.0   | 5.78     | 37.97       | 29.5   | 6.21     | 41.21       | 30.8   | 6.26     | -50       |
| -45       | 23.63               | 18.1   | 5.59     | 28.15       | 25.3   | 6.01     | 30.47       | 26.4   | 6.06     | -45       |
| -40       | 17.91               | 16.3   | 5.41     | 21.07       | 21.7   | 5.81     | 22.73       | 22.6   | 5.88     | -40       |
| -35       | 13.70               | 14.6   | 5.23     | 15.91       | 18.4   | 5.62     | 17.11       | 19.2   | 5.70     | -35       |
| -30       | 10.58               | 13.1   | 5.06     | 12.13       | 15.5   | 5.44     | 12.98       | 16.2   | 5.53     | -30       |
| -25       | 8.232               | 11.6   | 4.90     | 9.320       | 12.9   | 5.26     | 9.930       | 13.5   | 5.36     | -25       |
| -20       | 6.460               | 10.1   | 4.74     | 7.221       | 10.7   | 5.10     | 7.654       | 11.2   | 5.21     | -20       |
| -15       | 5.110               | 8.8    | 4.59     | 5.640       | 8.7    | 4.94     | 5.945       | 9.1    | 5.05     | -15       |
| -10       | 4.072               | 7.5    | 4.45     | 4.438       | 7.0    | 4.78     | 4.650       | 7.3    | 4.91     | -10       |
| -5        | 3.268               | 6.3    | 4.31     | 3.517       | 5.4    | 4.64     | 3.663       | 5.7    | 4.76     | -5        |
| 0         | 2.641               | 5.1    | 4.18     | 2.807       | 4.1    | 4.50     | 2.905       | 4.3    | 4.63     | 0         |
| 5         | 2.148               | 4.0    | 4.05     | 2.255       | 3.0    | 4.36     | 2.319       | 3.1    | 4.50     | 5         |
| 10        | 1.759               | 2.9    | 3.92     | 1.824       | 2.0    | 4.23     | 1.862       | 2.1    | 4.37     | 10        |
| 15        | 1.449               | 1.9    | 3.81     | 1.484       | 1.2    | 4.10     | 1.505       | 1.3    | 4.25     | 15        |
| 20        | 1.200               | 0.9    | 3.69     | 1.215       | .5     | 3.98     | 1.223       | .6     | 4.13     | 20        |
| 25        | 1.000               | 0.0    | 3.58     | 1.0000      | 0.0    | 3.87     | 1.0000      | 0.0    | 4.01     | 25        |
| 30        | 0.8377              | 0.9    | 3.48     | .8278       | .5     | 3.76     | .8219       | .6     | 3.90     | 30        |
| 35        | 0.7054              | 1.8    | 3.38     | .6889       | 1.1    | 3.65     | .6792       | 1.2    | 3.80     | 35        |
| 40        | 0.5969              | 2.6    | 3.28     | .5763       | 1.8    | 3.55     | .5641       | 1.9    | 3.69     | 40        |
| 45        | 0.5076              | 3.5    | 3.19     | .4845       | 2.5    | 3.45     | .4708       | 2.6    | 3.59     | 45        |
| 50        | 0.4336              | 4.3    | 3.10     | .4092       | 3.3    | 3.35     | .3949       | 3.4    | 3.50     | 50        |
| 55        | 0.3720              | 5.1    | 3.01     | .3473       | 4.1    | 3.26     | .3327       | 4.3    | 3.41     | 55        |
| 60        | 0.3206              | 5.9    | 2.93     | .2960       | 5.0    | 3.17     | .2816       | 5.2    | 3.32     | 60        |
| 65        | 0.2774              | 6.6    | 2.85     | .2534       | 5.9    | 3.09     | .2393       | 6.1    | 3.23     | 65        |
| 70        | 0.2410              | 7.4    | 2.77     | .2178       | 6.8    | 3.01     | .2043       | 7.1    | 3.14     | 70        |
| 75        | 0.2102              | 8.1    | 2.70     | .1879       | 7.8    | 2.93     | .1751       | 8.1    | 3.06     | 75        |
| 80        | 0.1839              | 8.8    | 2.63     | .1628       | 8.8    | 2.85     | .1507       | 9.1    | 2.99     | 80        |
| 85        | 0.1616              | 9.5    | 2.56     | .1415       | 9.8    | 2.78     | .1301       | 10.2   | 2.91     | 85        |
| 90        | 0.1424              | 10.2   | 2.49     | .1235       | 10.8   | 2.70     | .1128       | 11.3   | 2.84     | 90        |
| 95        | 0.1259              | 10.9   | 2.43     | .1081       | 11.8   | 2.64     | .09812      | 12.4   | 2.77     | 95        |
| 100       | 0.1117              | 11.5   | 2.36     | .09500      | 12.9   | 2.57     | .08565      | 13.5   | 2.70     | 100       |
| 105       | 0.09938             | 12.2   | 2.30     | .08373      | 14.0   | 2.50     | .07502      | 14.6   | 2.63     | 105       |
| 110       | 0.08869             | 12.8   | 2.25     | .07403      | 15.0   | 2.44     | .06592      | 15.7   | 2.57     | 110       |
| 115       | 0.07938             | 13.4   | 2.19     | .06565      | 16.1   | 2.38     | .05810      | 16.8   | 2.50     | 115       |
| 120       | 0.07124             | 14.0   | 2.14     | .05838      | 17.2   | 2.33     | .05137      | 18.0   | 2.44     | 120       |
| 125       | 0.06410             | 14.6   | 2.08     | .05207      | 18.3   | 2.27     | .04555      | 19.1   | 2.39     | 125       |
| 130       | 0.05783             | 15.2   | 2.03     | .04567      | 19.4   | 2.22     | .04050      | 20.3   | 2.33     | 130       |
| 135       | 0.05230             | 15.7   | 1.98     | .04175      | 20.5   | 2.16     | .03611      | 21.4   | 2.27     | 135       |
| 140       | 0.04741             | 16.3   | 1.94     | .03753      | 21.6   | 2.11     | .03229      | 22.5   | 2.22     | 140       |
| 145       | 0.04308             | 16.8   | 1.89     | .03382      | 22.7   | 2.06     | .02894      | 23.7   | 2.17     | 145       |
| 150       | 0.03924             | 17.4   | 1.85     | .03055      | 23.8   | 2.02     | .02600      | 24.9   | 2.12     | 150       |

| T<br>(°C) | Material code B (K) |        |          |             |        |          |             |        |          | T<br>(°C) |
|-----------|---------------------|--------|----------|-------------|--------|----------|-------------|--------|----------|-----------|
|           | L 3790              |        |          | M 3950      |        |          | N 4080      |        |          |           |
|           | R (T) / R25         | TF (%) | α (°/°C) | R (T) / R25 | TF (%) | α (°/°C) | R (T) / R25 | TF (%) | α (°/°C) |           |
| -55       | 82.52               | 22.3   | 7.38     | 99.56       | 23.2   | 7.71     | 110.1       | 24.0   | 7.81     | -55       |
| -50       | 58.01               | 19.3   | 7.11     | 68.95       | 20.1   | 7.42     | 75.90       | 20.7   | 7.53     | -50       |
| -45       | 41.30               | 16.6   | 6.84     | 48.38       | 17.3   | 7.15     | 52.98       | 17.8   | 7.26     | -45       |
| -40       | 29.75               | 14.2   | 6.60     | 34.37       | 14.8   | 6.89     | 37.43       | 15.2   | 7.01     | -40       |
| -35       | 21.67               | 12.0   | 6.36     | 24.71       | 12.5   | 6.64     | 26.75       | 12.9   | 6.77     | -35       |
| -30       | 15.96               | 10.1   | 6.13     | 17.96       | 10.6   | 6.41     | 19.33       | 10.9   | 6.54     | -30       |
| -25       | 11.88               | 8.5    | 5.92     | 13.20       | 8.8    | 6.18     | 14.12       | 9.1    | 6.32     | -25       |
| -20       | 8.930               | 7.0    | 5.72     | 9.803       | 7.3    | 5.97     | 10.41       | 7.5    | 6.10     | -20       |
| -15       | 6.776               | 5.7    | 5.32     | 7.351       | 5.9    | 5.77     | 7.758       | 6.1    | 5.90     | -15       |
| -10       | 5.188               | 4.5    | 5.34     | 5.585       | 4.7    | 5.57     | 5.834       | 4.9    | 5.71     | -10       |
| -5        | 4.007               | 3.6    | 5.16     | 4.251       | 3.7    | 5.39     | 4.426       | 3.8    | 5.53     | -5        |
| 0         | 3.120               | 2.7    | 4.99     | 3.275       | 2.8    | 5.21     | 3.387       | 2.9    | 5.35     | 0         |
| 5         | 2.449               | 2.0    | 4.83     | 2.544       | 2.0    | 5.04     | 2.614       | 2.1    | 5.18     | 5         |
| 10        | 1.937               | 1.3    | 4.68     | 1.992       | 1.4    | 4.88     | 2.033       | 1.4    | 5.02     | 10        |
| 15        | 1.543               | .8     | 4.53     | 1.572       | .8     | 4.73     | 1.593       | .9     | 4.87     | 15        |
| 20        | 1.238               | .4     | 4.39     | 1.249       | .4     | 4.58     | 1.258       | .4     | 4.72     | 20        |
| 25        | 1.0000              | 0.0    | 4.25     | 1.0000      | 0.0    | 4.44     | 1.0000      | 0.0    | 4.57     | 25        |
| 30        | .8129               | .3     | 4.12     | .8057       | .4     | 4.30     | .8004       | .4     | 4.44     | 30        |
| 35        | .6648               | .7     | 4.00     | .6534       | .8     | 4.17     | .6448       | .8     | 4.31     | 35        |
| 40        | .5409               | 1.2    | 3.88     | .5331       | 1.2    | 4.05     | .5228       | 1.3    | 4.18     | 40        |
| 45        | .4525               | 1.6    | 3.77     | .4376       | 1.7    | 3.93     | .4264       | 1.8    | 4.06     | 45        |
| 50        | .3765               | 2.2    | 3.66     | .3612       | 2.2    | 3.81     | .3497       | 2.3    | 3.94     | 50        |
| 55        | .3148               | 2.7    | 3.55     | .2998       | 2.8    | 3.71     | .2885       | 2.9    | 3.83     | 55        |
| 60        | .2646               | 3.3    | 3.45     | .2501       | 3.4    | 3.60     | .2392       | 3.5    | 3.72     | 60        |
| 65        | .2235               | 3.8    | 3.36     | .2097       | 4.0    | 3.50     | .1994       | 4.1    | 3.62     | 65        |
| 70        | .1896               | 4.5    | 3.26     | .1767       | 4.6    | 3.40     | .1671       | 4.8    | 3.52     | 70        |
| 75        | .1616               | 5.1    | 3.17     | .1496       | 5.3    | 3.31     | .1406       | 5.5    | 3.42     | 75        |
| 80        | .1383               | 5.7    | 3.09     | .1272       | 6.0    | 3.22     | .1189       | 6.2    | 3.33     | 80        |
| 85        | .1189               | 6.4    | 3.00     | .1087       | 6.7    | 3.13     | .1010       | 6.9    | 3.24     | 85        |
| 90        | .1026               | 7.1    | 2.92     | .09321      | 7.4    | 3.05     | .08617      | 7.6    | 3.16     | 90        |
| 95        | .08889              | 7.7    | 2.85     | .08027      | 8.1    | 2.97     | .07381      | 8.3    | 3.07     | 95        |
| 100       | .07729              | 8.4    | 2.77     | .06939      | 8.8    | 2.89     | .06347      | 9.1    | 2.99     | 100       |
| 105       | .06745              | 9.1    | 2.70     | .06020      | 9.5    | 2.82     | .05480      | 9.8    | 2.92     | 105       |
| 110       | .05906              | 9.8    | 2.63     | .05243      | 10.2   | 2.75     | .04148      | 10.6   | 2.84     | 110       |
| 115       | .05189              | 10.5   | 2.57     | .04581      | 11.0   | 2.68     | .04129      | 11.3   | 2.77     | 115       |
| 120       | .04573              | 11.3   | 2.50     | .04017      | 11.7   | 2.61     | .03603      | 12.1   | 2.70     | 120       |
| 125       | .04043              | 12.0   | 2.44     | .03533      | 12.5   | 2.55     | .03155      | 12.9   | 2.64     | 125       |
| 130       | .03585              | 12.7   | 2.38     | .03117      | 13.2   | 2.48     | .02771      | 13.7   | 2.57     | 130       |
| 135       | .03188              | 13.4   | 2.33     | .02759      | 14.0   | 2.42     | .02442      | 14.4   | 2.51     | 135       |
| 140       | .02843              | 14.1   | 2.27     | .02449      | 14.7   | 2.37     | .02158      | 15.2   | 2.45     | 140       |
| 145       | .02543              | 14.8   | 2.22     | .02180      | 15.5   | 2.31     | .01913      | 16.0   | 2.39     | 145       |
| 150       | .02279              | 15.6   | 2.17     | .01945      | 16.2   | 2.26     | .01700      | 16.8   | 2.34     | 150       |

## TABLE OF RESISTANCE: TEMPERATURE CHARACTERISTICS

| T<br>(°C) | Material code B (K) |        |          |             |        |          |             |        |          | T<br>(°C) |
|-----------|---------------------|--------|----------|-------------|--------|----------|-------------|--------|----------|-----------|
|           | P 4220              |        |          | Q 4300      |        |          | R 4400      |        |          |           |
|           | R (T) / R25         | TF (%) | α (%/°C) | R (T) / R25 | TF (%) | α (%/°C) | R (T) / R25 | TF (%) | α (%/°C) |           |
| -55       | 121.3               | 24.8   | 7.88     | 98.02       | 25.5   | 7.14     | 113.9       | 25.9   | 7.42     | -55       |
| -50       | 83.32               | 21.4   | 7.61     | 69.51       | 22.0   | 6.95     | 79.69       | 22.4   | 7.22     | -50       |
| -45       | 57.91               | 18.4   | 7.36     | 49.72       | 18.9   | 6.77     | 56.29       | 19.2   | 7.03     | -45       |
| -40       | 40.71               | 15.8   | 7.11     | 35.86       | 16.2   | 6.59     | 40.12       | 16.4   | 6.84     | -40       |
| -35       | 28.95               | 13.4   | 6.88     | 26.08       | 13.7   | 6.42     | 28.85       | 14.0   | 6.66     | -35       |
| -30       | 20.80               | 11.3   | 6.66     | 19.12       | 11.6   | 6.26     | 20.92       | 11.8   | 6.48     | -30       |
| -25       | 15.10               | 9.4    | 6.44     | 14.12       | 9.7    | 6.10     | 15.29       | 9.8    | 6.31     | -25       |
| -20       | 11.07               | 7.8    | 6.24     | 10.51       | 8.0    | 5.94     | 11.27       | 8.1    | 6.14     | -20       |
| -15       | 8.196               | 6.3    | 6.04     | 7.876       | 6.5    | 5.79     | 8.367       | 6.6    | 5.98     | -15       |
| -10       | 6.123               | 5.1    | 5.85     | 5.946       | 5.2    | 5.64     | 6.260       | 5.3    | 5.83     | -10       |
| -5        | 4.615               | 4.0    | 5.67     | 4.520       | 4.1    | 5.50     | 4.719       | 4.1    | 5.67     | -5        |
| 0         | 3.507               | 3.0    | 5.49     | 3.460       | 3.1    | 5.36     | 3.583       | 3.1    | 5.53     | 0         |
| 5         | 2.688               | 2.2    | 5.33     | 2.666       | 2.2    | 5.23     | 2.739       | 2.3    | 5.38     | 5         |
| 10        | 2.078               | 1.5    | 5.16     | 2.067       | 1.5    | 5.09     | 2.108       | 1.5    | 5.24     | 10        |
| 15        | 1.616               | .9     | 5.01     | 1.613       | .9     | 4.96     | 1.634       | .9     | 5.11     | 15        |
| 20        | 1.267               | .4     | 4.86     | 1.266       | .4     | 4.84     | 1.274       | .4     | 4.97     | 20        |
| 25        | 1.0000              | 0.0    | 4.72     | 1.0000      | 0.0    | 4.72     | 1.0000      | 0.0    | 4.84     | 25        |
| 30        | .7949               | .4     | 4.58     | .7944       | .4     | 4.60     | .7897       | .4     | 4.72     | 30        |
| 35        | .6360               | .8     | 4.45     | .6347       | .8     | 4.48     | .6273       | .9     | 4.60     | 35        |
| 40        | .5120               | 1.3    | 4.32     | .5099       | 1.3    | 4.37     | .5012       | 1.4    | 4.48     | 40        |
| 45        | .4148               | 1.8    | 4.20     | .4119       | 1.9    | 4.26     | .4026       | 1.9    | 4.36     | 45        |
| 50        | .3380               | 2.4    | 4.06     | .3345       | 2.5    | 4.15     | .3255       | 2.5    | 4.25     | 50        |
| 55        | .2769               | 3.0    | 3.96     | .2730       | 3.1    | 4.05     | .2644       | 3.1    | 4.14     | 55        |
| 60        | .2282               | 3.6    | 3.86     | .2239       | 3.7    | 3.95     | .2159       | 3.8    | 4.04     | 60        |
| 65        | .1890               | 4.3    | 3.75     | .1846       | 4.4    | 3.85     | .1772       | 4.5    | 3.03     | 65        |
| 70        | .1573               | 5.0    | 3.65     | .1529       | 5.1    | 3.75     | .1462       | 5.2    | 3.83     | 70        |
| 75        | .1316               | 5.7    | 3.55     | .1272       | 5.8    | 3.66     | .1212       | 5.9    | 3.74     | 75        |
| 80        | .1106               | 6.4    | 3.45     | .1063       | 6.5    | 3.57     | .1009       | 6.7    | 3.64     | 80        |
| 85        | .09338              | 7.1    | 3.36     | .08928      | 7.3    | 3.48     | .08441      | 7.4    | 3.55     | 85        |
| 90        | .07919              | 7.9    | 3.28     | .07527      | 8.1    | 3.39     | .07093      | 8.2    | 3.46     | 90        |
| 95        | .06744              | 8.6    | 3.19     | .06373      | 8.8    | 3.31     | .05985      | 9.0    | 3.38     | 95        |
| 100       | .05767              | 9.4    | 3.11     | .05417      | 9.6    | 3.23     | .05072      | 9.8    | 3.29     | 100       |
| 105       | .04951              | 10.2   | 3.03     | .04623      | 10.4   | 3.15     | .04315      | 10.6   | 3.21     | 105       |
| 110       | .04267              | 10.9   | 2.95     | .03961      | 11.2   | 3.07     | .03686      | 11.4   | 3.13     | 110       |
| 115       | .03691              | 11.7   | 2.88     | .03405      | 12.0   | 3.00     | .03160      | 12.2   | 3.06     | 115       |
| 120       | .03204              | 12.5   | 2.81     | .02939      | 12.9   | 2.93     | .02720      | 13.1   | 2.98     | 120       |
| 125       | .02791              | 13.3   | 2.74     | .02545      | 13.7   | 2.86     | .02349      | 13.9   | 2.91     | 125       |
| 130       | .02440              | 14.1   | 2.67     | .02211      | 14.5   | 2.79     | .02036      | 14.7   | 2.84     | 130       |
| 135       | .02139              | 14.9   | 2.61     | .01928      | 15.3   | 2.72     | .01771      | 15.6   | 2.77     | 135       |
| 140       | .01882              | 15.7   | 2.55     | .01686      | 16.1   | 2.66     | .01545      | 16.4   | 2.71     | 140       |
| 145       | .01660              | 16.5   | 2.49     | .01479      | 17.0   | 2.60     | .01353      | 17.2   | 2.64     | 145       |
| 150       | .01469              | 17.3   | 2.43     | .01302      | 17.8   | 2.54     | .01188      | 18.1   | 2.58     | 150       |

| T<br>(°C) | Material code B (K) |        |          |             |        |          |             |        |          | T<br>(°C) |
|-----------|---------------------|--------|----------|-------------|--------|----------|-------------|--------|----------|-----------|
|           | S 4520              |        |          | T 4630      |        |          | U 4840      |        |          |           |
|           | R (T) / R25         | TF (%) | α (°/°C) | R (T) / R25 | TF (%) | α (°/°C) | R (T) / R25 | TF (%) | α (°/°C) |           |
| - 55      | 126.1               | 26.6   | 7.55     | 137.0       | 27.2   | 7.64     | 173.7       | 28.5   | 8.04     | - 55      |
| - 50      | 87.73               | 23.0   | 7.35     | 94.92       | 23.5   | 7.45     | 118.2       | 24.6   | 7.83     | - 50      |
| - 45      | 61.59               | 19.8   | 7.16     | 66.34       | 20.2   | 7.26     | 81.16       | 21.2   | 7.63     | - 45      |
| - 40      | 43.62               | 16.9   | 6.97     | 46.77       | 17.3   | 7.09     | 56.25       | 18.1   | 7.44     | - 40      |
| - 35      | 31.17               | 14.3   | 6.79     | 33.25       | 14.7   | 6.90     | 39.33       | 15.4   | 7.25     | - 35      |
| - 30      | 22.45               | 12.1   | 6.62     | 23.83       | 12.4   | 6.72     | 27.74       | 12.9   | 7.07     | - 30      |
| - 25      | 16.31               | 10.1   | 6.45     | 17.22       | 10.3   | 6.56     | 19.73       | 10.8   | 6.89     | - 25      |
| - 20      | 11.94               | 8.3    | 6.28     | 12.54       | 8.5    | 6.39     | 14.15       | 8.9    | 6.71     | - 20      |
| - 15      | 8.808               | 6.8    | 6.12     | 9.205       | 6.9    | 6.23     | 10.23       | 7.3    | 6.54     | - 15      |
| - 10      | 6.548               | 5.4    | 5.96     | 6.806       | 5.6    | 6.08     | 7.456       | 5.8    | 6.38     | - 10      |
| - 5       | 4.904               | 4.2    | 5.81     | 5.069       | 4.3    | 5.92     | 5.475       | 4.5    | 6.22     | - 5       |
| 0         | 3.699               | 3.2    | 5.66     | 3.803       | 3.3    | 5.78     | 4.051       | 3.4    | 6.06     | 0         |
| 5         | 2.810               | 2.3    | 5.52     | 2.873       | 2.4    | 5.63     | 3.019       | 2.5    | 5.91     | 5         |
| 10        | 2.149               | 1.6    | 5.38     | 2.185       | 1.6    | 5.49     | 2.267       | 1.7    | 5.76     | 10        |
| 15        | 1.654               | 1.0    | 5.24     | 1.673       | 1.0    | 5.35     | 1.714       | 1.0    | 5.61     | 15        |
| 20        | 1.282               | .4     | 5.10     | 1.289       | .4     | 5.22     | 1.305       | .5     | 5.47     | 20        |
| 25        | 1.0000              | 0.0    | 4.97     | 1.0000      | 0.0    | 5.09     | 1.0000      | 0.0    | 5.33     | 25        |
| 30        | .7848               | .4     | 4.85     | .7805       | .4     | 4.96     | .7715       | .4     | 5.20     | 30        |
| 35        | .6196               | .9     | 4.72     | .6129       | .9     | 4.83     | .5991       | .9     | 5.06     | 35        |
| 40        | .4922               | 1.4    | 4.60     | .4842       | 1.4    | 4.71     | .4681       | 1.5    | 4.94     | 40        |
| 45        | .3932               | 2.0    | 4.48     | .3847       | 2.0    | 4.59     | .3681       | 2.1    | 4.81     | 45        |
| 50        | .3158               | 2.6    | 4.37     | .3074       | 2.6    | 4.48     | .2911       | 2.8    | 4.69     | 50        |
| 55        | .2551               | 3.2    | 4.26     | .2470       | 3.3    | 4.37     | .2316       | 3.4    | 4.57     | 55        |
| 60        | .2072               | 3.9    | 4.15     | .1996       | 4.0    | 4.26     | .1853       | 4.2    | 4.45     | 60        |
| 65        | .1691               | 4.6    | 4.05     | .1621       | 4.7    | 4.15     | .1491       | 4.9    | 4.34     | 65        |
| 70        | .1387               | 5.3    | 3.94     | .1323       | 5.4    | 4.04     | .1207       | 5.7    | 4.23     | 70        |
| 75        | .1144               | 6.1    | 3.84     | .1086       | 6.2    | 3.94     | .09813      | 6.5    | 4.12     | 75        |
| 80        | .09477              | 6.8    | 3.75     | .08953      | 7.0    | 3.84     | .08023      | 7.3    | 4.02     | 80        |
| 85        | .07888              | 7.6    | 3.65     | .07417      | 7.8    | 3.75     | .06592      | 8.2    | 3.91     | 85        |
| 90        | .06595              | 8.4    | 3.56     | .06173      | 8.6    | 3.65     | .05443      | 9.0    | 3.82     | 90        |
| 95        | .05539              | 9.2    | 3.47     | .05161      | 9.5    | 3.56     | .04515      | 9.9    | 3.72     | 95        |
| 100       | .04671              | 10.1   | 3.39     | .04334      | 10.3   | 3.47     | .03763      | 10.8   | 3.63     | 100       |
| 105       | .03956              | 10.9   | 3.30     | .03655      | 11.2   | 3.39     | .03151      | 11.7   | 3.54     | 105       |
| 110       | .03364              | 11.7   | 3.22     | .03095      | 12.0   | 3.31     | .02650      | 12.6   | 3.45     | 110       |
| 115       | .02872              | 12.6   | 3.14     | .02632      | 12.9   | 3.22     | .02237      | 13.5   | 3.38     | 115       |
| 120       | .02461              | 13.4   | 3.07     | .02247      | 13.7   | 3.15     | .01897      | 14.4   | 3.28     | 120       |
| 125       | .02117              | 14.3   | 2.99     | .01925      | 14.6   | 3.07     | .01615      | 15.3   | 3.20     | 125       |
| 130       | .01828              | 15.1   | 2.92     | .01656      | 15.5   | 2.99     | .01381      | 16.2   | 3.12     | 130       |
| 135       | .01584              | 16.0   | 2.85     | .01429      | 16.4   | 2.92     | .01185      | 17.1   | 3.04     | 135       |
| 140       | .01376              | 16.8   | 2.78     | .01238      | 17.3   | 2.85     | .01020      | 18.0   | 2.97     | 140       |
| 145       | .01201              | 17.7   | 2.72     | .01076      | 18.1   | 2.78     | .00882      | 19.0   | 2.90     | 145       |
| 150       | .01050              | 18.6   | 2.65     | .00938      | 19.0   | 2.72     | .00765      | 19.9   | 2.83     | 150       |

# NTC Disc Thermistors

ND 03/06/09 • NV 06/09



## PACKAGING

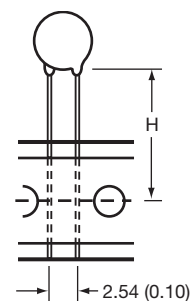
### • Reel & Ammopack

millimeters (inches)

| Types          | Suffix | H or Ho                                 | Leads    | Quantity/Size | Packaging |
|----------------|--------|-----------------------------------------|----------|---------------|-----------|
| ND03           | CA     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 3000          | AMMOPACK  |
|                | CB     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 3000          | REEL      |
|                | CC     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 3000          | AMMOPACK  |
|                | CD     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 3000          | REEL      |
| ND/NV<br>06/09 | DA     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 1500          | AMMOPACK  |
|                | DB     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Straight | 1500          | REEL      |
|                | DC     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 1500          | AMMOPACK  |
|                | DD     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Straight | 1500          | REEL      |
|                | DL     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Kinked   | 1500          | AMMOPACK  |
|                | DM     | $16 \pm 0.5$<br>( $0.630 \pm 0.020$ )   | Kinked   | 1500          | REEL      |
|                | DN     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Kinked   | 1500          | AMMOPACK  |
|                | DP     | $19.5 \pm 0.5$<br>( $0.768 \pm 0.020$ ) | Kinked   | 1500          | REEL      |

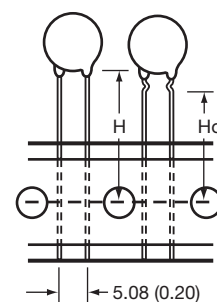
NTC

Type  
ND 03



NTC

Types  
ND  
NV  
06/09



### • Bulk

| Type | Quantity/box     |
|------|------------------|
| ND03 | 3000             |
| ND06 | 1500             |
| ND09 | 1500             |
| NV06 | According to P/N |
| NV09 | According to P/N |

## HOW TO ORDER

ND06



Type

P0



Material Code  
P

0103



Resistance  
10 kΩ

K



Tolerance  
K (±10%)

—



Packaging  
Bulk

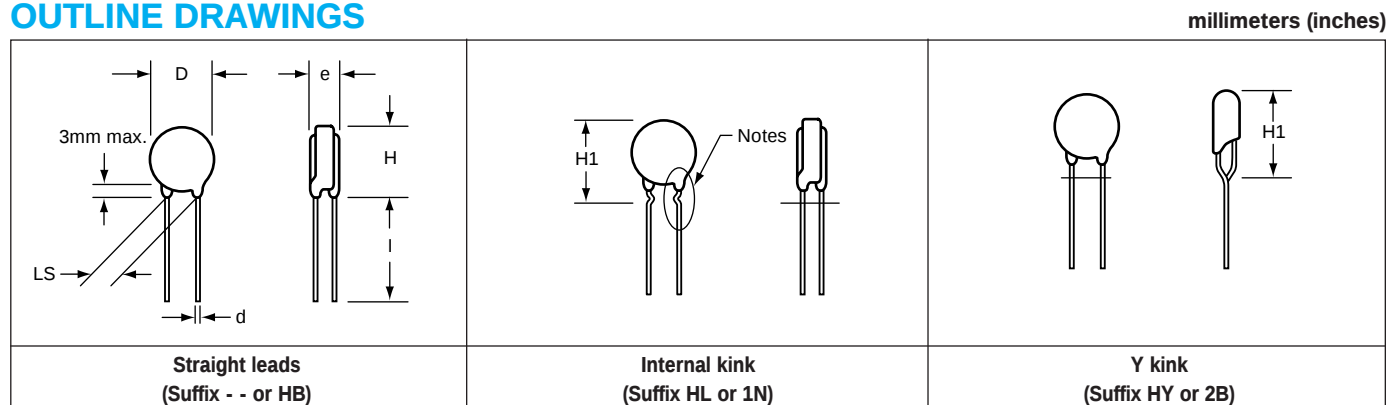
# NTC Inrush Current Limiters Thermistors



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<br>mm | e max<br>mm | H max<br>mm | H1 max<br>mm | l min<br>mm | d<br>±0.02 mm | LS<br>±0.8 mm |
|-------|-------------|-------------|-------------|--------------|-------------|---------------|---------------|
| 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) | 6.0 (.236)  | 25.0 (.984) | 29.0 (1.142) | 30 (1.181)  | 1.0 (.039)    | 7.62 (.30)    |

## GENERAL CHARACTERISTICS

| Type  | Standard<br>tolerance**<br>% | Maximum<br>operating<br>T°C | Max power<br>25°C<br>Watts | Thermal<br>dissipation<br>$\delta_{th}$ (mW/K) | Thermal time<br>constant<br>$\tau_c$ (s) | Heat<br>capacity<br>H (mJ/K) | Packing<br>bulk<br>✓ | Packing<br>tape<br>✓ |
|-------|------------------------------|-----------------------------|----------------------------|------------------------------------------------|------------------------------------------|------------------------------|----------------------|----------------------|
| 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 54-55)

|     |                                                                  |    |                                                          |
|-----|------------------------------------------------------------------|----|----------------------------------------------------------|
| - - | straight leads 0.8 or 1 mm wire diameter and 7.62 lead spacing   | 1N | internal kink 0.6 mm wire diameter and 5.08 lead spacing |
| HB  | straight leads 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   |
| HL  | internal kink 0.8 mm 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<br>ø (mm) | Part number<br>reference<br>T <sub>type</sub> | Zero power<br>resistance<br>R <sub>25°C</sub> (Ω) | Max steady<br>state current<br>I <sub>ss</sub> max 25°C (A) | Resistance<br>at max current<br>R <sub>iss</sub> 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                                                         | 0.10                                                     |
| *   |                        | 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                                                         | 0.10                                                     |
| *   |                        | 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                     | NF20AA0109M - -                               | 1.0                                               | 11.4                                                        | 0.04                                                     |
| *   |                        | 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                                                     |

\* cL/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

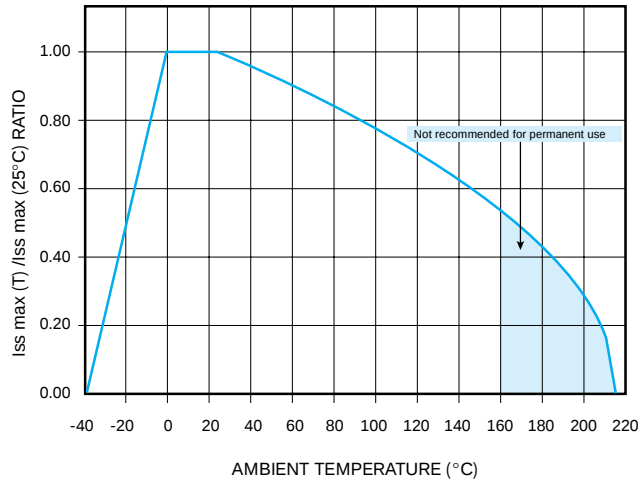
### Application Guide

#### 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 27.
- 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

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

- From the graph  $V(I)$  page 29, we find  $V_{SS} = 2.2 \text{ V}$  therefore,  $R_{SS} = 11 \Omega$
- From the graph  $R(T)$ , page 29, at  $R = 11 \Omega$ , we find  $T \pm 65^\circ\text{C}$

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

Example: NF13AA0100M

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

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

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

- 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,  $\delta = 16 \text{ mW/K}$  (see page 26)

therefore, the equation becomes:

$$T = 562.5 R_T + 60$$

from the  $R_T$  curve page 30 we find  $R_T$  starting from  $T$ :

| $T (^\circ\text{C})$ | $R_T (\Omega)$ | $\geq$ | $562.5 R_T + 60 (^\circ\text{C})$ |
|----------------------|----------------|--------|-----------------------------------|
| 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  $I_{SS} = 3 \text{ A}$  and  $T_A = 60^\circ\text{C}$  (this temperature is the one for which we have  $T = 562.5 R_T + 60$ ).

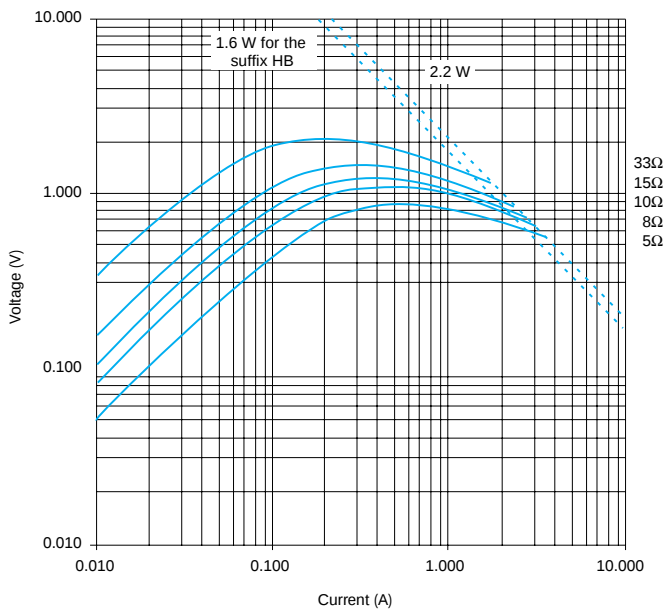
**Important:** A discrepancy may exist between practice and theory due to the tolerance of the thermistor ( $\pm 20\%$  usually).

# NTC Inrush Current Limiters Thermistors

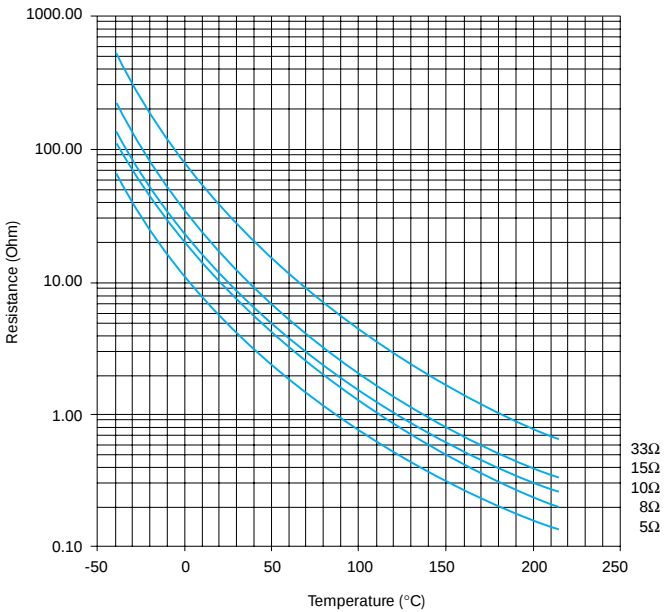


## Voltage-Current and Resistance-Temperature Characteristics

### TYPICAL VOLTAGE/CURRENT CHARACTERISTICS FOR TYPE NF08



### TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTICS FOR TYPE NF08

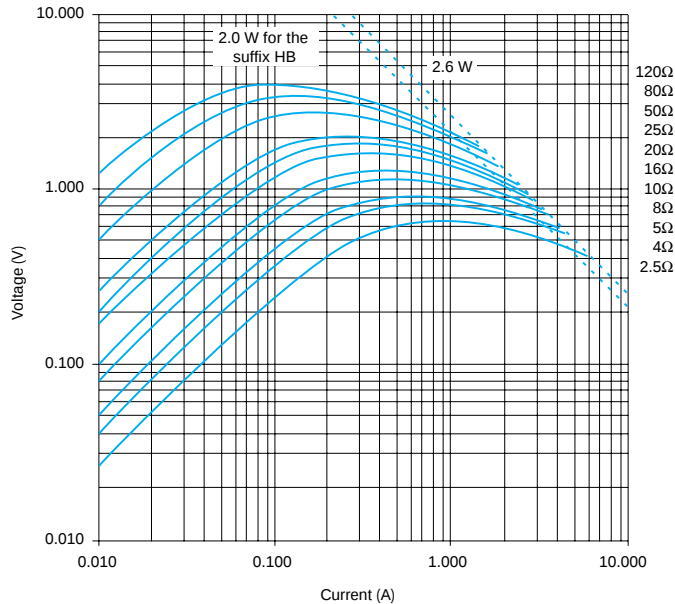


# NTC Inrush Current Limiters Thermistors

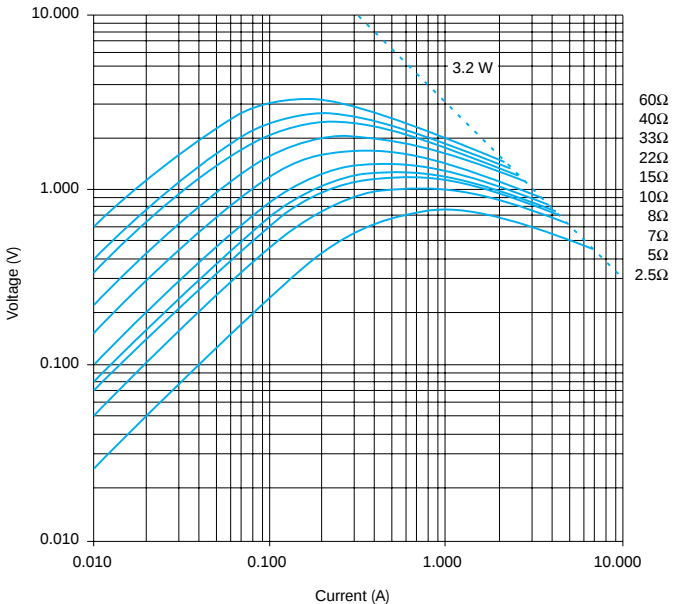


## Voltage-Current and Resistance-Temperature Characteristics

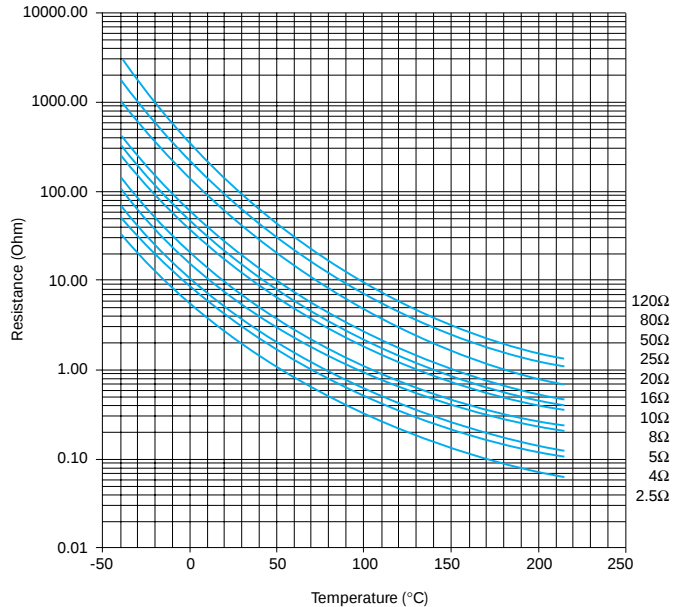
**TYPICAL VOLTAGE/CURRENT  
CHARACTERISTICS FOR TYPE NF10**



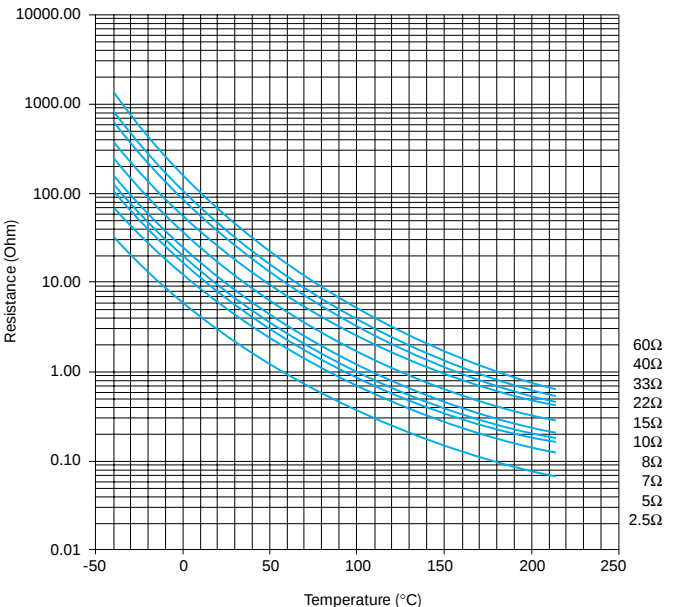
**TYPICAL VOLTAGE/CURRENT  
CHARACTERISTICS FOR TYPE NF13**



**TYPICAL RESISTANCE/TEMPERATURE  
CHARACTERISTICS FOR TYPE NF10**



**TYPICAL RESISTANCE/TEMPERATURE  
CHARACTERISTICS FOR TYPE NF13**

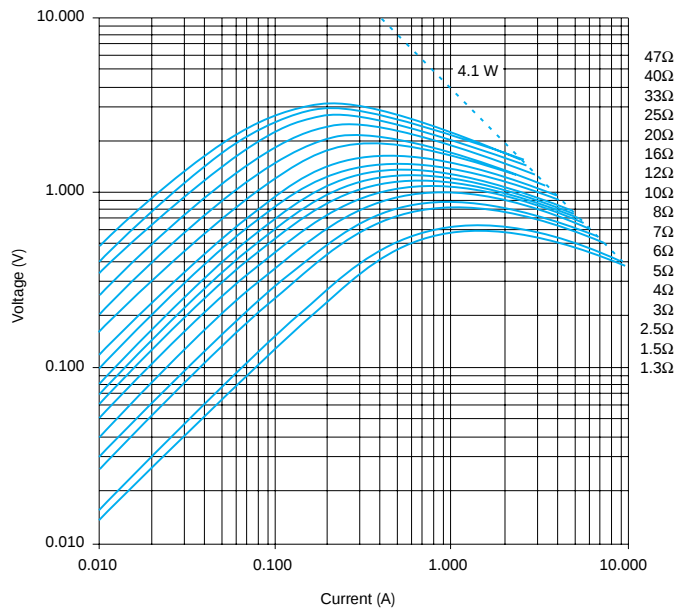


# NTC Inrush Current Limiters Thermistors

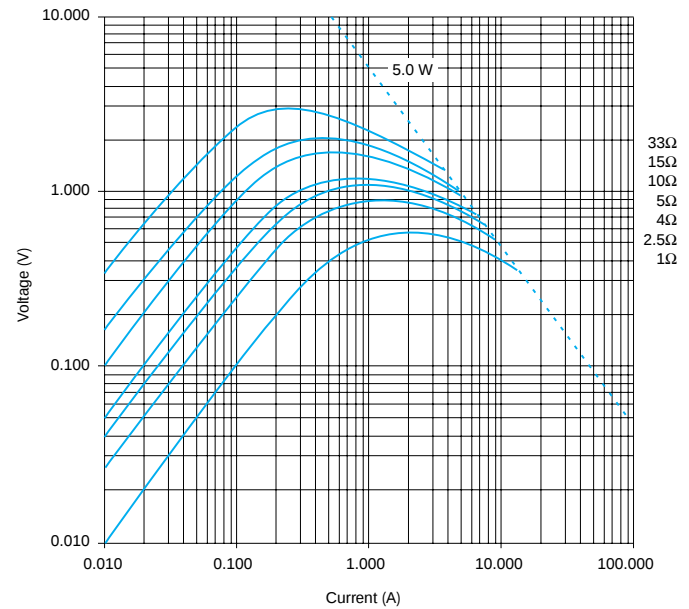


## Voltage-Current and Resistance-Temperature Characteristics

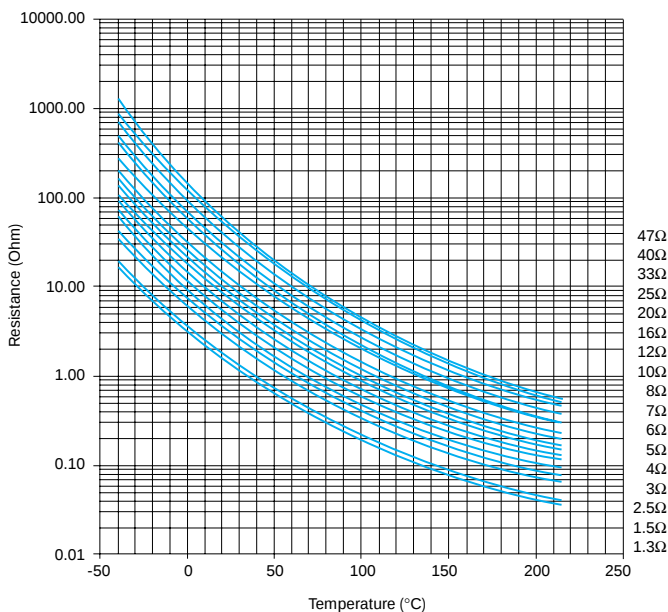
**TYPICAL VOLTAGE/CURRENT  
CHARACTERISTICS FOR TYPE NF15**



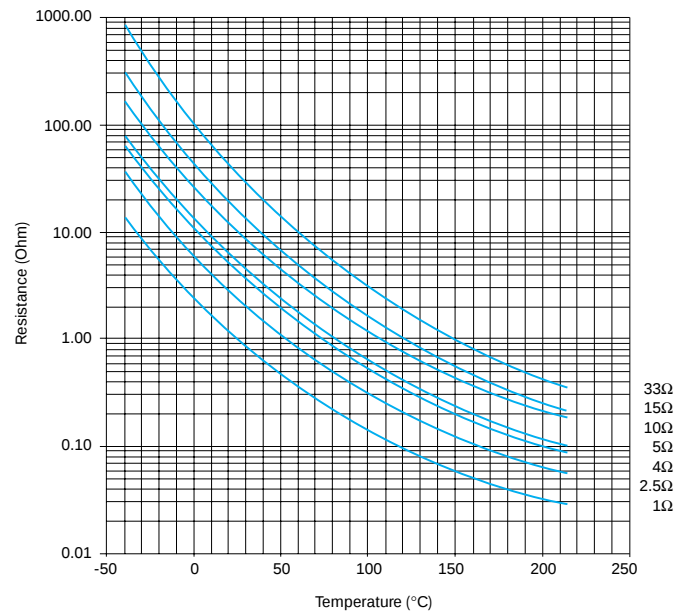
**TYPICAL VOLTAGE/CURRENT  
CHARACTERISTICS FOR TYPE NF20**



**TYPICAL RESISTANCE/TEMPERATURE  
CHARACTERISTICS FOR TYPE NF15**



**TYPICAL RESISTANCE/TEMPERATURE  
CHARACTERISTICS FOR TYPE NF20**



# NTC Accurate Leaded Thermistors

## NI24 • NJ28



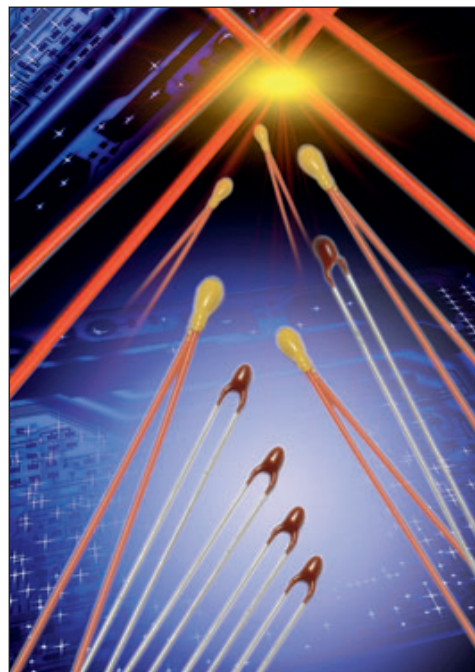
### APPLICATIONS

- High precision resistance
- Tight B tolerance
- Ideal for temperature measurement applications

### TECHNOLOGY

- NJ range: Coated chip (phenolic resin + varnish overcoat + bare leads)
- NI range: Coated chip (epoxy resin and insulated leads)
- Leads: Radial wire: NJ: tinned copper (\*)  
NI: PTFE insulated silvered nickel
- Marking: on package only
- Delivery Mode: Bulk for NI range  
Bulk or Reel or Ammopack for NJ range

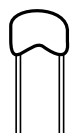
(\*) other materials available: consult us



#### Accuracy Series

NJ28

NI24



### PERFORMANCE CHARACTERISTICS

| Types                              | Accurate Thermistors |      |
|------------------------------------|----------------------|------|
|                                    | NJ28                 | NI24 |
| Operating Temperature              | -55 to +150°C        |      |
| Tolerance on R <sub>n</sub> (25°C) | ±1%, ±2%, ±3%        |      |
| Maximum dissipation at 25°C        | 0.16 W               |      |
| Thermal dissipation factor         | 3 mW/°C              |      |
| Thermal time constant              | 8 s                  |      |
| Response time                      | < 2 s                |      |

### HOW TO ORDER

NJ28

Type

MA

Material Code  
MA

0502

Resistance  
5 kΩ

F

Tolerance  
F (±1%)

--

Packaging  
Bulk

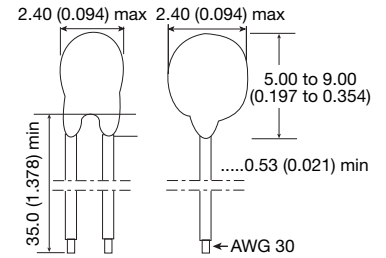
# NTC Accurate Leaded Thermistors

## NI24 • NJ28



### TABLE OF VALUES

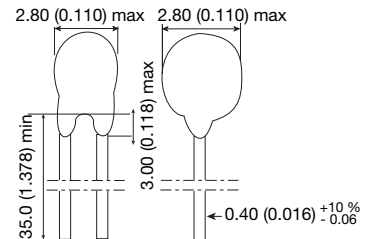
#### NI24



| Part Number | Rn at 25°C (Ω) | Material Code | B (K)      | α at 25°C (%/°C) |
|-------------|----------------|---------------|------------|------------------|
| NI24KA0202  | 2000           | KA            | 3625 ±1%   | -4.1             |
| NI24MA0302  | 3000           | MA            | 3960 ±0.5% | -4.5             |
| NI24MA0502  | 5000           | MA            | 3960 ±0.5% | -4.5             |
| NI24MA0103  | 10000          | MA            | 3960 ±0.5% | -4.5             |
| NI24NA0103  | 10000          | NA            | 4100 ±1%   | -4.6             |
| NI24PA0203  | 20000          | PA            | 4235 ±1%   | -4.8             |
| NI24QA0503  | 50000          | QA            | 4250 ±1%   | -4.8             |
| NI24RA0104  | 100000         | RA            | 4380 ±1%   | -4.9             |

### TABLE OF VALUES

#### NJ28



| Part Number | Rn at 25°C (Ω) | Material Code | B (K)      | α at 25°C (%/°C) |
|-------------|----------------|---------------|------------|------------------|
| NJ28KA0202  | 2000           | KA            | 3625 ±1%   | -4.1             |
| NJ28MA0302  | 3000           | MA            | 3960 ±0.5% | -4.5             |
| NJ28MA0502  | 5000           | MA            | 3960 ±0.5% | -4.5             |
| NJ28MA0103  | 5000           | MA            | 3960 ±0.5% | -4.5             |
| NJ28NA0103  | 10000          | NA            | 4100 ±1%   | -4.6             |
| NJ28PA0203  | 20000          | PA            | 4235 ±1%   | -4.8             |
| NJ28QA0503  | 50000          | QA            | 4250 ±1%   | -4.8             |
| NJ28RA0104  | 100000         | RA            | 4380 ±1%   | -4.9             |

# NTC Accurate Leaded Thermistors

## NI24 • NJ28



### TABLE OF RESISTANCE: TEMPERATURE CHARACTERISTICS

| T<br>(°C) | Material code B (K) |        |          |             |        |          |             |        |          | T<br>(°C) |
|-----------|---------------------|--------|----------|-------------|--------|----------|-------------|--------|----------|-----------|
|           | KA 3625             |        |          | MA 3960     |        |          | NA 4100     |        |          |           |
|           | R (T) / R25         | TF (%) | α (%/°C) | R (T) / R25 | TF (%) | α (%/°C) | R (T) / R25 | TF (%) | α (%/°C) |           |
| -55       | 61.21               | 7.1    | 6.77     | 104.2       | 3.9    | 7.89     | 109.5       | 8.0    | 7.83     | -55       |
| -50       | 44.24               | 6.1    | 6.53     | 71.63       | 3.4    | 7.57     | 75.42       | 6.9    | 7.54     | -50       |
| -45       | 32.33               | 5.3    | 6.30     | 49.94       | 2.9    | 7.28     | 52.63       | 6.0    | 7.27     | -45       |
| -40       | 23.88               | 4.5    | 6.08     | 35.28       | 2.5    | 7.00     | 37.18       | 5.1    | 7.01     | -40       |
| -35       | 17.81               | 3.8    | 5.88     | 25.25       | 2.1    | 6.73     | 26.58       | 4.3    | 6.76     | -35       |
| -30       | 13.41               | 3.2    | 5.68     | 18.28       | 1.8    | 6.48     | 19.22       | 3.7    | 6.52     | -30       |
| -25       | 10.19               | 2.7    | 5.49     | 13.39       | 1.5    | 6.25     | 14.04       | 3.1    | 6.30     | -25       |
| -20       | 7.814               | 2.2    | 5.31     | 9.917       | 1.2    | 6.02     | 10.37       | 2.5    | 6.09     | -20       |
| -15       | 6.040               | 1.8    | 5.14     | 7.419       | 1.0    | 5.81     | 7.730       | 2.1    | 5.89     | -15       |
| -10       | 4.707               | 1.5    | 4.98     | 5.605       | .8     | 5.61     | 5.817       | 1.6    | 5.70     | -10       |
| -5        | 3.696               | 1.1    | 4.83     | 4.275       | .6     | 5.42     | 4.416       | 1.3    | 5.51     | -5        |
| 0         | 2.923               | .9     | 4.68     | 3.289       | .5     | 5.24     | 3.382       | 1.0    | 5.34     | 0         |
| 5         | 2.329               | .6     | 4.53     | 2.552       | .3     | 5.06     | 2.611       | .7     | 5.17     | 5         |
| 10        | 1.867               | .4     | 4.40     | 1.997       | .2     | 4.90     | 2.032       | .5     | 5.01     | 10        |
| 15        | 1.507               | .3     | 4.27     | 1.574       | .1     | 4.74     | 1.593       | .3     | 4.86     | 15        |
| 20        | 1.224               | .1     | 4.14     | 1.250       | .1     | 4.59     | 1.258       | .1     | 4.71     | 20        |
| 25        | 1.0000              | 0.0    | 4.02     | 1.0000      | 0.0    | 4.45     | 1.0000      | 0.0    | 4.57     | 25        |
| 30        | .8217               | .1     | 3.91     | .8053       | .1     | 4.31     | .8004       | .1     | 4.44     | 30        |
| 35        | .6788               | .2     | 3.80     | .6527       | .1     | 4.18     | .6446       | .3     | 4.31     | 35        |
| 40        | .5638               | .4     | 3.69     | .5323       | .2     | 4.06     | .5224       | .4     | 4.19     | 40        |
| 45        | .4707               | .5     | 3.59     | .4367       | .3     | 3.94     | .4258       | .6     | 4.07     | 45        |
| 50        | .3948               | .7     | 3.49     | .3604       | .4     | 3.82     | .3491       | .8     | 3.96     | 50        |
| 55        | .3328               | .9     | 3.40     | .2990       | .5     | 3.71     | .2877       | 1.0    | 3.85     | 55        |
| 60        | .2818               | 1.0    | 3.31     | .2493       | .6     | 3.61     | .2383       | 1.2    | 3.74     | 60        |
| 65        | .2396               | 1.2    | 3.22     | .2090       | .7     | 3.51     | .1984       | 1.4    | 3.64     | 65        |
| 70        | .2046               | 1.4    | 3.14     | .1760       | .8     | 3.41     | .1660       | 1.6    | 3.55     | 70        |
| 75        | .1754               | 1.6    | 3.06     | .1489       | .9     | 3.32     | .1396       | 1.8    | 3.45     | 75        |
| 80        | .1510               | 1.8    | 2.98     | .1266       | 1.0    | 3.23     | .1178       | 2.1    | 3.36     | 80        |
| 85        | .1305               | 2.0    | 2.90     | .1081       | 1.1    | 3.14     | .09991      | 2.3    | 3.28     | 85        |
| 90        | .1131               | 2.3    | 2.83     | .09262      | 1.2    | 3.06     | .08507      | 2.5    | 3.20     | 90        |
| 95        | .09846              | 2.5    | 2.76     | .07970      | 1.3    | 2.98     | .07273      | 2.8    | 3.12     | 95        |
| 100       | .08597              | 2.7    | 2.69     | .06885      | 1.5    | 2.91     | .06241      | 3.0    | 3.04     | 100       |
| 105       | .07531              | 2.9    | 2.63     | .05969      | 1.6    | 2.83     | .05376      | 3.3    | 2.96     | 105       |
| 110       | .06618              | 3.1    | 2.56     | .05194      | 1.7    | 2.76     | .04648      | 3.5    | 2.89     | 110       |
| 115       | .05834              | 3.4    | 2.50     | .04535      | 1.8    | 2.69     | .04032      | 3.8    | 2.82     | 115       |
| 120       | .05158              | 3.6    | 2.44     | .03973      | 2.0    | 2.63     | .03510      | 4.1    | 2.76     | 120       |
| 125       | .04573              | 3.8    | 2.39     | .03491      | 2.1    | 2.56     | .03065      | 4.3    | 2.69     | 125       |
| 130       | .04066              | 4.0    | 2.33     | .03077      | 2.2    | 2.50     | .02685      | 4.6    | 2.63     | 130       |
| 135       | .03625              | 4.3    | 2.28     | .02721      | 2.3    | 2.44     | .02359      | 4.8    | 2.57     | 135       |
| 140       | .03240              | 4.5    | 2.23     | .02412      | 2.5    | 2.39     | .02079      | 5.1    | 2.51     | 140       |
| 145       | .02903              | 4.7    | 2.18     | .02145      | 2.6    | 2.33     | .01838      | 5.4    | 2.45     | 145       |
| 150       | .02608              | 5.0    | 2.13     | .01912      | 2.7    | 2.28     | .01629      | 5.6    | 2.40     | 150       |

| T<br>(°C) | Material code B (K) |        |          |             |        |          |             |        |          | T<br>(°C) |
|-----------|---------------------|--------|----------|-------------|--------|----------|-------------|--------|----------|-----------|
|           | PA 4235             |        |          | QA 4250     |        |          | RA 4380     |        |          |           |
|           | R (T) / R25         | TF (%) | α (%/°C) | R (T) / R25 | TF (%) | α (%/°C) | R (T) / R25 | TF (%) | α (%/°C) |           |
| -55       | 123.3               | 8.3    | 8.00     | 101.8       | 8.3    | 7.36     | 110.7       | 8.6    | 7.53     | -55       |
| -50       | 84.31               | 7.2    | 7.71     | 71.33       | 7.2    | 7.13     | 77.22       | 7.4    | 7.29     | -50       |
| -45       | 58.37               | 6.2    | 7.43     | 50.51       | 6.2    | 6.91     | 54.43       | 6.4    | 7.07     | -45       |
| -40       | 40.92               | 5.3    | 7.17     | 36.14       | 5.3    | 6.70     | 38.76       | 5.5    | 6.85     | -40       |
| -35       | 29.03               | 4.5    | 6.92     | 26.11       | 4.5    | 6.50     | 27.86       | 4.6    | 6.65     | -35       |
| -30       | 20.83               | 3.8    | 6.69     | 19.05       | 3.8    | 6.31     | 20.22       | 3.9    | 6.46     | -30       |
| -25       | 15.10               | 3.2    | 6.46     | 14.02       | 3.2    | 6.12     | 14.81       | 3.3    | 6.27     | -25       |
| -20       | 11.07               | 2.6    | 6.25     | 10.41       | 2.6    | 5.85     | 10.94       | 2.7    | 6.09     | -20       |
| -15       | 8.189               | 2.1    | 6.05     | 7.791       | 2.1    | 5.78     | 8.143       | 2.2    | 5.92     | -15       |
| -10       | 6.117               | 1.7    | 5.85     | 5.879       | 1.7    | 5.62     | 6.112       | 1.8    | 5.76     | -10       |
| -5        | 4.610               | 1.3    | 5.67     | 4.470       | 1.3    | 5.46     | 4.622       | 1.4    | 5.60     | -5        |
| 0         | 3.504               | 1.0    | 5.49     | 3.424       | 1.0    | 5.31     | 3.522       | 1.0    | 5.45     | 0         |
| 5         | 2.686               | .7     | 5.32     | 2.642       | .7     | 5.17     | 2.702       | .8     | 5.31     | 5         |
| 10        | 2.075               | .5     | 5.16     | 2.052       | .5     | 5.03     | 2.087       | .5     | 5.17     | 10        |
| 15        | 1.615               | .3     | 5.01     | 1.605       | .3     | 4.90     | 1.623       | .3     | 5.03     | 15        |
| 20        | 1.266               | .1     | 4.86     | 1.263       | .1     | 4.77     | 1.270       | .1     | 4.91     | 20        |
| 25        | 1.0000              | 0.0    | 4.72     | 1.0000      | 0.0    | 4.65     | 1.0000      | 0.0    | 4.78     | 25        |
| 30        | .7949               | .1     | 4.58     | .7965       | .1     | 4.53     | .7920       | .1     | 4.66     | 30        |
| 35        | .6359               | .3     | 4.45     | .6380       | .3     | 4.42     | .6308       | .3     | 4.55     | 35        |
| 40        | .5119               | .4     | 4.32     | .5139       | .4     | 4.31     | .5052       | .5     | 4.43     | 40        |
| 45        | .4145               | .6     | 4.20     | .4162       | .6     | 4.20     | .4068       | .6     | 4.33     | 45        |
| 50        | .3376               | .8     | 4.09     | .3388       | .8     | 4.10     | .3292       | .8     | 4.22     | 50        |
| 55        | .2765               | 1.0    | 3.98     | .2771       | 1.0    | 4.00     | .2678       | 1.0    | 4.12     | 55        |
| 60        | .2276               | 1.2    | 3.87     | .2278       | 1.2    | 3.90     | .2189       | 1.3    | 4.02     | 60        |
| 65        | .1883               | 1.4    | 3.77     | .1881       | 1.4    | 3.81     | .1797       | 1.5    | 3.93     | 65        |
| 70        | .1566               | 1.7    | 3.67     | .1560       | 1.7    | 3.72     | .1483       | 1.7    | 3.84     | 70        |
| 75        | .1308               | 1.9    | 3.58     | .1300       | 1.9    | 3.63     | .1228       | 2.0    | 3.75     | 75        |
| 80        | .1098               | 2.1    | 3.48     | .1088       | 2.1    | 3.55     | .1022       | 2.2    | 3.67     | 80        |
| 85        | .09258              | 2.4    | 3.40     | .0914       | 2.4    | 3.47     | .08537      | 2.5    | 3.58     | 85        |
| 90        | .07838              | 2.6    | 3.31     | .07708      | 2.6    | 3.39     | .07160      | 2.7    | 3.50     | 90        |
| 95        | .06662              | 2.9    | 3.23     | .06527      | 2.9    | 3.31     | .06029      | 3.0    | 3.42     | 95        |
| 100       | .05686              | 3.1    | 3.15     | .05547      | 3.2    | 3.24     | .05095      | 3.2    | 3.35     | 100       |
| 105       | .04871              | 3.4    | 3.07     | .04731      | 3.4    | 3.17     | .04322      | 3.5    | 3.28     | 105       |
| 110       | .04189              | 3.7    | 3.00     | .04049      | 3.7    | 3.10     | .03679      | 3.8    | 3.21     | 110       |
| 115       | .03614              | 3.9    | 2.93     | .03478      | 3.9    | 3.03     | .03143      | 4.1    | 3.14     | 115       |
| 120       | .03130              | 4.2    | 2.86     | .02996      | 4.2    | 2.96     | .02693      | 4.3    | 3.07     | 120       |
| 125       | .02719              | 4.5    | 2.79     | .02590      | 4.5    | 2.90     | .02316      | 4.6    | 3.01     | 125       |
| 130       | .02370              | 4.7    | 2.73     | .02246      | 4.7    | 2.84     | .01997      | 4.9    | 2.94     | 130       |
| 135       | .02072              | 5.0    | 2.67     | .01953      | 5.0    | 2.78     | .01728      | 5.2    | 2.88     | 135       |
| 140       | .01817              | 5.3    | 2.61     | .01704      | 5.3    | 2.72     | .01499      | 5.4    | 2.82     | 140       |
| 145       | .01598              | 5.5    | 2.55     | .01490      | 5.5    | 2.67     | .01305      | 5.7    | 2.77     | 145       |
| 150       | .01410              | 5.8    | 2.49     | .01307      | 5.8    | 2.61     | .01138      | 6.0    | 2.71     | 150       |

# NTC Accurate Leaded Thermistors

## NI24 • NJ28



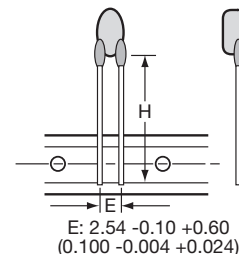
### PACKAGING

#### • Reel & Ammopack

| Types | Suffix | H or Ho                       | Leads    | Quantity/Size | Packaging |
|-------|--------|-------------------------------|----------|---------------|-----------|
| NJ28  | CA     | 16 ± 0.5<br>(0.630 ± 0.020)   | Straight | 3000          | AMMOPACK  |
|       | CB     | 16 ± 0.5<br>(0.630 ± 0.020)   | Straight | 3000          | REEL      |
|       | CC     | 19.5 ± 0.5<br>(0.768 ± 0.020) | Straight | 3000          | AMMOPACK  |
|       | CD     | 19.5 ± 0.5<br>(0.768 ± 0.020) | Straight | 3000          | REEL      |

#### • Bulk

| Type | Quantity/box |
|------|--------------|
| NJ28 | 2000         |
| NI24 | 1000         |



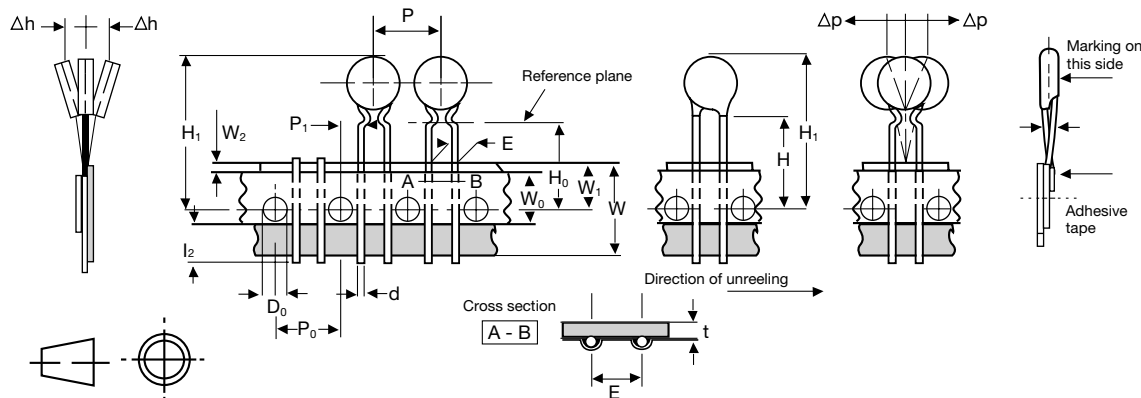
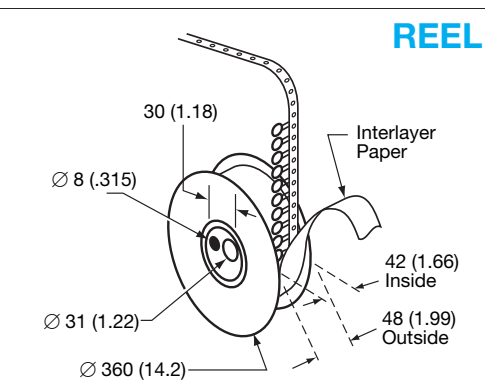
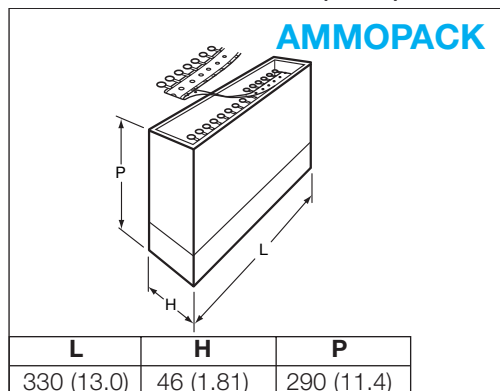
### TAPING CHARACTERISTICS

#### Missing components

A maximum of 3 consecutive components may be missing from the bandolier, surrounded by at least 6 filled positions. The number of missing components may not exceed 0.5% of the total per packing module.

The beginning and the end of tape exhibit 8 or 9 blank positions.

#### DIMENSIONS: millimeters (inches)



| Value   | Tolerance    | Dimensions Characteristics                                                           |
|---------|--------------|--------------------------------------------------------------------------------------|
| 18      | +1 / -0.5    | W Leading tape width                                                                 |
| 6       | ±0.3         | W <sub>0</sub> Adhesive tape width                                                   |
| 9       | +0.75 / -0.5 | W <sub>1</sub> Sprocket hole position                                                |
| 3 max.  |              | W <sub>2</sub> Distance between the top of the tape and the adhesive                 |
| 4       | ±0.2         | D <sub>0</sub> Diameter of sprocket hole                                             |
| 16/19.5 | ±0.5         | H <sub>0</sub> Distance between the tape axis and the seating plane of the component |
|         |              | H <sub>1</sub> Distance between the tape axis and the top of component body          |

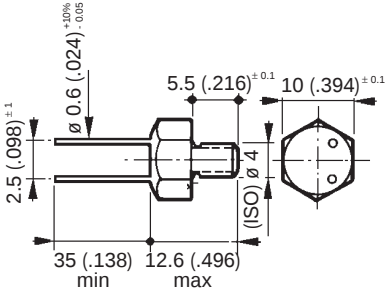
| Value     | Tolerance | Dimensions Characteristics                                               |
|-----------|-----------|--------------------------------------------------------------------------|
| 12.7      | ±0.2      | P <sub>0</sub> Sprocket holes pitch                                      |
| 254       | ±1        | Distance between 21 consecutive holes 20 pitches                         |
| 0.7       | ±0.2      | t Total thickness of tape                                                |
| 2.54 5.08 | +0.6 -0.1 | E Lead spacing                                                           |
| 5.08 3.85 | ± 0.7     | P <sub>1</sub> Distance between the sprocket hole axis and the lead axis |
| 12.7      | ±1.0      | P Spacing of components                                                  |
| 0.5 0.6   | ±5%       | d Lead diameter                                                          |
| 0         | ±1.3      | °P Verticality of components                                             |
| 0         | ±2        | °h Alignment of components                                               |

# NTC Thermistors Insulated Metal Case NM 06



Especially designed for mounting on a chassis or screwing on a plate, these thermistors provide an excellent thermal

contact and ensure a good accuracy of measurement and alarm control for different types of equipment.

| Type                                    | NM 06                                                                                                                                                                 |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Finish                                  | Disc thermistor, insulated metal case for chassis mounting                                                                                                            |
| <b>DIMENSIONS:</b> millimeters (inches) |  <p>This type can be delivered with fixing nut, add suffix WC to the reference.</p> |
| Marking                                 | Nominal resistance<br>Tolerance for ±10%                                                                                                                              |
| Operating temperature                   | -55°C to +150°C                                                                                                                                                       |
| Table of values                         | See table on page 25                                                                                                                                                  |
| Tolerance on R <sub>n</sub> (25°C)      | ±10% ±20%                                                                                                                                                             |
| Maximum dissipation at 25°C             | 0.8 W - without heat sink<br>2 W - with heat sink<br>Part mounted in the center of a brass plate<br>(dim.: 100 x 100 x 1 mm)                                          |
| Thermal dissipation factor*             | 8 mW/°C: without heat sink<br>20 mW/°C: with heat sink                                                                                                                |
| Thermal time constant                   | Depending on cooling system                                                                                                                                           |
| Test voltage to earth                   | 380 Vrms (50 Hz)                                                                                                                                                      |

\*Typical value

## HOW TO ORDER

**NM06**

Type

**P0**

Material Code  
P  
(See table page 25)

**0103**

Resistance  
10 kΩ

**M --**

Tolerance  
M (±20%)

# Table of Values



## NM 06

| Types                                              | Rn at 25°C                    | Material Code | B (K)<br>$\left( \frac{\Delta B}{B} \begin{matrix} (1) \pm 5\% \\ (2) \pm 3\% \end{matrix} \right)$ | $\alpha$ at 25°C (%/°C) |
|----------------------------------------------------|-------------------------------|---------------|-----------------------------------------------------------------------------------------------------|-------------------------|
| NM 06 F 0 0100<br>NM 06 F 0 0150                   | 10<br>15                      | F             | 2800 (1)                                                                                            | – 3.2                   |
| NM 06 G 0 0220<br>NM 06 G 0 0330                   | 22<br>33                      | G             | 3030 (1)                                                                                            | – 3.4                   |
| NM 06 H 0 0470<br>NM 06 H 0 0680                   | 47<br>68                      | H             | 3160 (1)                                                                                            | – 3.5                   |
| NM 06 I 0 0101                                     | 100                           | I             | 3250 (1)                                                                                            | – 3.7                   |
| NM 06 J 0 0151<br>NM 06 J 0 0221                   | 150<br>220                    | J             | 3480 (1)                                                                                            | – 3.9                   |
| NM 06 K 0 0331<br>NM 06 K 0 0471                   | 330<br>470                    | K             | 3630 (1)                                                                                            | – 4.0                   |
| NM 06 L 0 0681<br>NM 06 L 0 0102                   | 680<br>1,000                  | L             | 3790 (2)                                                                                            | – 4.2                   |
| NM 06 M 0 0152                                     | 1,500                         | M             | 3950 (2)                                                                                            | – 4.4                   |
| NM 06 N 0 0222<br>NM 06 N 0 0332                   | 2,200<br>3,300                | N             | 4080 (2)                                                                                            | – 4.6                   |
| NM 06 P 0 0472<br>NM 06 P 0 0682<br>NM 06 P 0 0103 | 4,700<br>6,800<br>10,000      | P             | 4220 (2)                                                                                            | – 4.7                   |
| NM 06 Q 0 0153<br>NM 06 Q 0 0223                   | 15,000<br>22,000              | Q             | 4300 (2)                                                                                            | – 4.7                   |
| NM 06 R 0 0333                                     | 33,000                        | R             | 4400 (2)                                                                                            | – 4.8                   |
| NM 06 S 0 0473<br>NM 06 S 0 0683                   | 47,000<br>68,000              | S             | 4520 (2)                                                                                            | – 5.0                   |
| NM 06 T 0 0104                                     | 100,000                       | T             | 4630 (2)                                                                                            | – 5.1                   |
| NM 06 U 0 0154<br>NM 06 U 0 0224<br>NM 06 U 0 0334 | 150,000<br>220,000<br>330,000 | U             | 4840 (2)                                                                                            | – 5.3                   |

Resistance - Temperature characteristics: pages 32 to 35.

This type of product is widely used in automotive and consumer applications.

They are assembled in custom-probes for sensing the temperature of liquids (water, oil, ...), gases or surface of any other component.

The metallization covers completely the surfaces of the thermistor.

The particularly flat and smooth surfaces ensure an excellent electrical and thermal contact under pressure.

| Types                      | NR                                                                                                                                                              |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Physical data (dim. in mm) |                                                                                                                                                                 |
| Marking                    | On package only / On parts upon request                                                                                                                         |
| Operating temperature      | -40°C to +200°C                                                                                                                                                 |
| Values and tolerances      | Custom - designed products defined with:<br>$D \pm \Delta D$ $R_1 \pm \Delta R_1 / R_1$ at $T_1$<br>$E \pm \Delta E$ $R_2 \pm \Delta R_2 / R_2$ at $T_2, \dots$ |

## DESIGN OF THE THERMISTOR

### Choice of the resistances

If the application is to measure the temperature around a defined point, a unique nominal resistance can be chosen (for example, among standard values of the ND range products presented on pages 16 to 21).

When it is required to measure the temperature over selected ranges  $T_1 - T_2$ ,  $T_2 - T_3$ , ..., the corresponding resistance  $R_1$ ,  $R_2$ ,  $R_3$ , ..., must be such that they can be located on the  $R(T)$  characteristic of an existing NTC material (for example among standard materials whose  $R(T)$  are displayed on pages 32 to 35).

The resistances must also be compatible with the resistivity of the material and the dimensions of the thermistor.

### Choice of the tolerances

The precision of the temperature measurement determines the calculation of the tolerance on the resistance:

$$\Delta R / R = \alpha \text{ (}\% / ^\circ\text{C)} \cdot \Delta T \text{ (}^\circ\text{C)}$$

For example, the NTC NR55--3049-99, using "N5" material ( $R(T)$  characteristic displayed on page 34), requires a precision of 1°C over the temperature range 110°C - 120°C.

The tolerances can be calculated:

$$\Delta R_{110^\circ\text{C}} / R_{110^\circ\text{C}} = 1^\circ\text{C} \cdot 2.91\% / ^\circ\text{C} = 2.91\%$$

$$\Delta R_{120^\circ\text{C}} / R_{120^\circ\text{C}} = 1^\circ\text{C} \cdot 2.76\% / ^\circ\text{C} = 2.76\%$$

\*For your specific requirements, please consult us.

## HOW TO ORDER

**NR55 - - 3002 - 99**

# NTC Leadless Disc Thermistors



We present below some examples of our custom - designed products as an illustration of the different ways to define products.

## DIMENSIONS: millimeters (inches)

| Types              | D                           | E                           | Material Code | B (k) | $R_1 \pm \Delta R_1$ at $T_1$ | $T_1$ (°C) | $R_2 \pm \Delta R_2$ at $T_2$ | $T_2$ (°C) | $R_3 \pm \Delta R_3$ at $T_3$ | $T_3$ (°C) |
|--------------------|-----------------------------|-----------------------------|---------------|-------|-------------------------------|------------|-------------------------------|------------|-------------------------------|------------|
| NR 55 -- 3002 - 99 | 5.5 (.217) $\pm$ 0.5 (.020) | 1.1 (.043) $\pm$ 0.4 (.016) | N5            | 4160  | 1230 $\Omega \pm 7.5\%$       | 40         | 160 $\Omega \pm 5\%$          | 96.5       | –                             | –          |
| NR 67 -- 3068 - 99 | 6.7 (.264) $\pm$ 0.5 (.020) | 1.7 (.067) $\pm$ 0.3 (.012) | N             | 4080  | 150 $\Omega \pm 3.3\%$        | 100        | 51 $\Omega \pm 5.3\%$         | 140        | –                             | –          |
| NR 55 -- 3049 - 99 | 5.5 (.217) $\pm$ 0.5 (.020) | 1.0 (.040) $\pm$ 0.2 (.008) | N5            | 4160  | 107 $\Omega \pm 2.9\%$        | 110        | 80.6 $\Omega \pm 2.8\%$       | 120        | –                             | –          |
| NR 55 -- 3046 - 99 | 5.5 (.217) $\pm$ 0.5 (.020) | 1.3 (.051) $\pm$ 0.4 (.016) | S             | 4520  | 48600 $\Omega \pm 7.5\%$      | 25         | 3210 $\Omega \pm 5\%$         | 90         | –                             | –          |
| NR 49 -- 3119 - 99 | 4.9 (.193) $\pm$ 0.3 (.012) | 1.5 (.060) $\pm$ 0.4 (.016) | M             | 3950  | 840 $\Omega \pm 10\%$         | 37.8       | 84 $\Omega \pm 5\%$           | 104.4      | –                             | –          |
| NR 55 -- 3114 - 99 | 5.5 (.217) $\pm$ 0.4 (.016) | 1.0 (.040) $\pm$ 0.2 (.008) | P             | 4220  | 5000 $\Omega \pm 10\%$        | 25         | –                             | –          | –                             | –          |
| NR 70 -- 3121 - 99 | 7.0 (.275) $\pm$ 0.3 (.012) | 1.2 (.047) $\pm$ 0.2 (.008) | L             | 3790  | 210 $\Omega \pm 10\%$         | 40         | 40 $\Omega \pm 7.5\%$         | 90         | 30 $\Omega \pm 6.7\%$         | 100        |
| NR 29 -- 3107 - 99 | 2.9 (.014) $\pm$ 0.3 (.012) | 1.5 (.060) $\pm$ 0.3 (.012) | K             | 3630  | 2050 $\Omega \pm 6\%$         | 25         | 193 $\Omega \pm 5.4\%$        | 96.5       | –                             | –          |
| NR 55 -- 3122 - 99 | 5.5 (.217) $\pm$ 0.5 (.020) | 1.5 (.060) $\pm$ 0.4 (.016) | J             | 3480  | 210 $\Omega \pm 5\%$          | 25         | –                             | –          | –                             | –          |
| NR 55 -- 3126 - 99 | 5.5 (.217) $\pm$ 0.5 (.020) | 1.0 (.040) $\pm$ 0.2 (.008) | P             | 4220  | 3340 $\Omega \pm 10\%$        | 25         | 264 $\Omega \pm 7\%$          | 90         | 107 $\Omega \pm 7\%$          | 120        |
| NR 47 -- 3116 - 99 | 4.7 (.185) $\pm$ 0.4 (.016) | 1.2 (.047) $\pm$ 0.2 (.008) | R             | 4400  | 33000 $\Omega \pm 2\%$        | 25         | –                             | –          | –                             | –          |
| NR 49 -- 3113 - 99 | 4.9 (.193) $\pm$ 0.3 (.012) | 1.2 (.047) $\pm$ 0.2 (.008) | N             | 4080  | 1680 $\Omega \pm 10\%$        | 40         | 382 $\Omega \pm 6.7\%$        | 80         | 176 $\Omega \pm 5\%$          | 105        |
| NR 47 -- 3101 - 99 | 4.6 (.181) $\pm$ 0.3 (.012) | 1.4 (.055) $\pm$ 0.3 (.012) | J             | 3480  | 146 $\Omega \pm 13\%$         | 40         | 22 $\Omega \pm 10\%$          | 100        | –                             | –          |
| NR 55 -- 3071 - 99 | 5.8 (.228) $\pm$ 0.3 (.012) | 1.0 (.040) $\pm$ 0.2 (.008) | L             | 3790  | 262 $\Omega \pm 8.7\%$        | 40         | 120 $\Omega \pm 10\%$         | 60         | 35.5 $\Omega \pm 7.8\%$       | 100        |
| NR 61 -- 3063 - 99 | 6.1 (.240) $\pm$ 0.3 (.012) | 1.5 (.060) $\pm$ 0.3 (.012) | N             | 4080  | 760 $\Omega \pm 9.2\%$        | 50         | 130 $\Omega \pm 8.5\%$        | 100        | 56.6 $\Omega \pm 8.5\%$       | 130        |
| NR 67 -- 3053 - 99 | 6.7 (.264) $\pm$ 0.4 (.016) | 1.7 (.067) $\pm$ 0.3 (.012) | N             | 4080  | 540 $\Omega \pm 11\%$         | 60         | 144 $\Omega \pm 7\%$          | 100        | –                             | –          |
| NR 50 -- 3048 - 99 | 5.0 (.197) $\pm$ 0.5 (.020) | 1.5 (.060) $\pm$ 0.5 (.020) | J             | 3480  | 233 $\Omega \pm 10\%$         | 25         | 13.3 $\Omega \pm 7\%$         | 121        | –                             | –          |
| NR 60 -- 3021 - 99 | 6.0 (.236) $\pm$ 0.5 (.020) | 3.2 (.125) $\pm$ 0.3 (.012) | P             | 4220  | 3640 $\Omega \pm 3\%$         | 40         | 457 $\Omega \pm 3\%$          | 96.5       | –                             | –          |
| NR 55 -- 3016 - 99 | 5.5 (.217) $\pm$ 0.5 (.020) | 1.1 (.043) $\pm$ 0.4 (.016) | Q             | 4300  | 5500 $\Omega \pm 9\%$         | 40         | 650 $\Omega \pm 7.7\%$        | 96.5       | –                             | –          |

Resistance - Temperature characteristics: pages 32 to 35.